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Knowledge Networks and Local Resources Shaping Innovation in Rural Areas

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Declaration:
Hereby I declare that this doctoral thesis, my original investigation and achievement, submitted for the doctoral degree at Tallinn University of Technology, has not been previously submitted for doctoral or equivalent academic degree.

Merli Reidolf

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Teadmusvõrgustikud ja kohalikud ressursid innovatsiooni kujundajatena maapiirkondades

MERLI REIDOLF

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Contents

List of Publications

The list of author's publications, on the basis of which the thesis has been prepared:

I Reidolf, M. (2016). Knowledge networks and the nature of knowledge relationships of innovative rural SMEs. European Journal of Innovation Management, 19 (3), 317−336. 10.1108/EJIM-06-2015-0043. (ETIS 1.1)

II Reidolf, M.; Graffenberger, M. (2019). How local resources shape innovation and path development in rural regions. Insights from rural Estonia. Journal of Entrepreneurship, Management and Innovation (JEMI), 15 (3), 131−162. 10.7341/20191535. (ETIS 1.1)

III Ferreiro, M. de F.; Sheikh, F. A.; Reidolf, M.; de Sousa, C.; Bhaduri, S. (2019). Tradition and innovation: Between dynamics and tensions. African Journal of Science, Technology, Innovation and Development, 1−10. 10.1080/20421338.2018.1558743. (ETIS 1.1)

Author's Contribution to the Publications

The author contributed to the papers in this thesis in the following ways:

I The author of the thesis was the sole author of Article I.

II In Paper II, the author of the thesis served as the first author, led the idea generation throughout the discussions with the co-author and contributed to theoretical research design, data collection, data analysis and manuscript preparation. The main findings and conclusions were prepared jointly by both authors.

III In paper III, the author participated in idea generation and study design through discussions with other co-authors. She contributed to the preparation of the theoretical framework, participated in data collection, prepared data for analysis (Estonian case) and was part of the team that conducted comparative analyses. The main findings and conclusions were prepared in discussions with all authors.

Introduction

Innovation is recognised as one of the key drivers of economic growth and development (Brem, 2011; Hong, Oxley, & McCann, 2012) and an important aspect of a knowledge-driven economy (Petrov, 2011). However, mainstream innovation literature typically considers cities superior to more geographically distributed platforms for entrepreneurship and innovation (Florida, Adler, & Mellander, 2017). As rural regions account for more than 80% of the territory and a quarter of the population of OECD countries (OECD, 2014), there is no justification for excluding these areas from innovation studies. In this research, innovation is understood as a result of an interactive process in which new marketed products, services, or novel processes (at least to the firm) are introduced (OECD/Eurostat, 2005). Innovation is an outcome of an activity that aims to implement something novel (OECD/Eurostat, 2018). Rural innovation studies, in particular, tend to use this broader understanding, where innovation could be utilised in new or improved products or services, processes or marketing endeavours (OECD, 2014). This broader understanding is especially vital for firms in regions where high-tech innovations are scarce (Eder, 2018), such as rural areas.

Although innovation has been identified to occur in rural areas (Rogers, 2003), theoretical, as well as empirical, contributions to innovation studies are biased towards cities (Shearmur, 2017; Torre & Wallet, 2013). The political and practical need is not fully addressed in the theoretical discussion. The long-term stream of literature focusing merely on agriculture (Singh & Bhowmick, 2015) is insufficient to understand the holistic picture of today's rurality (Li, Westlund, & Liu, 2019). Despite the growing theoretical discussion since the beginning of the 21st century, the rural innovation literature is still scarce, leaving the full potential of these locations under-examined (Eder, 2019; Graffenberger & Vonnahme, 2019). The topic has not been studied sufficiently to refute general stereotypes and strengthen theoretical grounds of rural innovation (Leão, 2014). Rural areas differentiate from dynamic core regions, for example, with a concentration of inhabitants, firms from the same sector, scientific organisations and local networking (Asheim & Isaksen, 2002; Isaksen & Karlsen, 2016). This thesis follows the definition of a rural area, where population density is below 150 inhabitants per km^2 and the majority of people live in rural communities outside of agglomerative centres (OECD, 2005). Smaller regional towns, as centres of the locality, are also regarded as part of the rural area. Thus, rurality is described according to the territory's population density and the size of urban centres. Furthermore, rurality is handled as a subjective factor and defined in comparison to other territories in the country (Eder, 2019). In some case, the term periphery is used as a synonym thus referring to the long distances from urban centres, whereas peripheralisation 'describes the production of peripheries through social relations and their spatial implications' (Kühn, 2015, p. 367). Although all rural areas do not have to be peripheral, the terms often coincide (Plüschke-Altof, 2017). This concurrence is one reason why the two terms rural and peripheral, are used in a similar way. To avoid confusion, in the current research, peripheralisation is used to stress the process of decline.

Meanwhile, city-focused research concentrates on science-based, high-tech and radical innovations measured via technological research and development (R&D) activities and patents (Hong et al., 2012), thus leaving incremental innovations and informal local knowledge sources mainly unexploited (Gamito & Madureira, 2019; Isaksen & Onsager, 2010). The importance of the local context, mutual learning and the

need to highlight incremental, as well as radical, innovations are emphasised in the innovation systems concept (Lundvall, 2010), while this broad focus has been somewhat narrower in later innovation research. Non-technological innovations are believed to be more common in rural settings (Doloreux, Dionne, & Jean, 2007) which is one reason why the adoption and dissemination of innovations in rural areas are believed to deviate from urban areas (Gross-Fengels & Fromhold-Eisebith, 2018; Rogers, 2003). Small-scale innovations and a lack of patenting explain why scholarly innovation research has paid so little attention to these areas. There is, thus, a need to examine rural innovation from a new, unconventional angle, discarding traditional urban-centred radical innovation assumptions to analyse the full slate of resources available to rural firms.

The starting point of the thesis is that rural firms suffer from the shortage of local actors, forcing them to compensate for this lack; as recompense, these localities may provide a number of resources that can be used for innovations. A knowledge network is an important resource for innovations (Lundvall, 2007), while delivering novel knowledge to the actors, thus creating additional opportunities, offsetting the dearth of knowledge and local actors (Dubois, 2013; Huggins & Johnston, 2009; Liu, Chaminade, & Asheim, 2013). Social factors (Rutten, 2017; Shearmur, 2011) and territorial contexts (Isaksen & Trippl, 2017) can heavily influence knowledge creation and innovation. Although the importance of knowledge networks is well-known, the number of studies specifically concerning rural networking is still limited (Li et al., 2019; Slotte-Kock & Coviello, 2010). Those that do focus on territorialised innovation theories concentrate on networking inside some given locality (e.g. Bassi, Zaccarin, & De Stefano, 2014; van Hemert, Nijkamp, & Masurel, 2012). For rural innovation, however, the extra-local dimension and extra-local relationships going beyond the locality might make for more valuable focus points (Young, 2010).

Rural areas vary according to geographical, institutional and other conditions and, thus, offer different sets of local resources as inputs for innovations. Constraints in accessing high-tech solutions and highly educated employees may promote the use of local opportunities (Fromhold-Eisebith & Dewald, 2018). Despite limited contributions in the rural innovations literature (Shearmur, Carrincazeaux, & Doloreux, 2016), some scholars, for instance Gibson (2016), Korsgaard, Ferguson and Gaddefors (2015) and Müller and Korsgaard (2018), provide seminal examples for theoretical discussion. While most scholars regard rural characteristics as weaknesses, they analysed the use of rural qualities in innovation activities. There are examples wherein rural entrepreneurs have effectively exploited local resources in their innovation activities, for example their physical, cultural and historical landscapes (Korsgaard et al., 2015; Müller & Korsgaard, 2018). Rural areas tend to be equipped with special tools. Traditions relying on historical knowledge and practical experience, local images and identities (Gibson, 2016; Korsgaard et al., 2015; Müller & Korsgaard, 2018; Plüschke-Altof & Grootens, 2019) could be unique place-specific attributes upon which innovations can be built. Furthermore, Lafuente, Vaillant and Serarols (2010) have noticed that non-economic values, such as lifestyle, traditions and identity, are sometimes highly valued by rural entrepreneurs, especially when these entrepreneurs are not solely motivated by economic concerns. This is a novel means of assessing innovation in the rural context, and its uniqueness and small scale might explain why rural resources have, thus far, been neglected in the innovation research context.

While more published sources are now considering aspects of rural innovations, certain stigmas remain (Copus, Skuras, & Tsegenidi, 2008; Graffenberger & Vonnahme, 2019;

Virkkala, 2007). These stigmas can be at least partly linked with evolutionary perspectives that propose continuity and path-dependency as keys to projecting regional development trajectories (Martin & Sunley, 2006), i.e., while radical innovations are not common today, they are less likely to happen in the near future. This has unduly compromised the idea that these concepts contain some plasticity (Strambach, 2008) and that entrepreneurial activity and innovation can mould existing development paths. Innovations are ultimately implemented (or not); the innovation diffusion process is channelled over time through social systems (Rogers, 2003). Therefore, the development paths are either modified or not due to the existence or absence of agents and their capacity to make choices and take action either deliberately or not (Huggins & Thompson, 2019; Isaksen, Jakobsen, Njøs, & Normann, 2019; Sotarauta & Suvinen, 2018). This decision making is supported by local resources and local and extra-local networks (Müller & Korsgaard, 2018), which are part of a complex interplay of the innovation activities that can be explained with the help of a systemic approach (Edquis, 2006; Touzard, Temple, Faure, & Triomphe, 2015). Although the regional innovation systems (RIS) may not be fully developed for rural settings (Tödtling & Trippl, 2005), the RIS still proposes a framework for exploring the innovation activities, although it may have some locality-based specifics. The overall ecosystem of a particular location (e.g., local resources, activities and decisions, networking of local actors) shapes the innovations, and the innovations, in turn, influence the future of these localities when changing the development trajectories or strengthening or weakening possibilities to build upon local traditions. Since the existing rural innovation research is highly limited and sporadic, the narrow contributions concentrate on only limited aspects of the theme, but the overall development as a larger aim is vital, too.

Innovation is highly contextual (Hong et al., 2012). Eder (2019) points out the need to analyse rural innovation at a micro level through firms' activities. A vast majority of papers have focused more on regional level development, but there is a need to analyse the activities of firms at a micro level within wider evolving systems (Gertler, 2010). Moreover, the geography of existing studies seems to be concentrated on highly-developed countries (e.g. Dubois, 2013; Fink, Lang, & Harms, 2013; Hermans, Van Apeldoorn, Stuiver, & Kok, 2013; Varis & Littunen, 2012). Studies of rural innovation in Central and Eastern Europe (Eder, 2019; Květoň & Blažek, 2018) are particularly scarce. Studies targeting localities in the former Soviet Union where structures and institutions differ from their western counterparts are rarer still (Lasagni, 2012; McKeever, Anderson, & Jack, 2014).

The aim of the thesis is to identify the use of knowledge networks and local rural resources as sources of innovation activities of small and medium-sized enterprises (SMEs) in rural areas. Working at the micro-level, from a firm-level viewpoint, the research analyses knowledge networks delivering knowledge for innovations and using local resources for innovations in SMEs in rural Central and Eastern European areas. Hence, this research analyses the opportunities for using localities and knowledge networks as compensating instruments. As the use of local resources in innovation activities might influence the locality itself, this thesis also analyses the interplay between innovations and the locality. The focus is on capturing the complexity that needs to be examined by covering the different sides of the issue that could offer a novel angle for unpacking the issue.

The following research questions arise from the previously described research and background information regarding this topic:

RQ1: How do firms in rural areas use knowledge networks for their innovation activities?

RQ2: How do firms in rural areas use local resources for their innovation activities?

RQ3: How does the use of local resources for innovation activities influence the development paths of localities?

This research is built on an innovation systems approach that recognises innovation as an output of complex, cumulative and interactive processes (Asheim, Grillitsch, & Trippl, 2016; Lundvall, 2010). The research is further based on network paradigms (Murdoch, 2000) that stress the importance of social action and an understanding that local conditions influence innovation activities (Isaksen & Karlsen, 2016; Müller & Korsgaard, 2018). Empirical research was conducted mainly in rural areas in Estonia, specifically concentrating on the activities of innovative rural firms (Articles I and II). In Article III, the Estonian case is compared to examples from rural areas in other countries (Portugal and India). The research takes an explorative approach to understand the place of knowledge networks and local resources in rural firms' innovation activities. The papers are based on data gathered via semi-structured interviews with local firms and other actors influencing rural innovations.

The thesis is based on three papers. All three are interconnected and provide information to answer the research questions (Figure 1). Article I mainly answers RQ1 while analysing the knowledge networks of innovative firms in rural areas. Article II addresses RQ2 while investigating how the subject firms mobilise local resources for innovations. In addition, Article II analyses how these innovation activities mould regional development paths, thus contributing to work on RQ3. Article III benefits in answering RQ2 while analysing the traditions as one of local resources enabling innovations. Furthermore, this article responses to RQ3 while studying the complex interplay between tradition and innovation, enabling and restricting the nature of traditional knowledge and resources to innovations and vice versa.

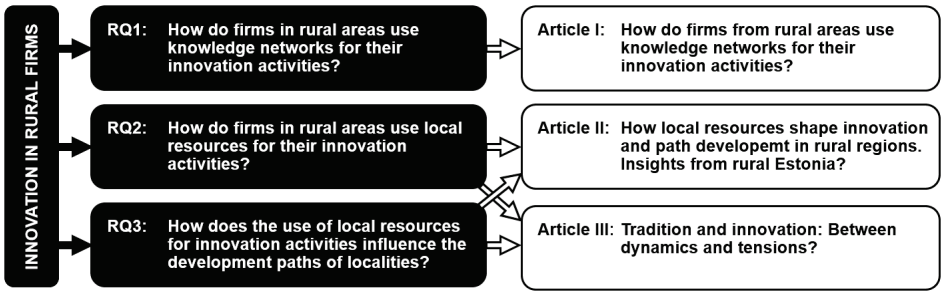

Figure 1. *Research questions and connections between the articles.*
Source: Author.

This doctoral thesis seeks to contribute to the growing rural innovation literature while unpacking different aspects of rural innovation and discussing complex connections between social dynamics and locality. The research provides several novel insights into the rural innovation literature:

- It proposes a framework for analysing the configuration of knowledge networks and the nature (activity and strength) of relations between actors to analyse in detail the use of existing links (Article I).
- The use of social network analyses in innovation studies is elaborated beyond a region's borders, something not common in studies of social network analysis.
- Several salient examples are given regarding how local resources are used in rural firm innovations, contrary to mainstream innovation literature (Articles II and III).
- Rural innovation is a multi-directional activity, not a linear process, as innovations are shaped by localities and the innovations themselves can modify local resources, traditions and development paths. The thesis explores several cases (in Estonia, Portugal and India) where innovations and traditions either supported or hindered each other during the development process (Article III).
- This thesis presents possible ways in which innovation-related activities can shape the development paths of these regions (Article II), thus enlarging the understanding about the complexity of innovation routes.
- The thesis provides new empirical examples from Central and Eastern Europe in order to enrich the current rural innovation literature (all articles).

Beyond these theoretical contributions, this thesis also has practical value. It stresses the complexity of innovation processes compared to the linear R&D oriented innovations, and as well as the importance of incremental innovations. These factors should be considered when managing innovation-related processes in the firms and through policy development.

This PhD thesis is structured as follows: the next section discusses theoretical grounds and existing knowledge on the processes of rural innovation amongst SMEs in rural areas. It then gives an overview of the research methodology. This is followed by the key results of the empirical research; they are presented, structured and compared with the previous theoretical knowledge and examples. Finally, the conclusion, list of references and appendix (including Articles I-III) are presented.

Abbreviations

DUI	Doing, using, interacting
EC	European Commission
EU	European Union
ICT	Information and communication technology
OECD	Organisation for Economic Co-operation and Development
R&D	Research and development
RIS	Regional innovation system
SME	Small and medium-sized enterprises
SNA	Social network analysis
STI	Science, technology, innovation

1 Literature review

This section discusses the literature addressing different aspects of rural innovation and sets the theoretical grounds of the research. The overview focuses on the specifics of rural innovation: sources of knowledge for innovations, the use of local resources and the effects of rural innovations on localities' development paths.

1.1 Setting the scene: rurality impacting innovation in firms

It is believed that local and regional conditions influence entrepreneurship and innovation (Courtney, Lépicier, & Schmitt, 2008; Isaksen & Karlsen, 2016; Müller & Korsgaard, 2018; Tödtling & Grillitsch, 2012). Rural areas are not identical, although they share common features, which are often interpreted as negative traits that might somehow affect innovation activities. Rural and urban can be distinguished based on objective factors (e.g., population density, distance from cities and economic activities) and subjective features, such as the residents' lifestyle and attitudes (Fromhold-Eisebith & Dewald, 2018). Rural areas tend to possess limited local markets which often face shrinkage, as well as older and less educated populations (Burnett & Danson, 2004; Irvine & Anderson, 2008; Ring, Peredo, & Chrisman, 2010). The rural labour force is generally paid less while, nonetheless, working longer for the same employer than their urban counterparts (Kalantaridis, 2009; Virkkala, 2007). The rural infrastructure is typically weaker; low and medium-low technologies usually prevail, and such areas demonstrate a historical reliance on traditional (mostly agricultural) sectors, which in many places have been in decline for some time (Li et al., 2019; McDonagh, 2012; Varis, Tohmo, & Littunen, 2012). Social and grassroots innovations are overwhelming in these places, institutional structures tend to be thin, and innovation systems are weakly developed (Fromhold-Eisebith & Dewald, 2018; Tödtling & Trippl, 2005). Benefits from agglomeration, such as proximity, density and diversity, which are considered prerequisites for innovations, are not readily available to rural businesses (Asheim, Smith, & Oughton, 2011; Besser & Miller, 2013; Massard & Autant-Bernard, 2015). Although great hope has been placed on information and communication technology (ICT), the research paradoxically shows that differences in ICT are not compensating for remoteness (Salemink, Strijker, & Bosworth, 2017). It is often interpreted that these inconvenient conditions discourage the development of innovation (Virkkala, 2007). However, the increasing theoretical debate about rural innovation has highlighted that in some cases, rural firms are far more innovative than would otherwise be expected.

Innovation is a subjective category where novelty is not an objective classification but is determined by the one adopting it (Rogers, 2003). When considering rural innovation, it is not a question about existence, but awareness. This thesis' definition of innovation includes innovations that are not necessarily new to the world; they can be a product, service, process or marketing scheme as long as they are novel to the firm and introduced to the market (OECD/Eurostat, 2005). This definition stresses a broader understanding and varied types of novelty. Different modes of innovation draw on disparate sources of knowledge. Science, technology and innovation (STI) and doing, using and interacting (DUI) are often seen as two ideal modes of learning and innovation (Jensen, Johnson, Lorenz, & Lundvall, 2007). STI, which is based on codified, scientific and technological knowledge, as well as advanced technology, is typical in research-intensive industries, while DUI, based on experiences and informal learning, is supported by market-based actors (Asheim, Isaksen, & Trippl, 2019; Jensen et al., 2007; Parrilli & Alcalde Heras,

2016). The DUI mode is typically represented in non-R&D based economies (Asheim, 2012), which characterise rural areas. Therefore, old knowledge can also be implemented in a novel way or unforgotten practices can be revived in the firms' innovation activities.

It should be noted that innovations do exist in rurality; however, innovating firms located in these areas often use certain strategies that divert from urban-centred expectations (Eder, 2019). First, rural firms are forced to compensate for local constraints (North & Smallbone, 2000); effective use of knowledge networks can be an opportunity to sidestep lacks of local networking, knowledge and other assets (Dubois, 2013; Huggins & Johnston, 2009; Liu et al., 2013). To do so, they can utilise a number of local resources, including place-specific, sometimes unconventional amenities, material and nontangible features (Li et al., 2019; Naldi, Nilsson, Westlund, & Wixe, 2015) in their innovation endeavours. Some weaknesses can be turned into strengths, e.g., topographical environments with sparse populations, scattered small houses and environmental attitudes that favour preserving natural resources can be advantageous for renewable energy concerns (Fromhold-Eisebith & Dewald, 2018). Furthermore, the attractiveness of the surrounding environment and subsequent quality of life can have major impacts on the entrepreneurs who are not solely motivated by pure economic factors (Gülümser, Baycan-Levent, & Nijkamp, 2010). Thus, rural localities offer alternatives to an overwhelming economic growth orientation. Leick and Lang (2018) pointed out that rurality leaves room for 'beyond growth' thinking as an additional dimension to describe success and sustainability. This stresses the importance of understanding not only the sources of innovations, but also the overall influence of the innovation activities on the place itself and its development trajectories.

1.2 Knowledge networks triggering rural innovations

Innovation is a collective and social process, not merely a technological novelty (Asheim & Isaksen, 2002; Ozman, 2009), it depends upon knowledge shared via links between actors (Jack, 2010). The importance of interaction with different actors is stressed in debates over regional innovation systems (Asheim et al., 2011), whereas varied members of the network can transfer dissimilar knowledge. However, territorial innovation theories tend to concentrate on networking inside certain communities (Bassi et al., 2014; Lorentzen, 2008; van Hemert et al., 2012), while rural areas often lack local knowledge sources (Fink et al., 2013). Globalising world and open economies demand consideration of extra-local dimensions (Copus, Dubois, & Hedström, 2011; Young, 2010), thus it is believed that additional opportunities created while sharing knowledge via networking with different actors can actually compensate for the lack of local actors and knowledge (Dubois, 2013; Huggins & Johnston, 2009; Liu et al., 2013; Murdoch, 2000). Without negating the importance of local social interaction, combining local and global networks might be an opportunity and necessity for rural firms (Bathelt, Malmberg, & Maskell, 2004; Fløysand & Sjøholt, 2007).

Networks are composed of links between pairs of different actors, where the actors are directly or indirectly connected with other actors. These links may be established because of the need for new technologies, skills or experiences (Ahuja, 2000). Larger networks should technically deliver more novel knowledge; however, maintaining diverse relationships takes time and resources (Murdoch, 2000). This is one reason why smaller, rural firms usually have fewer links in their knowledge networks (Roper & Love, 2018). Despite this, there are studies that show how small, innovative rural firms can effectively build their knowledge networks that are connected to larger foreign networks

(Copus et al., 2011). They can do this despite their disadvantages because rural firms might have their own strategies for network-building.

Network capital refers to the strategic capability of managing, building and maintaining knowledge networks, expressed in incoming and outgoing flows of knowledge (Huggins & Johnston, 2010). Firms' limited awareness about this resource, especially when creating links over longer distances, can pose additional problems (Dubois, 2013). This stresses the importance of understanding all the facets which support network capital in rural areas, including their configurations and the nature of the connections.

Configuration of knowledge networks, meaning the establishment of knowledge relationships and being part of larger networks, is one aspect of the issue. The other dimension is a capability to effectively exploit knowledge, i.e., to deliberately create activities to find suitable knowledge and how to leverage new information to produce innovations. Thus, network capital is closely linked with encoding capacity, which is a firm's ability to notice and convert external knowledge into useful forms (Roper & Love, 2018). Furthermore, networks themselves can enhance the capabilities which help to widen the use of the knowledge delivered via the networks of rural firms. For instance, they can help interpret unknown knowledge, improve communication, develop skills, recognise opportunities and create new markets (Singh & Bhowmick, 2015). According to scholars, knowledge networks are means to compensate for the locational disadvantages that rural regions face. However, we must understand precisely how the networks do this (Dubois, 2013), taking into account specific regional factors and the kinds of relations that are most useful in producing innovations.

The most well-known way to structure relationships in a network is to divide them according to their strength (weak or strong). Granovetter (1973, p. 1360) defines strength as 'amount of time, emotional intensity, intimacy (mutual confiding) and reciprocal services'. It is believed that weak ties are more beneficial for innovation as they are less personal and bring unknown knowledge (Jack, 2005; Ruef, 2002); however, knowledge coming through the weak ties is also more complicated to interpret, requiring larger inputs of encoding capacity because of its unfamiliarity. As existing knowledge supports the interpretation of new knowledge, it is easier to rely on strong ties, which are more regular relationships between actors with similar backgrounds (Granovetter, 1973). Indeed, rural firms are believed to depend more on small numbers of strong ties (Jack, 2005; Young, 2010) and informal relations (Huggins & Johnston, 2010; Moyes, Whittam, & Ferri, 2012).

The strength of the ties describes the existing network, but it does not adequately examine the motives behind using particular relationships. Analysing the nature of relationships and specific utilisation of the business networks is key (Jack, 2005). For instance, these relationships can be divided into reactive and proactive categories. Reactive networking involves using existing networks in an unplanned way within regular flows of information, whereas proactive relationships are deliberately used to find additional opportunities and knowledge for innovations (O'Donnell, 2004; Young, 2010). This relates back to the network capital (Huggins & Johnston, 2010) that helps firms use the networks strategically.

Thus far, the thesis has established that knowledge networks, in combination with local and extra-local relations, play an important role in rural innovation activities. These networks, thus, constitute a vital strategic resource. Describing knowledge networks through their configuration of networks is, tough, not enough. Adding the

nature of relationships (strength and activity) to the analysis of knowledge networks helps us acquire a deeper understanding about using knowledge networks for innovation activities, as well as about the roles of different relationships in innovation activities. Networks also have a role in exploiting local resources for innovations (Murdoch, 2000).

1.3 Rural resources impacting innovations

Innovation is a context-based, multi-dimensional issue where knowledge can be acquired from social and physical capital (Hong et al., 2012). Rather than contest one another, the social context and physical conditions should present unified places of opportunities where firms from rural areas can act (Rutten, 2017). The systemic viewpoint stresses the interactions between several actors for learning and innovation; these interactions take place within the firms themselves, as well as within the surrounding environments (Jensen et al., 2007). Local resources and existing knowledge can be combined in novel ways, especially utilising the DUI mode of innovation (Asheim et al., 2019; Fitjar & Rodríguez-Pose, 2013). In the DUI mode of innovation, activities often acquire knowledge, experiences and competencies from employees (Isaksen & Karlsen, 2016), which increases the importance of the contexts within which firms operate and encourages the search for localised opportunities. Previous studies (e.g. Fitjar & Rodríguez-Pose, 2013; Parrilli & Alcalde Heras, 2016) have found that, generally, although the DUI linkages may have smaller effect on technological innovations, local interaction patterns are affected by the cultural-specifics, which characterise many rural places, and might impact rural firms' innovation activities.

The importance of local rural resources, not just for the primary sector, has recently started to emerge in theoretical discussion (e.g. Fitjar & Rodríguez-Pose, 2011; Korsgaard et al., 2015; Mayer & Baumgartner, 2014), but analysis is still modest and needs further research. There are few examples that address the importance of rural qualities for innovation activities (e.g. Cannarella & Piccioni, 2011; Ring et al., 2010; Spyridakis & Dima, 2016; Stathopoulou, Psaltopoulos, & Skuras, 2004). These qualities could be, for instance, physical and social resources, less populated landscapes, historically embedded knowledge, local traditions etc. These can and should be valued as appreciated resources for entrepreneurship and innovation (Korsgaard et al., 2015; Li et al., 2019; Müller & Korsgaard, 2018). Eder and Trippl (2019) report that entrepreneurs find and exploit these local strengths in their innovation activities, but this tends to be rather scattered and underused compared to different compensation strategies.

Müller and Korsgaard (2018) analysed the use of rural resources according to a typology wherein local resources are divided into five dimensions (physical relates to landscapes and buildings, human relates to people's knowledge and capabilities, immaterial is intangible, social and community resource is linked with social capital, and financial resources). As innovation is considered an input for entrepreneurship (Huggins & Thompson, 2015), this typology could be a starting point for the analysis how the local resources impact strategies of innovation activities of firms from rural areas.

Social and community resources, expressed as social networks, partnerships and interconnectivity, are widely regarded as particularly useful for enabling innovation (Camps & Marques, 2014) and driving innovation diffusion (Rogers, 2003). This resource can reduce transaction costs, enhance access to information and facilitate use of other resources (Li et al., 2019). In a small community, social and business networks are easily intertwined (Siemens, 2010; Stathopoulou et al., 2004); they ease extended support from local governance and access to other local resources (Eder & Trippl, 2019; Petrov, 2011;

Singh & Bhowmick, 2015). They also participate in constructing (individual and collective) meanings of place-specific amenities (Isaksen & Karlsen, 2016).

Place specific meanings can relate to knowledge sustained through several generations and stored in traditions (Calafati, 2006; Nogueira, Pinto, & Guerreiro, 2014; Petruzzelli & Savino, 2014). It is commonly believed that traditions refer to inertia and unfashionableness (Cannarella & Piccioni, 2011), and to the threat of being locked in old knowledge (Boschma, 2005; Tödtling & Trippl, 2005), which seemingly opposes the development of new ideas. At the same time, there are examples where innovation endeavours dynamically revitalise unused traditions (Calafati, 2006). This is an example of positive lock-in where restrictions to change have kept some amenities such as traditional skills, embedded knowledge or outdated technology, which in other situations can be used as resources for innovation (Anderson, 2000; Gibson, 2016). Sticky traditions (Petruzzelli & Savino, 2014) can consist of valuable knowledge and practices that offer bases for innovations.

Old knowledge can even increase the success of innovations. Examining the past offers possibilities finding forgotten knowledge that can be used now, especially when considering developments in technology; furthermore, old components are tested over a long time thus reducing the risk of failure (Petruzzelli & Savino, 2014). Many rural resources are heavily interlinked and coupled with kinds of immaterial resources, such as traditions, cultural heritage, history of the buildings and local identity (Dinis, 2006; Müller & Korsgaard, 2018). Deliberate exploitation of these values helps in distinctive, place-specific marketing (North & Smallbone, 2000; Stathopoulou et al., 2004). On the other hand, overemphasising local resources, images and associations (Huggins & Thompson, 2019; Lafuente et al., 2010) can pose other threats and may lead to a situation where innovation potential is overlooked and opportunities are insufficiently recognised or even blocked (Martin & Sunley, 2006). Atterton (2007) mentioned that rural firms are less aware of this over-embeddedness threat. At the same time, strong ties and well-known actors prevailing in knowledge networks tend to strengthen this danger; countering that is the number of opportunities locking in presents for future innovation.

The literature points to the existence of rural resources that can be used for innovations. However, as rural innovations are difficult to notice because of their small scale and less clustering (Doloreux et al., 2007), the use and value of local resources may be likewise overlooked. However, this does not mean that they are worthless. Rather, this refers to the limited awareness and need to further examine the place-specific advantages (Fromhold-Eisebith & Dewald, 2018; Rogers, 2003). It must be remembered that even small amounts of resources can be usefully combined; thus, this bricolage is mutually reinforcing doing 'something from nothing' using an extraordinarily flexible and personal route (Baker & Nelson, 2005). It is vital that we acquire a better understanding of the opportunities that localities can offer to be able to exploit the existing resources successfully.

It has been pointed out that place-specific knowledge as traditions can be sources for innovations and modernisation. However, this relates to the complex multilevel aspects, as on the one hand, keeping the traditions can lock the places to the existing development trajectories (Boschma, 2005; Tödtling & Trippl, 2005); then again, the traditional knowledge can also be devalued during the innovation processes (Calafati, 2006). This leads the thesis to the question of how these rural innovations based on rural resources can shape the localities and their development trajectories.

1.4 Innovations influencing the locality

Internal and external factors offer opportunities for the innovation activities of firms in rural areas, and these innovation activities can strongly influence the development paths of relevant localities (Isaksen, 2015; Mitchell, 2013; Petrov, 2011). The dynamic interplay between systems, actors and environmental settings and choices of action can be explained with the help of the evolutionary economics (Boschma, 2004) and systemic approach (Edquis, 2006; Touzard et al., 2015).

The RIS approach is commonly applied in innovation studies (Smith, 2000), including in rural innovation debates (Eder, 2019). This approach emphasises the role of interactive learning and multi-scalar processes (Asheim et al., 2019) wherein knowledge, institutions and social relationships frame associated innovation processes (Touzard et al., 2015). Consequently, all participants and the environment of the system determine each other. A rural area has been interpreted as a 'network of networks' that operates within cultural, economic, environmental and social contexts (Cannarella & Piccioni, 2007). The social context (internal and external knowledge networks) and physical place (expressed as rural resources) do not oppose each other; instead they comprise the system in which firms operate (Rutten, 2017). Rural firms operate in an organisationally thin RIS, which is characterised by underdeveloped organisational or institutional setting with no or only a few local knowledge and support organisations and weak or no clustering (Asheim et al., 2019; Isaksen & Trippl, 2016; Tödtling & Trippl, 2005). A thin RIS cannot have the same functions as organisationally thick and well-developed RIS but offers a certain set of frames as both rural and urban firms cannot innovate in isolation (Edquis, 2006) and depend on the systemic approach for innovations. Rural firms function in a complex and evolving environment (Doloreux et al., 2007) where place and time contextualise the innovations and development (Nogueira et al., 2014). This multi-faceted nature of innovation, thus, shapes regional development trajectories (Pylak, 2015; Shearmur et al., 2016) and the characteristics of the RIS determine the support available in the locality for entrepreneurial and innovation activities and path development (Isaksen & Trippl, 2017).

The path development processes rely on an understanding that new knowledge interpretation is affected by past events and economic cycles (Martin & Sunley, 2006); today's decisions influence future ones. This concept is often coupled with the lock-in threat (Boschma, 2005; Tödtling & Trippl, 2005), as change is easier to implement when it is in line with existing community structures and the understandings of local actors (Barkin & Barón, 2005). Similar knowledge is easier to interpret (Jack, 2005) and innovation that is culturally close to the inventor tends to be more successful (Petruzzelli & Savino, 2014). However, this also means that being too close to existing knowledge might alter the change.

The essence of path development is continuity-driven development, supporting the reliance on the existing conditions; but the processes, especially innovations which are always related to the change and novelty, can determine open-ended developments (Asheim, Grillitsch, & Trippl, 2017; Garud & Karnøe, 2001; Martin & Sunley, 2006). Regarding the degree of change, the existing paths can be moulded in different levels, starting from the path extension which is a rather continuity-driven development; on the other spectrum is a new path creation where substantial change is implemented (Asheim et al., 2017; Isaksen et al., 2019; Martin & Sunley, 2006).

Innovation is a subjective process (Rogers, 2003). Initial conditions are seldom uniform, but the actors are the ones who identify, access, construct the meanings and

exploit resources and knowledge networks (Garud, Kumaraswamy, & Karnøe, 2010; Huggins & Thompson, 2019). Rogers (2003) states that awareness about potential sources is the first stage in the innovation-decision model; only then can additional steps, like the persuasion, decision-making and implementation take place. These decisions are not always fully deliberate and built on the rational calculations of maximising utility as is interpreted in neoclassical economic thought (Asheim et al., 2019); on the contrary, 'actors simply do what they believe must be done without fully realising what might follow' (Sotarauta & Suvinen, 2018, p. 97). Decisions and action of actors are not always the outcome of a single actor, but can have a larger effect, summarised as a collective activity (Sotarauta & Suvinen, 2018). Over time, the members of social systems create mutual understandings in the context of locality-specific capacities (Rogers, 2003). The institutions as norms, social rules, collective beliefs and habits affect the behaviours of actors and thus impact the development trajectories of the localities (Gertler, 2010). This collective power is involved in altering or keeps meanings in the localities (Leick & Lang, 2018). Rural actors' (alone or collectively) might have a larger role (Isaksen et al., 2019; Plüschke-Altof & Grootens, 2019) in understanding the meaning of local resources and therefore also in shaping the overall development especially when compared to institutionally or organisationally thick RIS.

To sum up the previous discussion, the thesis seeks to exemplify the interactive and multi-faceted nature of rural innovation. This topic needs to be analysed from multi-scalar perspectives while exploring the interrelations between and across scales (Bunnell & Coe, 2001). The innovation activities of firms located in rural areas can use local resources[1], as well as local and extra-local knowledge networks, to support this activity. These resources offer opportunities for SMEs located in rural areas. By conducting a micro-level analysis of rural firms, it is possible to understand how and why the firms are using knowledge networks and local resources for their innovation endeavours. Moreover, research acknowledges that both individual actors and institutional structures complement each other in this activity (Gertler, 2010). Therefore, this research analyses the use of knowledge networks as compensating mechanisms and local strengths (resources) and within this combination, it analyses rural innovation at the systemic level addressing how the effects of using local resources for innovation activities can mould the development paths of rural areas.

[1] The use of extra-local resources in not analysed in this thesis.

2 Research methodology

2.1 Methodological choices and the research process

The methodological choices of this research stem from an interpretivist framework of social constructivism wherein multiple realities and subjective meanings of practices are created by individuals in light of the local context (Carsrud & Brännback, 2014; Creswell, 2013). This framework relies on the participants' experiences, and thus, the meanings are constructed through the recognition and exploration of the participants' experiences (Carsrud & Brännback, 2014) and constantly revised through social interactions (Bryman & Bell, 2015). Social constructivism stresses the complexity of participants' views via social interaction (Creswell, 2013). Likewise, innovation is believed to be a social process (Asheim & Isaksen, 2002), relying on the interpretation of actors who construct their own conditions rather than accepting that their initial circumstances are predetermined (Garud & Karnøe, 2001). Moreover, innovation activities and their outcomes are highly context-based (Hong et al., 2012). The systemic nature of rural innovations makes them highly influenced and interrelated with the local context. This interrelatedness offers additional opportunities for unconventional advancements. Social constructivism allows the discovery of alternative development paths in non-core regions when considering the self-reinforcement and inter-relatedness of social and economic factors (Leick & Lang, 2018).

The objective of this research is to understand *how* firms from rural areas are building their innovation strategies; therefore, qualitative research methods are selected (Miles, Huberman, & Saldana, 2014) to answer the RQs. This explorative research follows a case study, which is recommended when the phenomenon is intertwined with the context (Yin, 2003). Innovations in rural areas are often small-scale and incremental in nature (Doloreux et al., 2007). Many of these innovations are not patented (Isaksen & Onsager, 2010; OECD, 2014), often deviating from classical business development (Mayer & Baumgartner, 2014). All these factors make it difficult to study the broad-spectrum of rural innovations in quantitative studies. Conventional quantitative surveys ignore small firms (Hong et al., 2012), typically concentrating on formal, technological innovation and over-representing high-tech and knowledge-intensive firms (OECD/Eurostat, 2018). Furthermore, categorising the firms based on location is difficult because their official address may coincide their actual place of business. These types of research biases often overlooks small firms based in rural settings. Furthermore, quantitative studies, such as the Community Innovation Survey (CIS), do not properly consider the DUI-mode of learning and innovation, which better support non-technological innovations (Jensen et al., 2007) that prevail in rural firms. Incremental innovations often rely on the DUI mode, and traditional knowledge is important for fostering the development of rural areas (Doloreux et al., 2007).

The current thesis is developed within the larger framework of an international project titled 'Crossing Boundaries: Knowledge and Technology Transfer and Innovation', where rural innovation was one of the analysed subthemes. During a period of international cooperation within this project, when the author of the current thesis was one of the team members, the overall research framework was agreed upon, including the data collection instrument and the approach to ascertain the analysed cases. The current research uses extractions from the data collected during the Crossing Boundaries project. Furthermore, the research used data collected by the co-author of

Article II; these interviews were conducted in the framework of the RegPol2 project. The work started from the literature review and analysed the available reports and other public sources. The interviews utilising open-ended questions with a focus on the context (Creswell, 2013) and concentrated on innovation activities. Interviewees were asked about their sources of innovations, partners who provided knowledge for their innovations, resources they used; and the role of their locations in innovation activities.

This PhD thesis focuses on the micro-level, centring on rural firms that have demonstrated a willingness to adopt new ideas. Implementing innovations interpreted as novelty (at least to the firm) in recent years was the main selection criterion for firm selection in all articles. Non-random purposeful criterion sampling (Patton, 2002) was used in two stages. The initial list of case study firms was ascertained with the help of county government, and the listing was adjusted in combination with snowballing techniques. Firms demonstrating openness to changes in comparison to other firms in the locality were selected as cases. In addition to innovative SMEs, other local actors were interviewed, including representatives of local and county governments, unions and other supporting organisations and representatives from the higher and vocational education sectors. Additional data were collected from secondary sources, primarily websites and other public sources (e.g. interviews in the newspapers). Using multiple sources helped ensure the objectivity of the research and enrich the data with multiple viewpoints.

The work focussed on the knowledge networks and local resources in innovation activities, concentrating on the last three years. Drawing on the analysis of understanding rural innovation, Articles I and II consider a wide variety of innovations happening in the heterogenic setting of firms in the rural areas of Estonia: Lääne County (Article I) and Lääne, Järva, Viljandi and Võru Counties (Article II). In Article III, innovation in Estonia is compared with innovation processes in Coruche, Portugal and Tilonia, India. These three processes were associated with critical resources for the studied rural localities and had met modernisation through innovation. Although, the represented countries have different culture and levels of socio-economic development, they all offer cases of innovation related to traditions important to these similarly predominantly rural localities, far from agglomerative centres.

Most of Estonia can be considered a rural territory based on the OECD 2005 definition. The locations of studied firms' also meet this standard, as well as the subjective understanding of rurality (Eder, 2019) when comparing the other territories of the country. Estonia is a small country on the north-eastern fringe of Europe, a member of the European Union with an open economy. Its population is 1.3 million, and the average population density is about 30 inhabitants per square kilometre. Its economic activity is divided between a heterogenic set of small firms. Estonia is described as having a marketing-based innovation system based on the linear STI policy model (Karo & Lember, 2016). The country and its institutions have undergone an economic and institutional transition during the past 30 years. Its economic policy was reformed rapidly and quickly compared to other ex-socialist Central and Eastern Countries (Karo & Lember, 2016). Currently, the physical infrastructure, including the availability of ICT, roads, and electricity, as well as distances to the airport, and its institutional framework is comparable to developed EU countries (EMÜ, 2012).

2.2 Research methods and sample

An overview of the data collection method, sample and analyses is presented in Table 1. Data were collected using face-to-face, semi-structured interviews with the owners or managers of micro, small and medium-sized enterprises engaged in a broad range of activities as this heterogenic set of firms characterise these rural areas. The interviews were recorded and transcribed in the language the interview was conducted.

Table 1. *The overview of the data collection method, sample and data analysis method.*

	Article 1	Article 2	Article 3
Data collection method	Face-to-face semi-structured interviews (40 to 90 minutes); document analysis	Face-to-face semi-structured interviews (40 to 90 minutes)	Mostly face-to-face, with some exceptions by tele-phone semi-structured inter-views (50 to 90 minutes); document analysis
Sample	25 interviews with innovative entrepreneurs (10) and local key informants (15)	20 interviews with innovative entrepreneurs	4 interviews in three localities with different stakeholders having knowledge about innovation and tradition considering the case processes
Data analysis method	SNA, qualitative content analysis, meaning coding and thematic categorisation	Qualitative content analysis, two-step coding and thematic categorisation	Qualitative content analysis, meaning coding and thematic categorisation

Source: Author.

In all articles, meaning coding and thematic categorisation (Kvale, 2007) was used to analyse the collected data. Patterns of meanings were developed in an inductive manner using open-ended questions with a focus on the context (Creswell, 2013). Furthermore, social network analyses (SNA) was used to analyse the structure of the knowledge networks in Article I.

3 Results

3.1 Using knowledge networks for innovations

Drawing from the aim of the research, the knowledge networks of rural innovative firms and the nature of these relationships are analysed utilising a network paradigm that has been recognised as particularly applicable to rural localities (Murdoch, 2000). This also compensates for the lack of local actors (Huggins & Johnston, 2009) and other hindrances (Dubois, 2013). Innovation is an interactive process where multiple actors participate in sharing the knowledge and expanding learning processes (Asheim et al., 2016).

While analysing interviews with the owners and managers of innovative rural enterprises, the research ascertained that both firm and non-firm actors are important parts of the knowledge networks of innovative rural SMEs (Article I). Unsurprisingly, market-based relations, especially their customers were considered most valuable in delivering knowledge for innovations. This finding was similar to that from previous studies (Majandus- ja Kommunikatsiooniministeerium, 2015; van Hemert, Masurel, & Nijkamp, 2011). Only a few analysed firms had acquired some knowledge needed for innovation from universities or other research organisations. The majority stated that the science sector does not provide them with the tools they need to fulfil their particular needs. This is not to question the overall importance of the science sector in innovations; rather, it refers to the fact that different innovations need input from different sources and vice versa. In essence, inspiration can come from a variety of places, depending upon needs and contexts. The DUI approach in particular is typically not reliant on traditional research and science outlets (Jensen et al., 2007). This highlights the need to reduce the gap between rural SMEs and scientific organisations and to help foster communications between them; on the other hand, this also stresses the need to encourage not only STI-mode of innovation, but also the wide spectrum of varied innovations.

The firms also ascertained a certain somewhat unexpected role for non-human actors in their knowledge networks. Such as the Internet, trade fairs and other wider forums of that kind serve a valuable role for rural firms as well; however, they do not seem to substitute face-to-face interaction. Even with limitations, though, they can be a starting point for growing stronger proactive relationships.

Not all network relationships play an equal role in transmitting the knowledge used for innovations. Taking a step further from traditional SNA, the nature of knowledge linkages was analysed to understand the usefulness of transferred knowledge and the capabilities to use the possessed knowledge (Article I). Proactiveness as a characteristic of actors (O'Donnell, 2004; Young, 2010) was combined with the strength of ties (Granovetter, 1973, 2005; Jack, 2005). Thus, a model for combining networking activity from the point of view of the firms and the strength of the connections between the firms and other actors was proposed (Table 1). The results of this research suggest that strong proactive relationships with extra-local alter actors, more often on an international level, seem to lead to higher innovation levels. These results refer to the much wider complexity and different dimensions that help describe knowledge networks in addition to the often used general belief in weak ties as sources for innovations (Ruef, 2002).

***Table 2**. Relationships between actors in the knowledge network*

		Strength of relationships (ties)	
		Weak	Strong
Network-ing activity	Reactive	Rarely used, part of existing networks	Often regular, unplanned, part of existing networks
	Proactive	Rarely used, initiated by the rural firm	Emotional, often regular, initiated by the rural actor

Source: Article I (Reidolf, 2016)

Proactive knowledge linkages (presented in Figure 3) seem to have greater direct value for innovations. For example, proactive relationships with special clients and scientific organisations tend to lead to higher levels of innovation. Weak and reactive relationships likely have a lower impact on these firms' innovations. However, the number of proactive relationships is rather modest; only the firms E6 and E4 have denser networks with proactive relationships (Figure 3). The sector around E4 and E6 is historically important to the analysed locality and has a small number of knowledge-sharing local actors, including a local research organisation. This distinguishes it from other sectors present in the area, which have less proactive knowledge linkages and thus rely more on the extra-local level (Article I). Some clustering is visible in the locality in this sector, while others tend to be part of larger national and international level innovation systems.

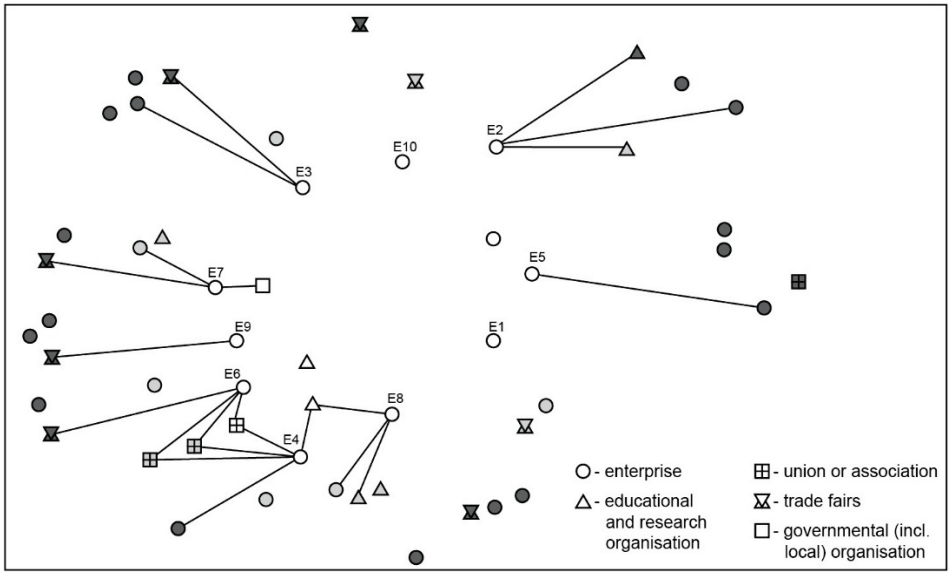

***Figure 2.** Proactive relationships in the knowledge networks of innovative rural enterprises.*
Source: Article I (Reidolf, 2016)
* The geographical location of actors from Lääne County's viewpoint: the regional (white), national (grey) and international (dark grey) actors.

The challenge these firms face is their limited number of proactive relationships. Although beneficial to their innovations, in the long run, the small number of relationships might be more easily exhausted and, thus, threaten regional lock-in. It must be stated that Estonian firms generally tend to have a limited network and few linkages with foreign partners (Majandus- ja Kommunikatsiooniministeerium, 2015).

Summarising the findings, this research contributes to the innovation literature discussion with a novel framework for analysing knowledge network configuration and nature of the linkages in this network. This framework helps to understand the usage of knowledge networks in innovation activities. The research stresses the need for a greater variety in proactive relationships as even more innovative firms tend to have a rather small number of relationships, especially proactive relationships, which seem to be most important for driving innovations. This illustrates the relatively weak position of rural firms in the larger knowledge networks. Moreover, their reliance on few connections can pose threats for the future and stresses the need to pay more attention to the development of network capital.

3.2 Using local resources for innovations

Although a great deal of material for innovations is derived from knowledge networks where extra-local actors are prevailing, local resources also offer input for innovation activities for firms located in rural areas. These resources pose a specific socio-cultural setting for interactive learning and innovation (Asheim et al., 2019). The research rests on the idea that local and regional conditions influence innovations (Isaksen & Karlsen, 2016; Müller & Korsgaard, 2018), and it questions the understanding that clustering and agglomeration (Asheim & Isaksen, 2002) are the only major factors supporting innovation activities. Therefore, rural local amenities and how they act as inputs for rural innovations were analysed relying on the typology of rural resources used previously by Müller and Korsgaard (2018) (Article II). Traditional knowledge-based innovation processes were analysed to understand how they enable new advancements (Article III).

Studying the experience of firms located in the western and southern rural counties of Estonia, the results highlight the fact that rural areas have a number of locality-specific resources that firms have utilised in their innovation activities. The research revealed a number of salient examples where rural resources offered useful and diverse opportunities. In particular, the DUI-mode of innovations seemed to dominate among the examples. The analyses showed that all five groups of local resources (physical, human, social and community, immaterial, financial) provided some input for innovations. These resources were often interlinked and complemented each other. Social and community resources seemed to have a wider in the rural innovation context compared to other resources (Article II). Previously, Petrov (2011) and Moyes, Whittam and Ferri (2012) also pointed to the role of social capital and local community in innovation endeavours. Local social resources seem to play a minor role in knowledge networks directly transferring innovation-relevant knowledge (Article I). However, social and community resources particular role seems to be operating as facilitators for accessing and using other resources. Furthermore, social and community resources help mobilise collective action, which subsequently creates meanings and value for other resources and constructs common goals beyond single firms' economic outputs (Article II).

A major prerequisite for using local resources is recognition, proactive and purposeful exploitation. The value of resources starts from awareness, how entrepreneurs interpret a locality and what they value and how they describe success and sustainability. In some

cases, the local resources might be scarce and small scale, but when grouped together the value of each small bit of resource might increase, as pointed out by Baker and Nelson (2005). Resources related to traditions are often used with several others: combining local, human and material resources, for example, could lead to a higher net value than any of them would offer alone. The will to use traditional resources can act as triggers for innovation (Article III). These examples show that traditional core processes supported with modern add-ons can lead to harmony between old norms and customs and modernisation.

As a result, these findings contribute a novel, empirically grounded model (Figure 4) to characterise the role of local resources in firm innovation and the various dimensions of this activity. This model helps systematise the productive role of rural resources, stressing their complexity and thus supplementing the understanding about the role of local resources in innovation endeavours.

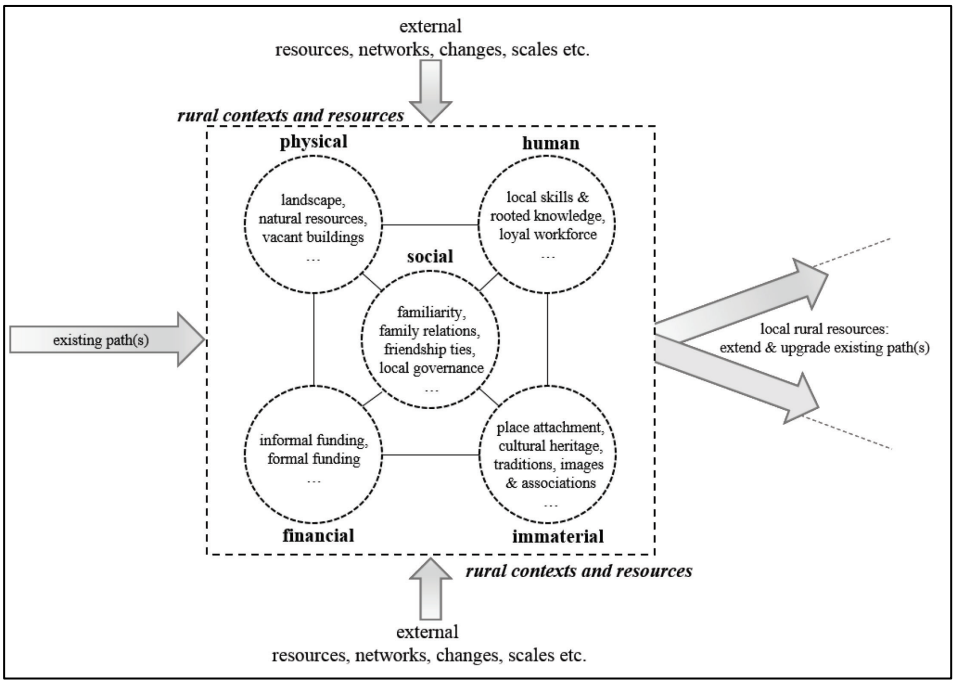

Figure 3. *Model on the role of local rural resources in firm's innovation and path development.*
Source: Article II (Reidolf & Graffenberger, 2019)

The ways of using these resources varies within different firms and their innovation endeavours, but there is potential here that should not be underestimated. This model stresses local environments as places of opportunities (Rutten, 2017). The results carry on the discussion of how best to leverage local resources. Furthermore, it will help explain the diverse results of the previous studies considering the diverse role of the local social capital in rural innovations.

3.3 Innovations shaping rural development paths

The locality offers several amenities that firms located in rural areas can use for their innovation activities, but these innovation activities can, in turn, influence the path development of localities. The current research analyses this influence from two perspectives: the innovations, as they relate to traditions as a local resource, to discover how traditions and innovations affect each other (Article III) and the role of innovation activities in relying on the use of local resources to establish and mould local development paths (Article II).

According to the systemic approach, innovation occurs not just on individual actor levels (Knickel, Brunori, Rand, & Proost, 2009), but involving many actors and a wider interplay between them. Even thin RISs have the capacity to influence local development paths, at least in some level, and contrary, changed development paths have to be institutionalised (Asheim et al., 2019). Thus, different actors and institutions are constructing a framework for understanding the complexity of innovation routes. Although rural localities are often connected with the lock-in threat (Boschma, 2005; Tödtling & Trippl, 2005) due to reliance on traditional knowledge that is supposed to deviate change, the evolutionary perspectives stress that at least to a certain extent the past activities and context direct the present and future economic action (Martin & Sunley, 2006). That said, some plasticity in the development routes is also possible (Strambach, 2008).

The data gathered via interviews with firms and other local actors refers to multi-directional processes that can be expressed in varied development paths. Innovation processes from three rural settings in three different country (Estonia, Portugal, India) that are related to local traditional knowledge and carry place specific images were analysed in detail (Article III). Examining the processes where these traditions have faced some forms of modernisations, it was possible to notice complex routes where the existence of local resources pushed for innovation activities and thus moulding the development paths. There was no linearity or overwhelming directing towards lock-in.

The desire to maintain the tradition may drive deliberate searches for novelty (Article III, Estonian mud case). Analysed cases showed that when modernisation is in line with localities' norms and customs and follows the creative enhancement (Mitchell, 2013) it hastens the introduction of innovations related to traditions. Thus, innovations can support the preservation of traditional knowledge along with the meanings and images of the locality. In some cases, however, the wish to keep traditions as they can outright hinder innovations. This restriction might be stronger when there is a threat of permanently destroying older knowledge, practices or local resources. In the worst case, a new technology can destroy natural resources, terminating the value of the locality as a sustainable living place and damaging the natural ecosystem that supports the survival of humanity (Article III, Portugal cork tree case). Thus, the lock-in process and resistance to change can also be positive and help to preserve the value of the local environment and overall development of the locality.

Furthermore, the analysed innovation endeavours relying on local resources primarily tend to lead to a continuity driven process in regional change, following the path extension and path upgrading routes (Article II). These locations did not experience new path development as a result of the exploitation of local resources. However, these resources did offer valuable opportunities to extend, upgrade and renew existing paths. Varied types of innovations use a mix of traditional and modern approaches, where old traditions and specific, occasionally ubiquitous, resources, are sustained and supported

by modern 'add-ons' (Article III). Thus, cumulatively moderate changes might lead to heterogenic and sustainable local development. This conclusion shows opportunities but does not reduce the weaknesses of the rural localities. Moreover, reliance only on local assets might eventually exhaust opportunities and lead to a lock-in risk. This might happen especially when coupled with limited extra-local knowledge sources, which seems to be a common strategy of these analysed rural firms (Article I).

This analysis thus contributes to the theoretical discussion by adding interesting examples showing the complexity and non-linearity of the innovation processes. Furthermore, the research benefits to the scarce discussion of a thin RIS development process (Isaksen, 2015). Presenting the fine interplay between traditions and innovations, a model to visualise this interaction (Figure 5) was proposed. Innovations help to preserve or, on the contrary, destroy local assets; moreover, traditions themselves can restrict or enable innovations. This complex interplay suggests being careful with any universal conclusions and reconfirms the need to look for case specific solutions.

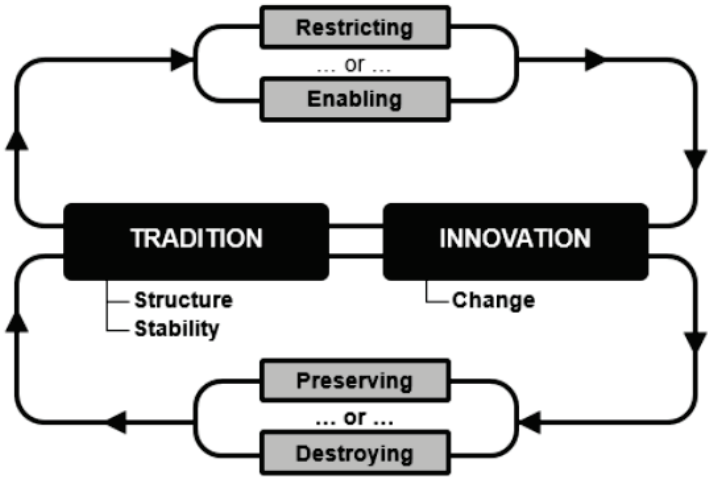

Figure 4*. Interplay between tradition and innovation.*
Source: Author's modifications based on Article III (Ferreiro, Ahmad, Reidolf, Sousa, & Bhaduri, 2019).

The research indicated that innovations led by local actors seemed to have lower innovation intentions; at the same time, the motivation of these local actors were diverse and not only directed by pure economic rationale. The local innovating actors pointed to the wider role of innovations considering the sustainability of the locality. Non-local actors who were less emotionally attached to their surroundings tended to follow market-driven motives, and thus the innovations could ultimately cause restriction and damage to the immediate environment. This denotes a variety of aims and the existence of 'beyond growth' thinking (Leick & Lang, 2018) which was supposed to exist more in rurality. These results raise new questions about sustainable regional development discussion which need further studies to answer.

4 Discussion

The previous sections have analysed, from the micro-level, how firms in rural areas build their innovation activities using knowledge networks consisting of local and extra-local actors and local resources. Furthermore, the thesis uses the systemic viewpoint to consider how these innovations influence the development paths of corresponding localities. Thus, the varied sides of rural innovation are unpacked, making it possible to propose models that help visualise this complex issue from varied angles.

The configuration of knowledge networks transferring knowledge required for innovations to rural SMEs (Article I) shows the importance of market-based actors and business relationships, especially clients. According to the CIS, the clients are also the most important collaborators for all small and medium-sized enterprises in Estonia (Majandus- ja Kommunikatsiooniministeerium, 2015). The role of informal local relationships remains modest while considering actors delivering knowledge for innovations. However, among the other local resources are social and community resources, specifically informal relationships seem to have attained a wider prominent role in innovation activities (Article II). This kind of complexity, or even contradiction, is further ascertained when analysing the results of previous scholarship. For example, the findings of Moyes et al. (2012) and Petrov (2011) stress the importance of informal social relationships, while the higher value of market-based relationships for innovations is in line with other studies (Dubois, 2013; North & Smallbone, 2000; Virkkala, 2007). However, this variety might refer to the multi-faceted issue of networks. Some relationships might transfer direct knowledge needed for innovations, often from formal market-based actors. Other types of networking, expressed in social and community resources, play an indirect role in innovations as they do not deliver direct knowledge for innovations; instead, for example, they facilitate the access to other resources and knowledge relationships, speeding innovation implementation and diffusion.

One noteworthy finding is that knowledge acquired from scientific actors, either local or extra-local, for innovations was generally modest, except for some firms from a particular field of activity (i.e., health and spa services; Article I). In Estonia the cooperation between firms and universities is, typically, rather modest (Majandus- ja Kommunikatsiooniministeerium, 2015). Whereas, for example, innovative rural firms in Finland highly value cooperation with academia (Virkkala, 2007). The limited number of relationships with scientific actors who deliver knowledge for innovations could trace its origins to several aspects. First, the lack of geographical proximity might be related to the limitation of other types of proximities and, therefore, reduce the willingness to communicate with each other. Larger extra-local scientific organisations may not see these small firms as attractive innovation partners. Second, the demand and supply of knowledge may be mismatched; different innovation modes require different knowledge sources. Considering the presented case (Article I), the local scientific organisation is small and can offer valuable knowledge only in a limited branch. Firms acting in other fields of activity or having innovation intentions that do not need direct scientific knowledge could not recognise the knowledge from this local scientific actor as being valuable to their innovations. Eder (2018) similarly points out that regions hosting a university have an advantage but only when there is a successful integration between the demands of local firms and resources provided by scientific organisations. Third, innovation intentions set limits on knowledge-delivering partners. Loose connections with scientific actors might reflect levels of innovations and the level of

knowledge firms are seeking. When the incremental process, marketing innovations and DUI-mode are prevailing (Article I), and there is no proactive intention to reach higher innovation levels, the knowledge needed for innovations might, indeed, come from existing business partners and not necessarily from scientific organisations. The RIS approach stresses the importance of universities, but they may not play a direct role in firms' innovation activities; instead, they may be in the role of bridging agents, transferring knowledge from other partners, or play a larger enabling role for the locality (Fromhold-Eisebith & Werker, 2013). However, these aspects refer to problems of rural firms that might need help and intervention to ensure that they have access to the necessary knowledge, as well as confirm that existing shortages are not provoking new ones. However, some obstacles might also be related to mechanisms inside universities, which have not been focused on in this research.

The SNA has been criticised because it does not explore the deeper motives and understandings of related actors (Neumeier, 2012). To further develop the use of knowledge networks in innovation activities, the static configuration of knowledge networks was supplemented with other dimensions. Activity and strength are the two dimensions that help describe the nature of knowledge relations. This explains why some relationships are more productive. Furthermore, this opens the role of the network capital. The nature (expressed in active or passive behaviour) influences the possibilities of using existing knowledge for innovation activities.

The results of the research contest the mainstream understanding that agglomeration and clustering are traditionally seen as prerequisites for innovation (Asheim & Isaksen, 2002). The empirical analyses (Article II) show that firms in rural areas use rural resources in their innovation activities and that each of the proposed groups of resources (physical, human, immaterial, financial, social and community) provides valuable and diverse opportunities for firms. Although the presented examples tend to be incremental and often scattered, they nonetheless have notable value for the firms. In some cases, innovations use several resources in combination, sometimes concentrating on one resource and supplementing with others. For instance, begin with a physical resource and add other resources (e.g., human resource as the knowledge about practices and handling of local resources or identity used in marketing, as an immaterial resource). Regardless, these local assets, alone or in combination, first have to be noticed and exploited proactively to employ all their potential. It is evident that better results are achieved when more than one type of resource is combined. Similarly, concentrating on some distinctive resource can be additionally supported by scientific research, which in turn offer opportunities for higher-level innovations. Furthermore, this example proves the importance of universities. Even if universities are not delivering direct knowledge needed for innovations, it helps raise local human resources in general, as well as widen the possibilities to use external knowledge as a brokering agent connecting local actors with extra-local counterparts. These results are not contradictory but supplement the growing stream of literature examining the productive role of rural resources (e.g. Anderson, 2000; Eder & Trippl, 2019; Gibson, 2016; Müller & Korsgaard, 2018) with new examples and explanations.

Locality and innovations influence each other. This is a complex interplay, where the strength of these localities is often in its traditions, which require inertia to maintain their value. At the same time, these amenities do not exist in a vacuum, and the innovations can both enable and restrict the traditions and shape the regional development trajectories (Article II and III). The empirics of this research indicate the overwhelming

emergence of incremental innovation, suggesting a continuity-driven development path (Isaksen et al., 2019). The cases did not reveal economic structures that drastically changed or created totally new paths (Article II). Innovations that respect traditions and support traditional knowledge with 'modern add-ons' might also be more ecologically favourable. Similarly, Mitchell (2013) described creative enhancement as an alternative to the overriding replacement of old with new. Careful observations have to be part of the innovation process. As far as it was possible to witness, drastically changing technology can jeopardise the ecological sustainability of specific regions (Article III, cork tree case). If needed, innovation strategies should be changed or activities reinvented to mitigate potential hazards.

The results underline the need to carefully analyse the tradition-related aspects of rural innovations, to avoid exhausting the strengths of the localities. In a society consisting of varied social groups, different individual perceptions can arise. These perspectives must be taken into consideration before any unchangeable results are delivered and refer back to the overall aim of innovations and activities' purpose. Several researchers (e.g., Dax & Fischer, 2018; Leick & Lang, 2018; Pike, Rodríguez-Pose, & Tomaney, 2017) doubt the possibility and reasonability of setting classical objectives, such as economic growth, as a target for rural development, considering the characteristics of these areas. Instead, the well-being of the population and desirable living could be alternatives (Dax & Fischer, 2018). This research supports the idea that at least some entrepreneurs hold non-economic values, such as lifestyle, identity, traditions and the environment (Gülümser et al., 2010; Lafuente et al., 2010). Consequently, successful innovation processes might even help counteract peripheralisation dynamics (Kühn, 2015) often witnessed in rural areas, and the balanced exploitation of innovation activities might achieve more sustainable development.

Although this research concentrated on the use of internal resources, it was also evident from the examples that internal resources alone are, in many cases, inadequate and need additional input from extra-local, often international actors. Small country size might be one of the reasons for this kind of strategy. The importance of extra-local actors in innovations has also been noted by some other scholars studying different regional contexts (e.g. Cannarella & Piccioni, 2011; Li et al., 2019; Müller, 2013). However, especially small firms might lack resources for intense international level networking. Here, hope could be placed in universities, which could create connections on the international level (Fromhold-Eisebith & Werker, 2013). The ultimate issue comes down to balance of responsible knowledge with the capacity to utilise all possible resources properly. The thoughtful combination of internal and external factors might be the key to future rural development (Li et al., 2019).

5 Conclusion

This thesis examined firms from a small Eastern European country to identify the use of knowledge networks and local resources in innovation activities. The research stressed the complexity of rural innovation and analysed the influence of these innovations on the development paths of localities. The analysed firms acquire knowledge for their innovation activities via varied but scattered relationships. Unsurprisingly, market-based actors prevail in this network. The most productive relationships are strong proactive links with extra-local actors. Local social relationships are valued less for directly delivering the knowledge needed for innovations. Most firms could not see the direct value of scientific organisations in delivering knowledge for their innovations. This finding was a bit surprising, compared to the result of a study from Finland, a neighbouring country (Virkkala, 2007), but can be explained by either the selection of firms and their innovation intentions or a number of other external factors.

All five groups of resources (physical, human, immaterial, financial, social and community) contributed to the analysed firms' innovations. Coupling more than one type of resource usually increased the value of the innovation activity. Traditional activities and knowledge-based resources referring to positive lock-in (Anderson, 2000; Gibson, 2016) examples helped to promote value for both resources and localities. The social and community resources seemed to have a leveraging effect while contributing the access and awareness of other resources. Despite the small scale of the innovations using local resources as an input, these innovations seemed to influence the localities' development trajectories. The interplay between local resources, including traditions and innovations, can both enable and restrict the nature of the tradition and shape local development trajectories. The evidence did not reveal radical change and the creation of new paths with the help of local resources alone; rather, these analysed endeavours led to continuity-driven paths. It seems that modernisation supporting the local strengths might be most in line with sustainable development to support the non-economic values represented in rural localities.

This research has contributed to the theoretical discussions of rural innovation in several ways:

- The research proposes a novel framework where two dimensions previously not used together (activity and strength) are combined to analyse the nature of knowledge networks of innovative SMEs (Article I). Knowledge can be transferred when there are links between actors, but nature (expressed as either active or passive behaviour) influences the use of existing knowledge for innovation activities. Thus, this framework helps analyse knowledge networks and relationships delivering knowledge for new advancements. Knowledge network configuration is just one aspect that describes the existence of inter-firm connections. The usability of knowledge networks is a much more complex theme than the belief in weak ties contributing to innovations (Ruef, 2002). The other dimension needed in rural innovation studies is an understanding of the value of knowledge and its use in creating innovations.

- From a methodological perspective, this research broadens the use of the SNA by crossing the borders of the locality and considering extra-local relations (Article I). It combines SNA with meaning coding and thematic categorisation (Kvale, 2007) to analyse the nature of knowledge relationships, which responds to the common critique of SNA (Neumeier, 2012) in an unconventional way.

- An empirically grounded original model is proposed to illustrate the multi-dimensionality of rural resources (Article II). This model suggests a new perspective, proposing a micro-level understanding of place-specific resources in innovation practices. Furthermore, this model supplements the growing stream of literature that has noticed the productive role of rural resources (e.g., Anderson, 2000; Eder & Trippl, 2019; Gibson, 2016; Müller & Korsgaard, 2018) while proposing a new angle for understanding their opportunities. Moreover, the model elucidates the need to enrich local resources with extra-local input. Traditional approaches in innovation studies stress agglomeration and clustering as prerequisites for innovation. In contrast, this thesis analyses how local resources can be used for innovation activities. Thus, the breadth of mainstream innovation literature is widened.

- The research proposes a visualisation to explore the potential dynamics in the interplay between traditions and innovations (Article III). This visualisation interprets the multi-directional way influences appear in innovation systems. Thus, the thesis explores the interplay between using local resources in innovations and local development trajectories (Articles II and III). The presented examples support the belief that development trajectories can be altered with the help of innovation endeavours involving local resources; that said, the presence of continuity-driven paths is as overwhelming as expected. Thus, analysing the various sides of rural innovation together adds an additional novel aspect to the research as compensation for the shortages of rural localities' knowledge networks and local strengths (i.e., local resources) are often analysed separately (Müller & Korsgaard, 2018).

- The research adds empirical examples from Central and Eastern Europe into the rural innovation literature. Estonia represents an area that is rarely examined in the rural innovation literature as the research tends to focus on highly-developed countries (Eder, 2019; Květoň & Blažek, 2018).

- Moreover, the research contributes to the emerging discussion regarding the roles of various actors in rural innovation activities. Although, some previous contributions have highlighted the importance of local social interactions and scientific actors (Moyes et al., 2012; Petrov, 2011; Virkkala, 2007), examples presented in the current research do not support this finding. Instead, the results widen the role of these actors in innovation processes in rural settings; both can be handled as enablers who provide access to some resources and could raise the overall awareness and perception of the use of other actors and resources. Additionally, widely accessible forums, such as the Internet and trade fairs, seem to be vital actors in the expansion of knowledge networks; such non-human actors have, so far, received relatively little attention in the rural innovation literature. Their emergence helps explain the multi-dimensionality of innovation systems at the local level.

Practical implications

The results of this research have practical implications that should be noticed at the micro-level in firm management, as well as at the political level. Limited knowledge networks, and especially the small number of proactive relationships, might refer to the need to get some help in raising network capital. Limited awareness about network capital and capabilities in managing knowledge networks can further restrain their growth. This can pose additional complications if the networks widen in the circumstances where there is minimal awareness about this capital. In particular, SMEs might be in need of special support to build their networks and encoding capital, allowing

them to effectively build and use larger networks delivering different kinds of knowledge needed for innovations. Foremost, this activity should begin with noticing and awareness on the firm level. Thus far, the empirics of the research point to the need to reconsider these issues from the viewpoint of further development of the firms.

Considering the limited practises with universities, there is a need for tools to encourage communication and cooperation between small firms and scientific organisations. This lack of communication might face obstacles from both sides because these actors usually seem to be located too far from each other but could, nonetheless, offer valuable additions even when the DUI mode of interaction is dominant. More active communication would allow universities to execute their potential role as a brokering agent (Fromhold-Eisebith & Werker, 2013), which might benefit the overall development of the locality even if it does not directly benefit the firms' current innovation activities.

The research provides several examples of how firms use local resources as inputs for innovations. Without falling into overwhelming rural idyll, entrepreneurs should look more carefully at the strengths and opportunities certain localities can offer. Rather than ignoring potential weaknesses, they should be honestly assessed in tandem with any analysis. The effective use of smart technologies can provide additional opportunities to do so, but this concept is not utilised enough to address the needs of small rural firms. In some cases, a firm is incapable of utilising some resources, but effective mutual activities could increase opportunities to do so. Again, in this situation, some help could be provided by different brokering agents, such as local governments, associations and unions, or conversations in the local sauna club.

Lastly, this research reconfirms that we need place-specific solutions (Tödtling & Trippl, 2005) and instruments for supporting innovation in a wide variety of contexts. Designing policies that take into consideration the complexity of individual conditions and provide flexibility to support all manner of firms operating in myriad landscapes and urban/rural combinations is essential. Support is vital for the ecological and economic sustainability of rural areas; while small firms may not have a significant impact on their national economies, they are often critical for local development. This multi-level aspect should not be forgotten when designing and redesigning policies. The levels of innovation systems (e.g., regional and national innovation systems) are intertwined (Fromhold-Eisebith, 2007), especially in a small state such as Estonia. However, the needs of local small firms and larger high-tech industries might not be the same.

Limitations and future research

The generalisability of these results is subject to certain limitations. As a qualitative study, this research focused on individuals' perspectives and interpretations to understand their actions and motives, but empirical generalisations of the results should be made with caution. Relying on the issues raised in this research, a widespread cross-national study would be a fruitful approach in future research. This broad understanding about innovations was based on the self-assessment of the interviewees. This allowed to witness several examples that would have stayed hidden if conventional high-tech interpretations were used. However, the comparability of the levels of innovations remain modest.

Furthermore, the results uncovered the role of non-human factors, such as trade fairs and the Internet, in the innovations of firms located in rural areas. In the future, this aspect needs further elaboration, especially in the era of globalisation and ICT development. One issue raised in the results is the question of what kinds of innovations

and development are communities looking for in the future. This intriguing question about overall sustainability can be elaborated further in additional research. Moreover, the current research did not establish any sectoral differences and could be an additional route for future work.

The post-socialist context and rapid transformation experienced by all post-socialist countries of the Central and Eastern countries might have an effect on current behaviour but is not necessarily a continued and interconnected path (Kay, Shubin, & Thelen, 2012). This research concentrated on innovation activities conducted in recent years and did not elaborate on the potential background of changes that took place decades ago. However, incorporating the historic background information could be a new route for future studies as some of these firms' activities were based on industrial activities engaged in prior to the change in economic regimes.

References

Ahuja, G. (2000). Collaboration Networks, Structural Holes, and Innovation: A Longitudinal Study. *Administrative Science Quarterly*, *45*, 425–455.

Anderson, A. R. (2000). Paradox in the periphery: An entrepreneurial reconstruction? *Entrepreneurship and Regional Development*, *12*, 91–109.

Asheim, B. (2012). The Changing Role of Learning Regions in the Globalizing Knowledge Economy: A Theoretical Re-examination. *Regional Studies*, *46*, 993–1004.

Asheim, B., Grillitsch, M., & Trippl, M. (2016). Regional innovation systems: past - present - future. In R. Shearmur, C. Carrincazeaux, & D. Doloreux (Eds.), *Handbook on the Geographies of Innovation* (pp. 45–62). Cheltenham, UK: Edward Elgar Publishing.

Asheim, B., Grillitsch, M., & Trippl, M. (2017). Introduction: Combinatorial Knowledge Bases, Regional Innovation, and Development Dynamics. *Economic Geography*, *93*, 429–435.

Asheim, B., & Isaksen, A. (2002). Regional Innovation Systems: The Integration of Local 'Sticky' and Global 'Ubiquitous' Knowledge. *Journal of Technology Transfer*, *27*, 77–86.

Asheim, B., Isaksen, A., & Trippl, M. (2019). *Advanced Introduction to Regional Innovation Systems*. Cheltenham, UK: Edward Elgar Publishing.

Asheim, B., Smith, H. L., & Oughton, C. (2011). Regional Innovation Systems: Theory, Empirics and Policy. *Regional Studies*, *45*, 875–891.

Baker, T., & Nelson, R. E. (2005). Creating Something from Nothing: Resource Construction through Entrepreneurial Bricolage. *Administrative Science Quarterly*, *50*, 329–366.

Barkin, D., & Barón, L. (2005). Constructing alternatives to globalisation: Strengthening tradition through innovation. *Development in Practice*, *15*, 175–185.

Bassi, I., Zaccarin, S., & De Stefano, D. (2014). Rural inter-firm networks as basis for multifunctional local system development: Evidence from an Italian alpine area. *Land Use Policy*, *38*, 70–79.

Bathelt, H., Malmberg, A., & Maskell, P. (2004). Clusters and knowledge: local buzz, global pipelines and the process of knowledge creation. *Progress in Human Geography*, *28*, 31–56.

Besser, T. L., & Miller, N. J. (2013). Community matters: successful entrepreneurship in remote rural US locations. *The International Journal of Entrepreneurship and Innovation*, *14*, 15–27.

Boschma, R. (2004). Competitiveness of regions from an evolutionary perspective. *Regional Studies*, *38*, 1001–1014.

Boschma, R. (2005). Proximity and Innovation: A Critical Assessment. *Regional Studies*, *39*, 61–74.

Brem, A. (2011). Linking innovation and entrepreneurship - literature overview and introduction of a process-oriented framework. *International Journal of Entrepreneurship and Innovation Management*, *14*, 6.

Bryman, A., & Bell, E. (2015). *Business Research Methods* (4th ed.). Oxford: Oxford University Press.

Bunnell, T. G., & Coe, N. M. (2001). Spaces and scales of innovation. *Progress in Human Geography*, *25*, 569–589.

Burnett, K. A., & Danson, M. (2004). Adding or subtracting value?: Constructions of rurality and Scottish quality food promotion. *International Journal of Entrepreneurial Behaviour & Research*, *10*, 384–403.

Calafati, A. (2006). “Traditional knowledge” and local development trajectories. *European Planning Studies*, *14*, 621–639.

Camps, S., & Marques, P. (2014). Exploring how social capital facilitates innovation: The role of innovation enablers. *Technological Forecasting and Social Change*, *88*, 325–348.

Cannarella, C., & Piccioni, V. (2007). Innovation Diffusion and Territorial Inertia. *International Journal of Rural Management*, *3*, 181–211.

Cannarella, C., & Piccioni, V. (2011). Traditiovations: Creating innovation from the past and antique techniques for rural areas. *Technovation*, *31*, 689–699.

Carsrud, A., & Brännback, M. (2014). Research in entrepreneurship: an introduction to the research challenges for twenty-first century. In A. Carsrud & M. Brännback (Eds.), *Handbook of Research Methods and Applications in Entrepreneurship and Small Business* (pp. 1–9). Cheltenham, UK: Edward Elgar.

Copus, A., Dubois, A., & Hedström, M. (2011). Expanding horizons: local embeddedness and local engagement among small firms in the European countryside. *European Countryside*, *3*, 164–182.

Copus, A., Skuras, D., & Tsegenidi, K. (2008). Innovation and Peripherality: An Empirical Comparative Study of SMEs in Six European Union Member Countries. *Economic Geography*, *84*, 51–82.

Courtney, P., Lépicier, D., & Schmitt, B. (2008). Spatial Patterns of Production Linkages in the Context of Europe’s Small Towns: How Are Rural Firms Linked to the Local Economy? *Regional Studies*, *42*, 355–374.

Creswell, J. W. (2013). *Qualitative inquiry & research design: Choosing Among Five Approaches* (3rd ed.). Los Angeles: Sage Publications.

Dax, T., & Fischer, M. (2018). An alternative policy approach to rural development in regions facing population decline. *European Planning Studies*, *26*, 297–315.

Dinis, A. (2006). Marketing and innovation: Useful tools for competitiveness in rural and peripheral areas. *European Planning Studies*, *14*, 9–22.

Doloreux, D., Dionne, S., & Jean, B. (2007). The Evolution of an Innovation System in a Rural Area: The Case of La Pocatiere, Quebec. *International Journal of Urban and Regional Research*, *31*, 146–167.

Dubois, A. (2013). *Managing Distance. Small Firm Networks at the Geographic Margins.* Stockholm.

Eder, J. (2019). Innovation in the Periphery. *International Regional Science Review*, *42*, 119–146.

Eder, J., & Trippl, M. (2019). Innovation in the periphery: compensation and exploitation strategies. *Papers in Economic Geography and Innovation Studies*, *07*, 1–17.

Edquis, C. (2006). Systems of Innovation: Perspectives and Challenges. In J. Fagerberg, D. C. Mowery, & R. Nelson (Eds.), *The Oxford Handbook of Innovation* (pp. 181–208). Oxford: Oxford University Press.

EMÜ. (2012). *Maapiirkonna ettevõtluse arenguvajadused ja -takistused Läänemaal ja Valgamaal*. Tartu.

Ferreiro, M. de F., Ahmad, F., Reidolf, M., Sousa, de C., & Bhaduri, S. (2019). Tradition and Innovation in rural contexts: between dynamics and tensions. *African Journal of Science, Technology, Innovation and Development*. doi:10.1080/20421338.2018.1558743

Fink, M., Lang, R., & Harms, R. (2013). Local responses to global technological change - Contrasting restructuring practices in two rural communities in Austria. *Technological Forecasting and Social Change*, *80*, 243–252.

Fitjar, R. D., & Rodríguez-Pose, A. (2011). Innovating in the Periphery: Firms, Values and Innovation in Southwest Norway. *European Planning Studies*, *19*, 555–574.

Fitjar, R. D., & Rodríguez-Pose, A. (2013). Firm collaboration and modes of innovation in Norway. *Research Policy*, *42*, 128–138.

Florida, R., Adler, P., & Mellander, C. (2017). The city as innovation machine. *Regional Studies*, *51*, 86–96.

Fløysand, A., & Sjøholt, P. (2007). Rural Development and Embeddedness: The Importance of Human Relations for Industrial Restructuring in Rural Areas. *Sociologia Ruralis*, *47*, 205–227.

Fromhold-Eisebith, M. (2007). Bridging scales in innovation policies: How to link regional, national and international innovation systems. *European Planning Studies*, *15*, 217–233.

Fromhold-Eisebith, M., & Dewald, U. (2018). Urban innovation or rural dedication? Contrasts in socio-technical niche development in photovoltaics in Germany. In M. Van Geenhuizen, J. A. Holbrook, & M. Taheri (Eds.), *Cities and Sustainable Technology Transitions. Leadership, Innovation and Adoption* (pp. 109–135). Cheltenham: Edward Elgar.

Fromhold-Eisebith, M., & Werker, C. (2013). Universities' functions in knowledge transfer: A geographical perspective. *Annals of Regional Science*, *51*, 621–643.

Gamito, T. M., & Madureira, L. (2019). Shedding light on rural innovation: Introducing and applying a comprehensive indicator system. *Regional Science Policy and Practice*, 1–27.

Garud, R., & Karnøe, P. (2001). Path creation as a process of mindeful deviation. In R. Garud & P. Karnøe (Eds.), *Path Dependence and Creation* (pp. 124–209). New York: Psychology Press.

Garud, R., Kumaraswamy, A., & Karnøe, P. (2010). Path dependence or path creation? *Journal of Management Studies*, *47*, 760–774.

Gertler, M. S. (2010). Rules of the game: The place of institutions in regional economic change. *Regional Studies*, *44*, 1–15.

Gibson, C. (2016). Material inheritances: How place, materiality, and labor process underpin the Path-Dependent evolution of contemporary craft production. *Economic Geography*, *92*, 61–86.

Graffenberger, M., & Vonnahme, L. (2019). Questioning the "periphery label" in economic geography: entrepreneurial action and innovation in South Estonia. *ACME: An International Journal for Critical Geographies*, *18*, 529–550.

Granovetter, M. S. (1973). The Strength of Weak Ties. *American Journal of Sociology*, *78*, 1360–1380.

Granovetter, M. S. (2005). The Impact of Social Structure on Economic Outcomes. *Journal of Economic Perspecitives*, *19*, 33–50.

Gross-Fengels, S., & Fromhold-Eisebith, M. (2018). Adapting Transport Related Innovations to Rural Needs: Smart Mobility and the Example of the Heinsberg Region, Germany. In R. S. Franklin, E. S. van Leeuwen, & A. Paez (Eds.), *Population Loss: The Role of Transportation and Other Issues. Advances in Transport Policy and Planning* (Vol. 2, pp. 125–162). Cambridge: Elsevier Academic Press.

Gülümser, A. A., Baycan-Levent, T., & Nijkamp, P. (2010). Measuring Regional Creative Capacity: A Literature Review for Rural-Specific Approaches. *European Planning Studies*, *18*, 545–563.

Hermans, F., Van Apeldoorn, D., Stuiver, M., & Kok, K. (2013). Niches and networks: Explaining network evolution through niche formation processes. *Research Policy*, *42*, 613–623.

Hong, S., Oxley, L., & McCann, P. (2012). a Survey of the Innovation Surveys. *Journal of Economic Surveys*, *26*, 420–444.

Huggins, R., & Johnston, A. (2009). Knowledge Networks in an Uncompetetive Region: SME Innovation and Growth. *Growth and Change*, *40*, 227–259.

Huggins, R., & Johnston, A. (2010). Knowledge Flow Across Inter-Firm Networks: The Influence of Network Resources , Spatial Proximity , and Firm Size. *Entrepreneurship and Regional Development*, *22*, 457–484.

Huggins, R., & Thompson, P. (2015). Entrepreneurship, innovation and regional growth: a network theory. *Small Business Economics*, *45*, 103–128.

Huggins, R., & Thompson, P. (2019). The behavioural foundations of urban and regional development: culture, psychology and agency. *Journal of Economic Geography*, *19*, 121–146.

Irvine, W., & Anderson, A. R. (2008). ICT (information communication technology), peripherality and smaller hospitality businesses in Scotland. *International Journal of Entrepreneurial Behaviour & Research*, *14*, 200–218.

Isaksen, A. (2015). Industrial development in thin regions: Trapped in path extension? *Journal of Economic Geography*, *15*, 585–600.

Isaksen, A., Jakobsen, S. E., Njøs, R., & Normann, R. (2019). Regional industrial restructuring resulting from individual and system agency. *Innovation: The European Journal of Social Science Research*, *32*, 48–65.

Isaksen, A., & Karlsen, J. (2016). Innovation in peripheral regions. In R. Shearmur, C. Carrincazeaux, & D. Doloreux (Eds.), *Handbook on the Geographies of Innovation* (pp. 277–285). Cheltenham, UK, Massachusetts, USA: Edward Elgar.

Isaksen, A., & Onsager, K. (2010). Regions, networks and innovative performance: The case of knowledge-intensive industries in Norway. *European Urban and Regional Studies*, *17*, 227–243.

Isaksen, A., & Trippl, M. (2016). Path Development in Different Regional Innovation Systems: A Conceptual Analysis. In M. D. Parrilli, R. D. Fitjar, & A. Rodriguez-Pose (Eds.), *Innovation drivers and regional innovation strategies* (pp. 66–84). New York, London: Routledge.

Isaksen, A., & Trippl, M. (2017). Innovation in space : the mosaic of regional innovation patterns. *Oxford Review of Economics Policy*, *33*, 122–140.

Jack, S. L. (2005). The Role, Use and Activation of Strong and Weak Network Ties: A Qualitative Analysis. *Journal of Management Studies*, *42*, 1233–1258.

Jack, S. L. (2010). Approaches to studying networks: Implications and outcomes. *Journal of Business Venturing*, *25*, 120–137.

Jensen, M. B., Johnson, B., Lorenz, E., & Lundvall, B. Å. (2007). Forms of knowledge and modes of innovation. *Research Policy*, *36*, 680–693.

Kalantaridis, C. (2009). SME Strategy, Embeddedness and Performance in East Cleveland, North East England. *International Small Business Journal*, *27*, 496–521.

Karo, E., & Lember, V. (2016). Emergence of societal challenges-based innovation policies in market-based innovation systems: Lessons from Estonia. *International Journal of Foresight and Innovation Policy*, *11*, 126–147.

Kay, R., Shubin, S., & Thelen, T. (2012). Rural realities in the post-socialist space. *Journal of Rural Studies*, *28*, 55–62.

Knickel, K., Brunori, G., Rand, S., & Proost, J. (2009). Towards a Better Conceptual Framework for Innovation Processes in Agriculture and Rural Development: From Linear Models to Systemic Approaches. *The Journal of Agricultural Education and Extension*, *15*, 131–146.

Korsgaard, S., Ferguson, R., & Gaddefors, J. (2015). The best of both worlds: how rural entrepreneurs use placial embeddedness and strategic networks to create opportunities. *Entrepreneurship and Regional Development*, *27*, 574–598.

Kühn, M. (2015). Peripheralization: Theoretical Concepts Explaining Socio-Spatial Inequalities. *European Planning Studies*, *23*, 367–378.

Kvale, S. (2007). *Doing interviews*. Los Angeles: Sage Publications.

Květoň, V., & Blažek, J. (2018). Path-development trajectories and barriers perceived by stakeholders in two Central European less developed regions: narrow or broad choice? *European Planning Studies*, *26*, 2058–2077.

Lafuente, E., Vaillant, Y., & Serarols, C. (2010). Location decisions of knowledge-based entrepreneurs: Why some Catalan KISAs choose to be rural? *Technovation*, *30*, 590–600.

Lasagni, A. (2012). How Can External Relationships Enhance Innovation in SMEs? New Evidence for Europe. *Journal of Small Business Management*, *50*, 310–339.

Leão, J. (2014). *Are Networks for Innovation an Important Strategic Tool For Sustainable Rural Development?* UNIVERSIDADE DO PORTO.

Leick, B., & Lang, T. (2018). Re-thinking non-core regions: planning strategies and practices beyond growth. *European Planning Studies*, *26*, 213–228.

Li, Y., Westlund, H., & Liu, Y. (2019). Why some rural areas decline while some others not: An overview of rural evolution in the world. *Journal of Rural Studies*, *68*, 135–143.

Liu, J., Chaminade, C., & Asheim, B. (2013). The Geography and Structure of Global Innovation Networks: A Knowledge Base Perspective. *European Planning Studies*, *21*, 1456–1473.

Lorentzen, A. (2008). Knowledge networks in local and global space. *Entrepreneurship & Regional Development*, *20*, 533–545.

Lundvall, B. (2007). National Innovation Systems—Analytical Concept and Development Tool. *Industry & Innovation*, *14*, 95–119.

Lundvall, B. (Ed.). (2010). *National systems of innovation: Toward a theory of innovation and interactive learning*. Retrieved from https://ebookcentral.proquest.com

Majandus- ja Kommunikatsiooniministeerium. (2015). *Eesti ettevõtete uuendusmeelsus ja innovatsiooni toetamise võimalused*. Tallinn. Retrieved from https://www.mkm.ee/sites/default/files/inno_24.pdf

Martin, R., & Sunley, P. (2006). Path dependence and regional economic evolution. *Journal of Economic Geography*, *6*, 395–437.

Massard, N., & Autant-Bernard, C. (2015). Editorial: Geography of Innovation: New Trends and Implications for Public Policy Renewal. *Regional Studies*, *49*, 1767–1771.

Mayer, H., & Baumgartner, D. (2014). The Role of Entrepreneurship and Innovation in Peripheral Regions. *DisP - The Planning Review*, *50*, 16–23.

McDonagh, J. (2012). Rural geography I: changing expectations and contradictions in the rural. *Progress in Human Geography*, *37*, 712–720.

McKeever, E., Anderson, A., & Jack, S. (2014). Social embeddedness in entrepreneurship research: the importance of context and community. In E. Chell & K.-Ö. Mine (Eds.), *Handbook of Research on Small Business and Entrepreneurship* (pp. 222–236). Cheltenham, UK: Edward Elgar.

Miles, M. B., Huberman, M. A., & Saldana, J. (2014). *Qualitative data analysis: a methods sourcebook* (3rd ed.). United States of America: Sage Publications.

Mitchell, C. J. (2013). Creative destruction or creative enhancement? Understanding the transformation of rural spaces. *Journal of Rural Studies*, *32*, 375–387.

Moyes, D., Whittam, G., & Ferri, P. (2012). A conceptualisation of the relationship capital of rural small service firms. *Local Economy*, *27*, 136–151.

Müller, S. (2013). *Entrepreneurship and Regional Development: On the Interplay between Agency and Context*. Aarhus University.

Müller, S., & Korsgaard, S. (2018). Resources and bridging: the role of spatial context in rural entrepreneurship. *Entrepreneurship and Regional Development*, *30*, 224–255.

Murdoch, J. (2000). Networks — a new paradigm of rural development? *Journal of Rural Studies*, *16*, 407–419.

Naldi, L., Nilsson, P., Westlund, H., & Wixe, S. (2015). What is smart rural development? *Journal of Rural Studies*, *40*, 90–101.

Neumeier, S. (2012). Why do Social Innovations in Rural Development Matter and Should They be Considered More Seriously in Rural Development Research? - Proposal for a Stronger Focus on Social Innovations in Rural Development Research. *Sociologia Ruralis*, *52*, 48–69.

Nogueira, C., Pinto, H., & Guerreiro, J. (2014). Innovation and Tradition in The Valorisation of Endogenous Resources : The Case of Salt Flower in Algarve. *Journal of Maritime Research*, *XI*, 45–52.

North, D., & Smallbone, D. (2000). The Innovativeness and Growth of Rural SMEs During the 1990s. *Regional Studies*, *34*, 145–157.

O'Donnell, A. (2004). The nature of networking in small firms. *Qualitative Market Research: An International Journal*, *7*, 206–217.

OECD/Eurostat. (2005). *Oslo Manual: Guidelines for Collecting and Interpeting Innovation Data* (3rd ed.). Paris: OECD Publishing. doi:10.1787/9789264013100-en

OECD/Eurostat. (2018). *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation* (4th ed.). Paris/Eurostat, Luxembourg: OECD/Eurostat. doi:https://doi.org/10.1787/9789264304604-en

OECD. (2005). *OECD Regions at a Glance*. Retrieved from http://www.oecd.org/gov/regions-at-a-glance.htm

OECD. (2014). *Innovation and Modernising the Rural Economy*. OECD Publishing. doi:dx.doi.org/10.1787/9789264205390-en

Ozman, M. (2009). Inter-firm networks and innovation: a survey of literature. *Economics of Innovation and New Technology*, *18*, 39–67.

Parrilli, M. D., & Alcalde Heras, H. (2016). STI and DUI innovation modes: Scientific-technological and context-specific nuances. *Research Policy*, *45*, 747–756.

Petrov, A. N. (2011). Beyond spillovers: Interrogating innovation and creativity in the peripheries. In H. Bathelt, M. P. Feldman, & D. F. Kogler (Eds.), *Beyond Territory: Dynamic Geographies of Knowledge Creation, Diffusion, and Innovation* (pp. 168–190). Oxon: Routledge.

Petruzzelli, A. M., & Savino, T. (2014). Search, recombination, and innovation: Lessons from haute cuisine. *Long Range Planning*, *47*, 224–238.

Pike, A., Rodríguez-Pose, A., & Tomaney, J. (2017). Shifting horizons in local and regional development. *Regional Studies*, *51*, 46–57.

Plüschke-Altof, B. (2017). *Images of the Periphery Impeding Rural Development? Discursive Peripheralization of Rural Areas in Post-Socialist Estonia*. University of Tartu.

Plüschke-Altof, B., & Grootens, M. (2019). Leading Through Image Making? On the Limits of Emphasising Agency in Structurally Disadvantaged Rural Places. In T. Lang & F. Görmar (Eds.), *Regional and Local Development in Times of Polarisation. New Geographies of Europe* (pp. 319–341). Singapure: Palgrave Macmillan.

Pylak, K. (2015). Changing innovation process models: A chance to break out of path dependency for less developed regions. *Regional Studies, Regional Science*, *2*, 46–72.

Reidolf, M. (2016). Knowledge Networks and the Nature of Knowledge Relationships of Innovative Rural SMEs. *European Journal of Innovation Management*, *19*, 317–336.

Ring, J. K., Peredo, A. M., & Chrisman, J. J. (2010). Business Networks and Economic Development in Rural Communities in the United States. *Entrepreneurship Theory and Practice*, *34*, 171–195.

Rogers, M. E. (2003). *Diffusion of Innovation* (5th ed.). New York: Free Press.

Roper, S., & Love, J. H. (2018). Knowledge context, learning and innovation: an integrating framework. *Industry and Innovation*, *25*, 339–364.

Ruef, M. (2002). Strong ties, weak ties and islands: structural and cultural predictors of organizational innovation. *Industrial and Corporate Change*, *11*, 427–449.

Rutten, R. (2017). Beyond proximities: the socio-spacial dynamics of knowledge creation. *Progress in Human Geography*, *41*, 159–177.

Salemink, K., Strijker, D., & Bosworth, G. (2017). Rural development in the digital age: A systematic literature review on unequal ICT availability, adoption, and use in rural areas. *Journal of Rural Studies*, *54*, 360–371.

Shearmur, R. (2011). Innovation, Regions and Proximity: From Neo-Regionalism to Spatial Analysis. *Regional Studies*, *45*, 1225–1243.

Shearmur, R. (2017). Urban Bias in Innovation Studies. In H. Bathelt, P. Cohendet, S. Henn, & L. Simon (Eds.), *The Elgar Companion to Innovation and Knowledge Creation* (pp. 440–456). Cheltenham, UK: Edward Elgar Publishing.

Shearmur, R., Carrincazeaux, C., & Doloreux, D. (2016). The geographies of innovations: beyond one-size-fits-all. In *Handbook on the Geographies of Innovation* (pp. 1–16). Cheltenham, UK: Edward Elgar Publishing.

Siemens, L. (2010). Challenges , Responses and Available Resources: Success in Rural Small Businesses. *Journal of Small Business & Entrepreneurship*, *23*, 65–80.

Singh, S., & Bhowmick, B. (2015). Network of Networks: A Systematic Review of Literature Constructing Rural Development. *Journal of Agricultural Economic and Rural Development*, *3*, 41–53.

Slotte-Kock, S., & Coviello, N. (2010). Entrepreneurship Research on Network Processes: A Review and Ways Forward. *Entrepreneurship Theory and Practice*, *34*, 31–57.

Smith, K. (2000). Innovation a s a Systemic Phenomenon: Rethinking the Role of Policy. *Enterprise & Innovation Management Studies*, *1*, 73–103.

Sotarauta, M., & Suvinen, N. (2018). Institutional Agency and Path Creation: Institutional Path from Industrial to Knowledge City. In A. Isaksen, R. Martin, & M. Trippl (Eds.), *New Avenues for Regional Innovation Systems - Theoretical Advances, Empirical Cases and Policy Lessons.* (pp. 1–17). New York: Springer.

Spyridakis, M., & Dima, F. (2016). Reinventing traditions: Socially produced goods in Eastern Crete during economic crisis. *Journal of Rural Studies*, *53*, 269–277.

Stathopoulou, S., Psaltopoulos, D., & Skuras, D. (2004). Rural entrepreneurship in Europe: A research framework and agenda. *International Journal of Entrepreneurial Behaviour & Research*, *10*, 404–425.

Strambach, S. (2008). *Path Dependency and Path Plasticity: the Co- evolution of Institutions and Innovation - the German Customized Business Software Industry* (Working Papers on Innovation and Space). Marburg. Retrieved from http://hdl.handle.net/10419/111860%0AStandard-Nutzungsbedingungen

Tödtling, F., & Grillitsch, M. (2012). Types of Innovation, Competencies of Firms, and External Knowledge Sourcing—Findings from Selected Sectors and Regions of Europe. *Journal of the Knowledge Economy*, *5*, 330–356.

Tödtling, F., & Trippl, M. (2005). One size fits all? *Research Policy*, *34*, 1203–1219.

Torre, A., & Wallet, F. (2013). Innovation and governance of rural territories. In E. Coudel, H. Devautour, C. T. Soulard, G. Faure, & B. Hubert (Eds.), *Renewing Innovation Systems in Agriculture and Food: How to go towards more sustainability?* (pp. 147–164). Wageningen Academic Publishers.

Touzard, J.-M., Temple, L., Faure, G., & Triomphe, B. (2015). Innovation systems and knowledge communities in the agriculture and agrifood sector: a literature review. *Journal of Innovation Economics*, *17*, 117.

van Hemert, P., Masurel, E., & Nijkamp, P. (2011). The role of knowledge sources of SMEs for innovation perception and regional innovation policy. *Regional Science Policy & Practice*, *3*, 163–179.

van Hemert, P., Nijkamp, P., & Masurel, E. (2012). From innovation to commercialization through networks and agglomerations: analysis of sources of innovation, innovation capabilities and performance of Dutch SMEs. *The Annals of Regional Science*, *50*, 425–452.

Varis, M., & Littunen, H. (2012). SMEs and Their Peripheral Innovation Environment: Reflections from a Finnish Case. *European Planning Studies*, *20*, 547–582.

Varis, M., Tohmo, T., & Littunen, H. (2012). Arriving at the Dawn of the New Economy: Is Knowledge-Based Industrial Renewal Possible in a Peripheral Region? *European Planning Studies*, *22*, 101–125.

Virkkala, S. (2007). Innovation and Networking in Peripheral Areas - a Case Study of Emergence and Change in Rural Manufacturing. *European Planning Studies*, *15*, 511–529.

Yin, R. K. (2003). *Applications of case study research* (2nd ed.). Californina, US: Sage Publications.

Young, N. (2010). Business networks, collaboration and embeddedness in local and extra-local spaces: The case of port hardy, Canada. *Sociologia Ruralis*, *50*, 392–408.

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Abstract

Knowledge Networks and Local Resources Shaping Innovation in Rural Areas

Innovation is recognised as one of the key drivers in economic growth and development (Brem, 2011; Hong et al., 2012) and an important aspect of a knowledge-driven economy (Petrov, 2011). However, the mainstream innovation literature concentrates on science-based, high-tech and radical innovations in cities (Hong et al., 2012; Shearmur, 2017; Torre & Wallet, 2013), thus leaving rural innovations, which are often incremental and based on informal local knowledge sources, largely unexplored (Gamito & Madureira, 2019; Isaksen & Onsager, 2010). However, rural regions comprise a remarkable portion of the territory and inhabitants. Focusing merely on agriculture (Singh & Bhowmick, 2015) is insufficient to understand the holistic picture of today's rurality (Li et al., 2019). Despite growing theoretical discussions, the rural innovation literature is still scarce, often described with a certain negative label and, therefore, leaving the full potential of these locations under-examined (Eder, 2019; Graffenberger & Vonnahme, 2019). The topic has not been studied sufficiently to refute general stereotypes and strengthen the theoretical grounds for the phenomena (Leão, 2014).

In this research, innovation is understood as a result of an interactive activity in which new products, services, marketing endeavours or processes (at least to the firm) are introduced to the market (OECD/Eurostat, 2005, 2018). Rural innovations, in particular, tend to use this broader understanding (OECD, 2014). This broad focus has been somewhat lost in research on innovation, although the importance of local context, mutual learning and the need to highlight incremental, as well as radical, innovations are emphasised in the innovation systems concept (Lundvall, 2010). Rural areas vary from dynamic core regions, for example, with the concentration of inhabitants, firms from the same sector, scientific organisations and local networking (Asheim & Isaksen, 2002; Isaksen & Karlsen, 2016). In this thesis, a locality is considered rural when its population density is below 150 inhabitants per km^2, and the majority of people live in rural communities, outside agglomerative centres (OECD, 2005). Smaller regional towns, as centres of the locality, are regarded as part of the rural area.

The starting point of the thesis is that rural firms suffer from a shortage of local actors; as recompense, these localities may provide a number of resources that can be used for innovations. Knowledge networks deliver novel knowledge to the actors, thus creating additional opportunities and compensate for the lack of local knowledge and actors (Dubois, 2013; Huggins & Johnston, 2009; Liu et al., 2013). Although the importance of knowledge networks is well-known, the number of studies specifically concerning rural networking remains limited (Li et al., 2019; Slotte-Kock & Coviello, 2010). While most scholars regard rural characteristics as weaknesses, some studies (e.g. Gibson, 2016; Korsgaard et al., 2015; Müller & Korsgaard, 2018) have analysed the use of rural resources as qualities for innovation activities. Rural areas tend to be equipped with special tools, such as traditions relying on historical knowledge and practical experience, local images and identities (Gibson, 2016; Korsgaard et al., 2015; Müller & Korsgaard, 2018; Plüschke-Altof & Grootens, 2019). These could be unique place-specific attributes upon which innovations can be built. Furthermore, non-economic values, such as lifestyle and identity are sometimes highly valued by rural entrepreneurs, especially when they are not solely motivated by economic concerns (Lafuente et al., 2010).

However, linked with evolutionary perspectives that propose continuity and path-dependency as keys to projecting regional development trajectories (Martin & Sunley, 2006), certain stigmas have not disappeared. However, this research rests on the idea that entrepreneurial activity and innovation can mould existing development paths. Innovations are implemented (or not) and diffused over time through social systems (Rogers, 2003). Although the regional innovation system's approach (RIS) may not be developed for rural settings (Tödtling & Trippl, 2005), the RIS still provides a framework for exploring innovation activities, and a complex interplay between innovation activities and localities. Furthermore, innovation is highly contextual (Hong et al., 2012), but so far, studies of rural innovation in Central and Eastern Europe (Eder, 2019; Květoň & Blažek, 2018) are particularly scarce. Moreover, the existing rural innovation research is limited and narrow, contributions concentrate on only limited aspects of the theme, but overall development as a larger aim is also vital.

The aim of the thesis is to identify the use of knowledge networks and local rural resources as sources of innovation activities of small and medium-sized enterprises (SMEs) in rural areas. The research explores answers to the following research questions:

RQ1: How do firms in rural areas use knowledge networks for their innovation activities?

RQ2: How do firms in rural areas use local resources for their innovation activities?

RQ3: How does the use of local resources for innovation activities influence the development paths of localities?

The research analyses are performed from a firm's viewpoint, exploring knowledge networks delivering knowledge for innovations and using local resources for innovations in SMEs located in rural areas. As the use of local resources in innovation activities might influence the locality itself, this thesis also analyses the interplay between innovations and the locality. This research attempts to capture the complexity that needs to be examined by covering the varied sides of the issue that could offer a novel angle for unpacking the theme.

This research is built on an innovation systems approach that recognises innovation as an output of complex, cumulative and interactive processes (Asheim et al., 2016; Lundvall, 2010), network paradigms (Murdoch, 2000) that stresses the importance of social action, and an understanding that local conditions influence innovation activities (Isaksen & Karlsen, 2016; Müller & Korsgaard, 2018). This is a qualitative explorative study conducted to understand how rural firms are building their innovation strategies. Empirical research, using data gathered via semi-structured interviews with local firms and other actors influencing rural innovations, is conducted mainly in rural areas in Estonia. Social network analyses are also perfomed to analyse the configuration of knowledge networks.

The analysed firms acquire knowledge for their innovation activities via varied but scattered relationships (Article I). Unsurprisingly, market-based actors prevail in this network. The most productive relationships are strong proactive links with extra-local actors. Local social relationships are less valued when knowledge needs to be delivered directly for innovations. Most firms in the study could not see that scientific organisations deliver knowledge for their innovations. All five groups of resources (physical, human, immaterial, social and community, financial) contribute to the analysed firms' innovations (Article II). Coupling more than one type of resource usually increase the value of the innovation activity. Traditional activities and knowledge-based resources

referring to positive lock-in (Anderson, 2000; Gibson, 2016) examples help to promote value for both resources and localities (Article III). The social and community resource seem to have a leveraging effect while contributing to the access and awareness of other resources but may not directly deliver knowledge for innovations. Similarly, universities might play a kind of mediator role. Despite the small scale of the innovations using local resources as an input, these innovations seem to influence the localities development trajectories. Traditions can enable and restrict the innovation activities and innovations can help preserve or destroy the nature of the tradition (Article III). Innovations using local resources can shape local development trajectories, but the evidence did not reveal radical change and the creation of new paths with the help of local resources alone; instead, these analysed endeavours led to continuity-driven paths (Article II). It seems that modernisation supporting the local strengths might be most in line with sustainable development to support the non-economic values represented in rural localities.

This doctoral thesis seeks to contribute to the growing rural innovation literature while unpacking different aspects of rural innovation and discussing complex connections between innovations and locality. It proposes a framework for analysing the configuration of knowledge networks and the nature (activity and strength) of relationships between actors to analyse, in detail, the use of existing relationships in the firms' knowledge networks (Article I). The use of social network analyses in innovation studies is elaborated beyond a region's borders, something uncommon in social network analyses in innovation studies (Article I). Several salient examples are given regarding how local resources are used in rural firms' innovations, contrary to the mainstream innovation literature (Article II). Rural innovation is a multi-directional activity, rather than a linear process, as innovations are shaped by localities and the innovations themselves can modify local resources, traditions and development paths. The thesis explores several cases (in Estonia, Portugal and India) where innovations and traditions either supported or hindered each other during the development process. Despite the culturally different context, they all saw an opportunity to use traditions as sources for innovations (Article III). This thesis presents possible ways in which innovation-related activities can shape the development paths of these regions, thus broadening the understanding of the complexity of innovation routes (Article II, III). The thesis provides new empirical examples from Central and Eastern Europe, which enriches the current rural innovation literature with less studied empirics (Article I, II, III).

Beyond these theoretical contributions, this thesis also has practical value. It stresses the complexity of innovation processes compared to the linear research and development oriented innovations, as well as the importance of incremental innovations. These factors should be considered when managing innovation-related processes in firms and while developing policy frameworks.

Lühikokkuvõte

Teadmusvõrgustikud ja kohalikud ressursid innovatsiooni kujundajatena maapiirkondades

Innovatsiooni peetakse majanduskasvu ja arengu aluseks (Brem, 2011; Hong et al., 2012) ning üheks olulisemaks komponendiks teadmistepõhises majanduses (Petrov, 2011). Innovatsioonialane teoreetiline kirjandus keskendub linnadele ja teadustegevusele toetuvale kõrgtehnoloogilisele radikaalsele (*radical*) innovatsioonile (Hong et al., 2012; Shearmur, 2017; Torre & Wallet, 2013) ning on seetõttu jätnud maapiirkonnad ning seal ülekaalus oleva väärtust järk-järgult tõstva (*incremental*) innovatsiooni ja mitteformaalsed teadmiste allikad suuresti tähelepanuta (Gamito & Madureira, 2019; Isaksen & Onsager, 2010). Poliitilist ja praktilist vajadust maapiirkondades toimuva innovatsiooni uurimiseks ei ole piisavalt kajastatud innovatsioonialases kirjanduses, kuigi maapiirkonnad moodustavad 80% OECD riikide territooriumist ja nende elanikkond veerandi rahvastikust (OECD, 2014). Olemasolevad innovatsiooniuuringud maapiirkondade kohta on keskendunud põllumajandusele (Singh & Bhowmick, 2015), aga sellest ei piisa, et saada ülevaade tänapäeva mitmekihilisest maaelust (Li et al., 2019). Kuigi 21. sajandil on maapiirkonna innovatsiooni käsitlevate teoreetiliste aruelude hulk kasvanud, on sellealast kirjandust vähe ja tihti on see negatiivse varjundiga, jättes seetõttu osa potentsiaalist tähelepanuta (Eder, 2019; Graffenberger & Vonnahme, 2019). Teemat pole piisavalt uuritud, et jätta seljataha levinud stereotüübid ja luua piisav teoreetiline raamistik (Leão, 2014).

Selles töös käsitletakse innovatsiooni kui interaktiivset tegevust, mille tulemuseks on turule toodud uus või edasi arendatud toode, teenus, turundustegevus või protsess ettevõtte sees (OECD/Eurostat, 2005, 2018). Seda laiapõhjalist definitsiooni on tihti kasutatud maapiirkonna uuringutes (OECD, 2014), kus kõrgtehnoloogial põhinevad innovatsioonid on vähemlevinud (Eder, 2018). Ka innovatsioonisüsteemi kontseptsiooni juures on tähtsal kohal kohalik kontekst, vastastikune õppimine ja erineva tasemega innovatsioonid [nii kõrgtehnoloogiline ja läbimurdeline (*radical*) kui järkjärgulist õppimist rõhutav tagasihoidlik ja etapiviisiline (*incremantal)* lähenemine] (Lundvall, 2010), aga see laiem lähenemine ei ole innovatsiooniuuringute keskmes. Maapiirkonnad erinevad kiirelt muutuvatest linnalistest keskustest näiteks elanikkonna asustustiheduse poolest, seal pole suurt hulka sama sektori ettevõtteid, kes võiksid klastritesse koonduda, samuti on seal vähem teadusasutusi ning vähem võimalusi suhtlemiseks erinevate toimijatega (*actors*) (Asheim & Isaksen, 2002; Isaksen & Karlsen, 2016). See töö defineerib maapiirkonda rahvastikutiheduse järgi (vähem kui 150 inimest elamas ühel km^2, kellest enamik peab elama maa-asulates) (OECD, 2005). See tähendab, et väiksemad linnad on arvestatud maapiirkonna sisse, olles keskustena piirkonna oluliseks osaks.

Käesoleva töö lähtekohaks on ühelt poolt see, et maapiirkonnas tegutsevad ettevõtted kannatavad kohalike toimijate puuduse all ning peavad selle korvamiseks rakendama teatud kompensatsioonistrateegiaid. Teiselt poolt on nendes piirkondades erinevaid ressursse, mida saab kasutada innovatsioonini viivates tegevustes. Teadmusvõrgustikud on olulised sisendid innovatsiooni jaoks (Lundvall, 2007), sest toovad uut teadmist ja loovad seeläbi uusi võimalusi kompenseerides kohapeal puuduvat teadmist ja koostööpartnereid (Dubois, 2013; Huggins & Johnston, 2009; Liu et al., 2013). Kuigi teadmusvõrgustike olulisus on teada, ei ole seda eriti uuritud maapiirkondadest lähtuvalt (Li et al., 2019; Slotte-Kock & Coviello, 2010). Teiselt poolt käsitletakse

maapiirkonnale iseloomulikke tunnuseid enamasti puudustena, ainult mõned üksikud uuringud (e.g. Gibson, 2016; Korsgaard et al., 2015; Müller & Korsgaard, 2018) on analüüsinud maapiirkonnas olevaid erinevaid ressursse (mitte ainult füüsilisi maavarasid) kui väärtusi, mida saab kasutada innovatsioonitegevuste sisendina. Näiteks traditsioonid, mis toetuvad ajaloolisel teadmisel, praktilisel kogemusel, kohalikel imidžitel ja identiteetidel on maapiirkondadele iseloomulikud spetsiifilised võimalused (Gibson, 2016; Korsgaard et al., 2015; Müller & Korsgaard, 2018; Plüschke-Altof & Grootens, 2019). Ka erinevad mitte-majanduslikud väärtused nagu elustiil ja identiteet võivad olla sellistes piirkondades paiknevate ettevõtjate jaoks olulised väärtused, eriti siis, kui nad juhinduvad muuhulgas ka mitte-majanduslikest motiividest, mis on iseloomulik just maapiirkonna ettevõtjatele (Lafuente et al., 2010).

Evolutsiooniteooriad, mis selgitavad rajasõltuvust ja järjepidevusele tuginevat majandustegevust (Martin & Sunley, 2006) on üheks põhjuseks, miks negatiivsed arusaamad maapiirkonna innovatsioonivõimaluste kohta on visad taanduma. Vastupidiselt levinud arusaamale, on evolutsiooniteooriates sees ka teatav paindlikkus. See töö lähtub arusaamast, et ettevõtlus- ja innovatsioonialased tegevused võivad muuta piirkondade arenguteid. Uudseid ideid rakendatakse ja innovatsiooniprotsess levib läbi sotsiaalsete suhete (Rogers, 2003). Kuigi regionaalne innovatsioonisüsteem (RIS) keskendub pigem linnalistele keskustele, kus ettevõtetel on lihtsam koonduda klastritesse ja saada toetust erinevatelt tugiorganisatsioonidelt (Tödtling & Trippl, 2005), annab RIS siiski teatava raamistiku, et analüüsida keerulist vastastikmõju innovatsiooni ja maapiirkonna vahel. Innovatsiooniprotsessid on paljuski sõltuvad kohalikest oludest (Hong et al., 2012), aga siiani on eriti vähe sellealaseid uuringuid Kesk- ja Ida-Euroopa maapiirkondadest (Eder, 2019; Květoň & Blažek, 2018). Kõik eeltoodu võib kokku võtta väiteks, et teemakohaseid uuringuid on vähe ja need puudutavad selle mitmetahulise teema üksikuid aspekte. Käesolev töö võtab laiema vaatenurga ja seostab teemaga seotud erinevad tahud, andes seeläbi võimaluse avada teema komplekssust.

Käesoleva töö eesmärk on analüüsida, kuidas maapiirkondades asuvad väike- ja keskmise suurusega ettevõtted kasutavad teadmusvõrgustikke ja kohalikke ressursse innovatsiooniallikatena. Töö otsib vastuseid järgmistele uurimisküsimustele:

1) Kuidas kasutavad maapiirkonna ettevõtted teadmusvõrgustikke oma innovatsioonitegevustes?
2) Kuidas kasutavad maapiirkonna ettevõtted kohalikke ressursse oma innovatsioonitegevustes?
3) Kuidas mõjutab piirkondade arenguradasid kohalike ressursside kasutamine innovatsioonitegevustes?

See töö tugineb innovatsioonisüsteemi toimimise põhimõtetel, mis teadvustavad, et innovatsioon on kumuleeruva ja interaktiivse protsessi tulemus (Asheim et al., 2016; Lundvall, 2010). Lisaks toetub töö võrgustiku paradigmale (Murdoch, 2000), mis rõhutab sotsiaalsete protsesside tähtsust, ja arusaamale, et kohalikud tingimused mõjutavad innovatsiooni (Isaksen & Karlsen, 2016; Müller & Korsgaard, 2018). Tegemist on avastava empiirilise uuringuga, mis tugineb pool-struktureeritud intervjuudele. Peamiselt on analüüsitud Eesti ettevõtteid, lisaks on käsitletud ka kohalikule traditsioonile toetuvaid innovatsiooniprotsesse kultuuriliselt erinevates maapiirkondades (Portugalis ja Indias). Täiendavalt on infoallikateks kohalik omavalitsus, kolledž, kutsekool, erinevad liidud ja ühendused.

Uurimisküsimustele annavad vastused kolm publitseeritud artiklit. Artikkel I analüüsib maapiirkonnas tegutsevate ettevõtjate teadmusvõrgustikke, mis aitavad nendeni tuua uuendusalasteks tegevusteks vajalikku informatsiooni. Artikkel II analüüsib, kuidas ettevõtjad on kasutanud erinevaid kohalikke ressursse oma innovatsioonitegevustes ja kuidas sellised kohalikel ressurssidel põhinevad tegevused mõjutavad piirkonna arengut. Artikkel III selgitab innovatsiooni ja kohalike ressursside (sh. traditsiooni) vastastikmõju ja keerukaid omavahelisi suhteid ning analüüsib, kuidas see vastastikmõju võib piirkonna arengut suunata.

Analüüsitud ettevõtted ammutavad innovatsiooni jaoks vajalikke teadmisi suhteliselt hajutatud suhetest. Ootuspäraselt on innovatsioonini viivate teadmiste allikatena ülekaalus turupõhised toimijad. Kõige enam toovad tulemusi tugevad proaktiivsed suhted organisatsioonidega, kes paiknevad väljaspool ettevõtjate asukohta. Kohalikke sotsiaalseid suhteid üldiselt ettevõtjad innovatsiooniallikatena ei hinda. Enamik analüüsitud ettevõtjaid arvab, et ka erinevad teadusorganisatsioonid ei ole toonud nende jaoks olulist innovatsioonini viivat infot.

Kui analüüsida, millised kohalikud ressursid ettevõtete innovatsioonitegevustesse panustasid, siis on esindatud kõik viis gruppi: 1) füüsiline ressurss nagu kohalikud maavarad, maastik, hooned, jms.; 2) inimressurss, mis on kohalike inimeste teadmised ja oskused; 3) mittemateriaalne ressurss, mis väljendub piirkonna identiteedis, kultuurilises pärandis ja ajaloolises teadmises; 4) sotsiaalne ja kogukondlik ressurss ehk nii ametlikud kui mitteametlikud kohalikud suhted; ja 5) kohaliku tasandi finantsressurss. Analüüs näitab, et mitme ressursi samaaegne kasutamine kasvatab üldiselt tulemuslikkust. Kuigi kohalikke sotsiaalseid suhteid ei peeta otseselt innovatsiooni jaoks vajaliku teadmise edastamisel oluliseks, siis ei tohi selle ressursi osatähtsust alahinnata. Sotsiaalsel ja kogukondlikul ressursil tundub olevat teistest ressurssidest erinev roll, sest selle abil on võimalik luua juurdepääs teistele ressurssidele, mis panustavad otsesemalt innovatsioonitegevustesse. Traditsioonilised tegevused ja ajalooline teadmine on positiivse lukustumise (Anderson, 2000; Gibson, 2016) näited, mis edendavad innovatsioonialaseid tegevusi ja kohalikku arengut üldiselt. Kuigi mainitud kohalike ressursside kasutamine ei ole kõigi ettevõtete jaoks peamine või ainus innovatsiooniallikas, olid need olulised ja sellel tegevusel on mõju ka kohalike arenguradade kujundamisel.

Traditsioonide kasutamine uuendustes võib nii edendada kui takistada innovatsiooni. Samamoodi on innovatsiooniga seotud tegevustel mõju kohalikele ressurssidele. Innovatsiooni käigus võib kohalikke ressursse võimendada ja väärindada, samas võib kohalikust ressursist lähtunud moderniseerimine hakata olemasolevat ressurssi hävitama. See kõik võib mõjutada piirkonna tulevikku. Käesolev töö ei tuvastanud näiteid, kus kohalike ressursside abil oleks olemasolevat arengurada radikaalselt muudetud või lausa uus rada tekitatud. Pigem lubas kohalike ressursside kasutamine jätkata tegevust olemasolevatel arenguradadel, otsides võimalusi nende radade rikastamiseks. Käesoleva töö kontekstis saab järeldada, et uuendused, mis toetavad kohalikke tugevusi, on jätkusuutlikumad ja toetavad ka piirkonna ettevõtjate mitte-majanduslikke motiive.

Käesolev doktoritöö panustab maapiirkonna innovatsioonialastesse aruteludesse, analüüsides innovatsiooni maapiirkonnas keerukate sotsiaalsete protsesside kaudu. Töö pakub välja mudeli, mis aitab analüüsida ettevõtete teadmusvõrgustikes olevate suhete olemust (aktiivsus ja tugevus) ning kasulikkust innovatsioonile (Artikkel I).

See töö aitab minna kaugemale traditsioonilisest võrgustike analüüsist, mis innovatsiooniuuringutes on territoriaalsetest teooriatest lähtuvalt keskendunud pigem piirkonnasisestele suhetele. Nüüd on kohalike suhete kõrval analüüsi kaasatud ka kogukonna piire ületavaid innovatsiooni panustavaid suhteid (Artikkel I).

Lisaks pakub doktoritöö näiteid, kuidas kohalikud ressursid üksi või mingites kombinatsioonides panustavad maapiirkonna ettevõtete innovatsioonitegevustesse (Artikkel II ja III). Selline kohalike ressursside tähtsustamine vastandub mõnevõrra aglomeratsiooni ja klasterdumise olulisusele kui üldlevinud innovatsioonieeldustele. Töö esitleb mudelit, mis aitab kohalikke ressursse esile tuua (Artikkel II). Innovatsioon maapiirkonnas on mitmetahuline ja kindlasti mittelineaarne protsess, kus kohalikud tingimused mõjutavad innovatsioone ja innovatsioonid omakorda kohalikke ressursse, sh. traditsioone ja piirkonna arenguradasid (Artikkel II ja III). Töös on ära toodud erinevad protsessid (Eesti, Portugali ja India maapiirkondadest), mis demonstreerivad, kuidas innovatsioonid ja traditsioonid võivad üksteist toetada või takistada. Kuigi kultuurilised kontekstid on erinevad, siis kõikides nendes erinevates piirkondades nähti traditsioonide kasutamises võimalusi innovatsioonialast tegevust edendada (Artikkel III). Töö analüüsib võimalusi, kuidas kohalike ressursside toel tekkinud innovatsioonid võivad piirkondade arenguid mõjutada. Seeläbi rõhutab töö innovatsiooniprotsesside keerukust ja mõju vahetutele ja kaugematele toimijatele. Originaalsust lisab tööle kirjandusse näidete toomine Kesk- ja Ida-Euroopast, mis seni on innovatsiooniuuringutes olnud suhteliselt vähe uuritud piirkond (Artikkel I, II ja III).

Lisaks teoreetilisele panusele on sel tööl ka praktiline väärtus, rõhutades innovatsiooniprotsesside komplekssust ja mittelineaarsust. Kasutades innovatsiooniuuringutes peamiselt teadusele ja kõrgtehnoloogiale tuginevaid näitajaid võib jätta olulise hulga innovatsioone ja ettevõtteid tähelepanuta. Oluline on märgata innovatsiooniallikate mitmekesisust, mis omakorda võivad viia erinevate innovatsioonideni. Ka etapiviisilisi arenguid tuleb toetada, andes erinevatele ettevõtetele võrdsemad võimalused, sest teinekord võib sellist innovatsiooni viljelevate ettevõtete väärtus konkreetsete piirkondade arengus olla väga olulise tähtsusega. Lisaks on töös toodud teadmine oluline ka ettevõtete sees innovatsiooniprotsesside lahtimõtestamisel ja erinevate aspektide märkamisel.

Appendix

Article I

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KNOWLEDGE, INNOVATION AND TECHNOLOGY ACROSS BORDERS

Knowledge networks and the nature of knowledge relationships of innovative rural SMEs

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Abstract

Purpose – The purpose of this paper is to develop a framework for analysing the configuration of knowledge networks used by innovative rural small- and medium-sized enterprises, and the nature of the relationships between knowledge transferring actors.

Design/methodology/approach – The research is based on semi-structured interviews with rural innovative entrepreneurs and regional key informants. Social network analysis (SNA) was used to identify configuration of relationships, and content analysis to understand the nature of the knowledge relationships.

Findings – Higher innovation levels are related to proactive and strong relationships with extra-local actors, usually from the international level, mainly from the Baltic Sea region. The actors, who have a greater role in innovation, are special customers, scientific organisations and non-human actors (e.g. trade fairs). Greater variety in proactive relationships helps achieve higher-level innovations. Reactive and weaker relationships tend to be related to lower innovation levels.

Originality/value – This study contributes to the development of rural innovation research practice through the development of a framework for analysing the configuration of knowledge networks and the nature (activity and strength) of relations between actors. Thus, two different dimensions not used together previously are combined and advanced. In addition, in this paper, the relations that go beyond a region's borders are also included, compared to earlier studies, where SNA was commonly used only with reference to relations inside a territory. An example from Central and Eastern Europe supplied to the literature on rural innovation networks is of additional value.

Keywords SME, Estonia, Actors, Central and Eastern Europe, Knowledge network, Rural innovation

Paper type Research paper

1. Introduction

Innovation is not only a process of technological modernisation, but also a social (Asheim and Isaksen, 2002) and collective process (Ozman, 2009) where varied actors and their interactions are connected in networks. The knowledge flows in these networks are among the most important resources (Lundvall, 2007) needed for innovation.

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While innovation theories stress the concentration of actors, proximity and agglomeration (Asheim *et al.*, 2011; Massard and Autant-Bernard, 2015), these are not the usual characteristics of rural areas. On the contrary, rural as a spatial category is often categorised with a number of common attributes, such as few inhabitants and sparsely populated areas, limited local markets, lower R&D intensity (Ward and Brown, 2009), limited access to actors who could provide financial, technological and other types of production input (Asheim *et al.*, 2011), as well as a shortage of knowledge resources (Fink *et al.*, 2013). Although all these aspects add complexity to the rural innovation process, there are, nevertheless, innovative rural small- and medium-sized enterprises (SMEs). This can mean that these rural firms use other mechanisms for compensating for the local constraints.

More than a decade ago, Murdoch (2000) recognised the network paradigm as a new approach for rural regions. Networks can compensate for the lack of local actors (Huggins and Johnston, 2009) and other location-related disadvantages (Dubois, 2013) while creating additional opportunities for enterprises (Jack and Anderson, 2002). However, there is still a limited number of studies about rural innovation and knowledge networks (Hoang and Antoncic, 2003; Jack and Anderson, 2002; Slotte-Kock and Coviello, 2010) and they tend to bring out general tendencies, while the specific features are still not clear (Massard and Autant-Bernard, 2015). The few studies that do exist on rural business networks are based on territorialised innovation theories (Lorentzen, 2008; Bassi *et al.*, 2014; van Hemert *et al.*, 2012). This means that they concentrate on networking within a certain territory, leaving aside the relationships that go beyond the region's borders to the national or international level. However, the extra-local dimension (Young, 2010) and global-local interaction (Copus *et al.*, 2011) need much more attention in the globalising world. In addition, these studies do not specify the nature of the varied connections in the knowledge network and what kind of relations contribute more to innovation.

The aim of the current paper is to develop a framework for analysing the configuration of knowledge networks used by innovative rural SMEs, and the nature of the relationships between knowledge transferring actors in these networks. The study sets out to identify the main actors involved in innovative rural enterprise knowledge networks, describe what kind of relationships exist in this network, and how they contribute to innovation.

Beside the general trends of globalisation, every rural SME and its networking is reliant on its specific diversified context. Therefore, the special qualities of different regional settings have to be considered (Atterton, 2007; Trettin and Welter, 2011). However, current studies seem to concentrate, on the one hand, on networks within rural (and peripheral) areas in highly developed countries (Dubois, 2013; Fink *et al.*, 2013; Hermans *et al.*, 2013) or in contrast, in developing countries such as Bolivia (Clark, 2010) and Ethiopia (Spielman *et al.*, 2010). Rural regions in Eastern European countries have been somewhat neglected (Lasagni, 2012).

In the current study, knowledge networks used by SMEs in a Central and Eastern European rural locality are analysed. This is used as a case study area because it is a predominantly rural region meeting the definition put forth by the OECD (2005), where population density is far below 150 inhabitants km^{-2} and more than half of the population live in rural communities. It is far from agglomerative centres. The data for the study came mainly from semi-structured interviews with different rural enterprises.

This explorative study contributes to the development of research literature in the field of rural innovation, while proposing a framework for analysing the configuration of knowledge networks and the nature of their internal relationships. Thus, the two

different dimensions suggested in previous research are originally combined. Therefore, this framework offers a modernised method for analysing the knowledge networks of rural SMEs, considering in addition, the nature (activity and strength) of the relationships between actors. Furthermore, in this analysis, social network analysis (SNA), which is still relatively under-utilised, especially in the innovation systems approach (Spielman *et al.*, 2010), has been used not only to study inter-regional ties as in many previous studies, but extra-local knowledge connections are also added to the model. Moreover, through this study an example from Central and Eastern Europe is added to the literature on rural innovation networks.

The paper is organised as follows: the next section reviews the literature concerning the actors and the nature of their relationships in the knowledge networks of rural enterprises. The third section describes the methodology. In the fourth part, the results of the analysis are presented, and this is followed by a discussion and conclusions.

2. The literature review

2.1 Actors in the knowledge network

A knowledge network consists of actors who deliver knowledge about something new and useful for enterprises, and linkages between these nodes. There can be a number of different actors in a network, such as firms (e.g. competing rivals or suppliers) and non-firm organisations (e.g. higher education and research organisations, the public sector, financial institutions, trade associations, customers) (Edquis, 2006; van Hemert *et al.*, 2012).

There are not many studies that have analysed input from different actors for innovation in rural SMEs, but our search revealed some. Rural entrepreneurs tend to stress the importance of value chains for innovation (Virkkala, 2007). Customers and suppliers are reported to be the main partners that transport new knowledge to rural enterprises (van Hemert *et al.*, 2011). Public research organisations, and especially university-type organisations, are usually described as central actors in the knowledge-creating role in regional innovation networks (van Hemert *et al.*, 2011; Kauffeld-Monz and Fritsch, 2013). All these findings stress the importance of market-based and formal relations. Conversely, a study of rural enterprises from Scotland provided only limited evidence of networking with competitors-customers and refers to the underdeveloped formal networks and the strength of social networks (Moyes *et al.*, 2012). This contradiction needs further clarification.

Not only are individuals and organisations as collectives important nodes in knowledge networks. Non-human factors (Pugliese, 2001), such as technical aspects and natural resources, also have their role. The external environment, places for public forums such as trade fairs, the internet, media, etc., can create new opportunities and be actors in these networks.

Links between actors have a vital role in knowledge sharing (Jack, 2010). Single relationships between different actors are connected into larger structured systems. These systems are networks where direct and indirect links between actors form varied structures. Therefore, a network presents configuration of human contact (Neumeier, 2012) that help to transfer knowledge.

More than a decade ago, networks as additional opportunities for rural firms (Murdoch, 2000) were introduced in theoretical discussions. They could compensate for the lack of local actors that are needed for innovation. Networks do not offer "the answer" to all problems, but show new opportunities when traditional linear approaches are

re-thought (Murdoch, 2000). Networks should help rural enterprises while, for example, strengthening flexibility and capabilities, offering opportunities of greater size, providing access to resources and mobilising resources (Gronum *et al.*, 2012; Jack, 2010) and compensating for the lack of an appropriate critical mass of organisations in regional knowledge and innovation systems (Huggins and Johnston, 2009).

All these previously mentioned varied actors can come from different geographical levels, as a network is not a spatial concept (Asheim *et al.*, 2011). Especially in rural areas, the innovation networks may extend geographically far (Kalantaridis and Bika, 2011; Murdoch, 2000) because of international suppliers, collaborators and customers who stretch it (Heanue and Jacobson, 2008) beyond borders. The extra-local actors that show much more focused relationships (Young, 2010) can be national as well as global.

Rural networks tie the "inside" and "outside" together (Murdoch, 2000). A (rural) firm can have a competitive advantage when it successfully uses the interplay between the local buzz, what is understood as multi-layered communication inside the local cluster, and contacts at the international level (Bathelt *et al.*, 2004). A successful rural firm is supposed to adjust according to local and global scales (Fløysand and Sjøholt, 2007), and therefore, can increase its business capacity (Young, 2010). However, in rural areas the local buzz tends to be limited because of the lack of actors. All in all, it seems that different innovations are likely related to various knowledge sources (Varis and Littunen, 2010), and the larger heterogeneity of actors (Gronum *et al.*, 2012) and diversity in knowledge transferring mechanisms lead to more radical innovations (Trippl *et al.*, 2009).

Increased awareness about networks as a strategic resource and a special type of network capital (Huggins and Johnston, 2010) can increase economic profits. Whereas limited network capital may cause additional problems, especially when rural firms are trying to establish extra-local connections (Dubois, 2013). In addition, creating and keeping interactions is time and energy consuming (Murdoch, 2000). In other words, this means that especially SMEs have to acknowledge networks as resources, and on the other hand, they have to pay attention to how to utilise this resource in a way that it does not overwhelm their core activities and actually adds value.

A network is a structure of actors and their relationships, where nodes can be linked to others directly or via other actors, or in some parts, structural holes exist in the form of a lack of connections. This kind of positioning of nodes determines the different roles that actors can have. In the context of business-related knowledge transfer, connecting innovation brokering (Hermans *et al.*, 2013) actors should get more attention. Thanks to their more central position, they obtain more varied knowledge and affect its dissemination. These brokering actors can create trust and embeddedness between sub-clusters or different actors (Dubois, 2013). Therefore, they help to minimise the risks connected with the uncertainty of new partners and new knowledge (Lasagni, 2012), and connect actors for knowledge transfer who are not otherwise connected.

Furthermore, managing indirect ties takes fewer resources compared with direct ones. Therefore, it can sometimes be very useful if an actor does not have many connections but is related to a powerful broker actor (Ahuja, 2000), who forwards the knowledge from other actors using indirect connections. Therefore, with the help of brokers, diversified unfamiliar knowledge (Ahuja, 2000), which can be the basis of innovation, especially radical innovation, can be made available. This also means that when these central broking actors are removed from the network, the knowledge flows can reduce and less varied knowledge reaches the actors in the networks.

Networks are important instruments for gaining new knowledge from various actors, and therefore, providing inputs for innovation. However, beside the structure of the network and availability of connections, knowledge transfer is affected by the nature of the relationships between the actors in that network. The enterprises have to be ready to acknowledge new issues and use the potential of an existing network. Therefore, in the next section, the nature of the connections between different actors in the context of innovation relevant knowledge transfer will be elaborated upon.

2.2 Nature of relationships in the knowledge network

In this section, a step forward is taken from the traditional approach to network analyses, and the nature of relationships in the knowledge network is added to the discussion.

The relationships between actors can be classified differently. One way is to divide them according to formality and their relationship to the business. The market-based ties are overall transactional business, buyer-supplier relations, that are often performed in a routinised manner (Bassi *et al.*, 2014). The non-market-based collaboration relationships evolve information exchange and knowledge transfer, collective promotional projects and so on, that are usually not compensated for financially (Dubois, 2013; Heanue and Jacobson, 2008).

The other often used characteristic of ties can be their strength (weak or strong), based on the "amount of time, emotional intensity, intimacy (mutual confiding) and reciprocal services" (Granovetter, 1973, p. 1360). Instead of regularity, Jack (2005) stresses the type of knowledge and usefulness that moves via connections. Based on that, strong ties are therefore strong enough to deal with infrequency, and dense regularity is not the most important factor. Weak ties that do not have a personal element (Jack, 2005) are believed to be more beneficial for innovation, according to the Granovetter concept, as they bring unknown knowledge from different types of actors (Ruef, 2002). However, one can find doubtsuni about that in the literature (Jack, 2005), as it is much harder to understand totally different knowledge.

A prerequisite for implementing innovation is that the general awareness that comes via varied actors has to be converted into firm-specific knowledge (Copus *et al.*, 2008). This, at least partly, is directed from the past (Trettin and Welter, 2011). New knowledge is interpreted through the lens of existing knowledge. According to the literature, rural firms tend to be more engaged with strong ties (Jack, 2005) and social ties (Moyes *et al.*, 2012). Previous contacts and a common background makes it easier to understand the knowledge. It is easier to communicate with partners who are known beforehand and relations with whom are already tested. At the same time, it must be admitted that overly strong direct ties can lead to lock-in effects (Tödtling and Trippl, 2005), which means that actors rely heavily on existing knowledge and do not let different knowledge in. It is meaningful that rural entrepreneurs are not always aware of the threat of over-embeddedness and lock-in (Atterton, 2007), which can refer to their low knowledge about relationship capital.

On the other hand, functionality and the utilisation of ties can be more important than frequency (Jack, 2005). Therefore, it is important to understand activity as a dimension of the relationships in the knowledge networks. Proactive networking represents an intention to establish connections with actors needed for innovation in a planned and deliberate way, compared to reactive relationships that are part of the existing social and business networks and are engaged in an unplanned and ad hoc manner (O'Donnell, 2004). Young (2010) similarly makes a distinction between active

and passive extra-locally oriented businesses. The former deliberately trying to find additional opportunities in larger economic spaces that would otherwise pass them by; the latter using possibilities offered by their regular flows and markets.

Based on the above, relationships between actors in the knowledge network can be presented in a conceptual model (Table I). According to networking activity from the point of view of entrepreneurs and the strength of ties, the relationships can be roughly divided into four types. Reactive relationships are part of the existing social or business networks that are used anyway. Reactive and weak relationships are routine not intensive connections that are rarely used. Reactive but strong ties are part of the existing social or business networks but compared with the previous they are emotional, regular and useful but not purposively initiated. Proactive relationships are characterised by purposeful activity initiated by the rural firm, weak ties are not as intensive and emotional as strong ones.

Furthermore, based on the awareness of problems and possible sources (Maskell, 2014), various strategies can be chosen for obtaining knowledge. This will also affect the activity in networking (O'Donnell, 2004). It is much easier if the problem is well-defined and possible knowledge sources are known. Then a firm can directly turn to the right actor. However, if the problem, sources or both, are not recognised then one possibility is to turn to the wider forums, which are not really personified and can be classified as non-human actors. If a firm knows well what specific knowledge is missing but is not sure about sources of knowledge, it usually turns to the internet; if the problem is also not very clear then a trade fair can be one solution for an entrepreneur to learn (Maskell, 2014).

Many rural firms tend to rely on a small number of relationships (Young, 2010), often only personal ones (Huggins and Johnston, 2010) and other ad hoc informal ties. An inward-looking attitude is reported to be more typical of rural firms (Dubois, 2013). Networking in formal networks is not a general matter for them, but rather an activity that is undertaken if a real need appears (Moyes *et al.*, 2012). The majority of rural SMEs are not capable of or interested in extra-local ties (Young, 2010). Many small firms, which are common to rurality, act in a reactive way; however, under some conditions, purposive and proactive manners also exist (O'Donnell, 2014; Virkkala, 2007). This denotes the risk of not recognising problems or possible sources and not being active in larger innovation networks.

The nature of relationships in the knowledge network has a role in the innovations of rural enterprises. Activity and strength as characteristics of the relationships between actors could influence the usability of the knowledge circulated in these networks. This kind of analysis add another dimension and thus can offer additional opportunities for analysing knowledge networks.

Table I.
Relationships between actors in the knowledge network

	Strength of relationships (ties)	
	Weak	Strong
Networking activity		
Reactive	Rarely used, part of existing networks	Often regular, unplanned, part of existing networks
Proactive	Rarely used, initiated by the rural firm	Emotional, often regular, initiated by the rural actor

Source: Author's compilation

3. Methodology

3.1 Data collection

Due to the objective of the study, qualitative research was chosen, which reveals complex processes to aid understanding the background of connections (Jack, 2010). Non-random purposeful criterion sampling (Patton, 2002) was used to collect interviewees, and representatives of SMEs that were innovative and open to change compared with other firms in the locality were selected. There had to be something novel (at least to the firm) from recent years.

The first list of potential interviewees was compiled with the help of regional key informants, and complemented if other examples were revealed during interviews. The firms in the sample are in manufacturing or offer tourism, health or IT services. There are micro, and SMEs. All owners or managers of these enterprises (E) who were willing to share their experience were interviewed from November 2013 to June 2014. The current paper is mostly based on ten face-to-face interviews that lasted from 50 to 90 min. They were recorded and transcribed. Additional information came from 15 interviews with regional key informants (representatives of local and county governments, business support organisations and the educational sector located in the county).

During the interviews the researchers sought the interviewees' opinions and self-evaluations from the perspective of the specific firm about partners in their knowledge networks and their role in innovation, and the role of the location in innovation.

3.2 Data analysis

SNA was used to reveal the relationships between actors (de Nooy *et al.*, 2005), and to understand the structures in the settings (Stathopoulou *et al.*, 2004). UCINET6 software (Borgatti *et al.*, 2002) was used to analyse the knowledge network. This is a meso-level analysis, where the organisations are nodes in the network. The central (interviewed) actor (*ego*) has a direct connection with another node (*alter*) if an *ego*-actor considered the *alter* to be important for acknowledging innovation relevant knowledge. It is a sum of the *ego*-centric knowledge networks of the interviewed actors. The number of extra-local actors in the figure is not comprehensive, as the same type of non-regional actors are marked with a single node unless the interviewer valued or stressed it somehow specially (e.g. some special types of customers are represented as additional actors beside other customers who are denoted by a single node). This is intentional in order not to overwhelm the figure but to map the types of interactions.

SNA has been criticised because it does not show the motives and understandings of actors (Neumeier, 2012). Therefore, the interviews were additionally analysed using meaning coding and thematic categorisation (Kvale, 2007). Consequently, combining SNA with a business network approach, it is possible to analyse different layers that are often missed in entrepreneurship research (Slotte-Kock and Coviello, 2010). This combination of methods helped to characterise relationships and their relevance for innovation.

Table I provides a framework for the content analysis of the interviews to understand the nature of the knowledge relationships of innovative rural firms. These links with the local as well as national- and international-level actors are classified according to their activity (proactive or reactive) and strength (weak or strong).

The broader understanding of innovation is used in the current paper: Innovation is a process of activities where something novel (at least to the firm) emerges as a result, such as a new or an improved product or service, a new method of production, new market or organisational changes (Brown-Kamn, 1987 cited in Crossing Boundaries, 2013). SMEs are more likely to seek incremental changes, including improvements in

technology, as well as other "better ways of doing things in all aspects of the business" (North and Smallbone, 2000, p. 147). Therefore, in this paper, similarly to some others (Huggins and Johnston, 2009; North and Smallbone, 2000), implemented innovations are classified as high or low level based on the novelty of the change made compared with others in the market. A lower-level innovation is something new to the firm itself, but not original to the industry. By contrast, high-level innovations are changes that are considered more outstanding also in the wider surroundings.

3.3 Limitations

There are some issues that have to be taken into account when drawing conclusions from the research. This study analyses only one Central-Eastern European region; therefore, it is necessary to be cautious when drawing broad conclusions. The importance of the innovation was not measured and the novelty is based on self-assessment. In a small community, the total number of enterprises and the set of innovative firms are not large and many connections may be informal and more hidden from the observer; therefore, some of the types of connections may not be revealed or are exposed in a different way. Consequently, there is a need for further studies in other regional settings.

3.4 Description of the data collection area

The studied firms are situated in Lääne County, Estonia, a small country in Central and Eastern Europe, on the eastern border of the European Union (EU). This rural county is situated on the eastern coast of the Baltic Sea. Compared with national conditions, the county is far from agglomerative centres. There are about 23.8 thousand inhabitants ($10\,km^{-2}$), less than half of them live in the county centre. The region is suffering because of out-migration and ageing, and therefore, its population is decreasing faster than in Estonia as a whole. Additionally, its GDP per capita is 62 per cent of the country's average (Statistics Estonia).

This county is well known for its tourism sector (tertiary sector is 56 per cent of GDP) and the primary sector (currently 9 per cent) has always been relatively unimportant. Physical infrastructure, in other words, the availability of the telecommunication infrastructure (90 per cent of households have the broadband internet connection; Statistics Estonia), roads, electricity, distance to the airport, and institutional framework, is well established, and local entrepreneurs are fairly satisfied with this (EMÜ, 2012).

Therefore, the region is an example of a rural region in a modern society where economic and population characteristics are lagging behind the national average, while the physical infrastructure is well-developed and on par with other Estonian regions and EU countries. Furthermore, it is a small locality with an open economy where fundamental changes in society took place after 1991. Therefore, an analysis of examples of rural innovative enterprise networks in this kind of region can add valuable knowledge to the theoretical discussion.

4. Findings

4.1 Actors in the knowledge network

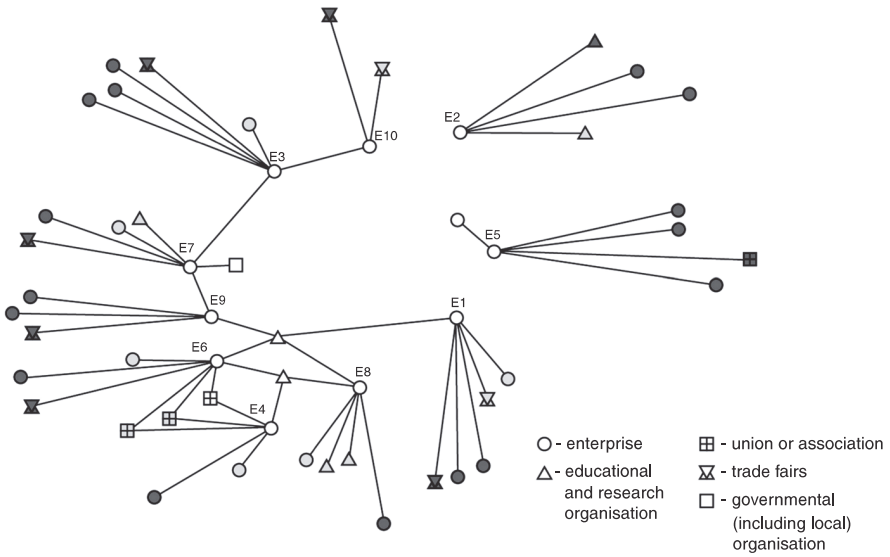
In general, innovative enterprises in the analysed locality acknowledge that innovations have to be part of their everyday life to at least keep their position on the market. The regular renewal of equipment and new technologies for optimising production processes are the most common activities related to product and process

innovation (E1, E7, E8, E10). In addition, a lack of human resources forces enterprises to purchase new production lines and technologies sooner to overcome the shortage of employees and this is mainly expressed as organisational innovations (E3). Several developments occur in production because materials are improved (E5). In the service sector, especially in tourism, enterprises (E4, E6, E9) have introduced marketing innovations (such as videos in YouTube to introduce treatment procedures, highly targeted joint marketing in neighbouring countries to raise awareness of Estonia as a health tourism destination) to sustain and grow their businesses.

Although smaller changes and rather low-level innovations are common in the enterprises of the county, there are also examples of higher-level innovations. For example, sophisticated high-level product innovations (life jackets, E2) have been available due to purposeful activities to sustain a place among other market leaders. These kinds of products have won best product titles in leading markets (e.g. Germany, Holland and Australia). As the owner of the firm admitted, one has to launch something new for every season to succeed on the market and, for longer steps and more radical innovations, high-level scientific input from university-level researchers is needed.

The firms see market-based actors and contacts gained via everyday business activities as the most valuable for transferring knowledge to their innovation-related activities (Figure 1).

One of the most important actors for innovation seems to be the customer. A typical answer from smaller and larger enterprises was that "innovation is based on the needs of customers" (E2). The second group of actors vital to innovation are business partners, such as suppliers, technology or materials providers who bring knowledge about new possibilities. The third largest group of actors important for innovation were competitors.



Notes: The geographical location of actors from Lääne County's viewpoint: the regional (white), national (grey) and international (dark grey) actors
Source: Author's compilation

Figure 1.
Knowledge networks of innovative rural enterprises

When exporting or dealing with foreign clients, one has to look around among international competitors to understand what they are doing.

Although there is a college in the region, most of the interviewed enterprises were not too eager to turn to this or other scientific organisations. They explained they have other needs, which are not in line with the topics covered at the local college, and their limited human resources. The exceptions are larger health and tourism enterprises (E4, E6, E8). They have direct contacts with scientific organisations. Their product and process innovations are related to, among other things, scientifically proven usage of traditional treatments using local natural resources (mud from the nearby seaside). Cooperation with the local college will hopefully help their traditional procedures reach a new level of development. In addition, research-based arguments should also bring more attention and help in marketing.

In addition, the existence of links with scientific partners can be related to the development level of their products. As one of the interviewees, whose firm used to make all innovations in-house, explained:

> Now when the steps are getting bigger, we need help from scientific partners, experts (E2).

Firms seemed to be rather independent and evidence of cooperation at local or national level was rather limited. This was explained by the low number of similar enterprises and a lack of (especially human) resources. The use of mediators, such as unions or other organisations for communicating with international actors, was not common. Only in the tourism sector did mediators seem to be important. There are some local and national organisations that are vital for innovation, at least for some tourism firms (E4, E6). They acknowledge common activities with the help of mediators in marketing, cooperation with scientific organisations and obtaining knowledge about international-level actors (competitors, technology providers, suppliers, etc.). On the other hand, one tourism micro-entrepreneur was an example of a business with limited resources; above all, it needed to consider its own needs and make corrections in networking if needed:

> I was in a couple of [unions], but I quit. […] At the beginning, you need experience and I was very active. […] But at one point, the ceiling was ahead […] And I didn't have time anymore, either (E9).

Most of the actors in these knowledge networks are now reaching the extra-local level, usually the international level, skipping the national. On the other hand, international-level networks are not very widespread, but are mainly focused on the Baltic Sea region. Although there are a number of regional organisations that are responsible for the development of the county's entrepreneurship environment, and should therefore have some role in the entrepreneurship environment and innovation, usually the interviewed firms did not consider them as part of their innovation networks. These local organisations could be needed by small starting firms, as it is much easier to turn to the local, more familiar organisations. However, if an enterprise has developed to a certain level, then more financial input as well as sophisticated know-how is needed, and this usually exceeds the competence as well as the resources of the local organisations. To be a successful enterprise in this country, one has to think globally and focus on export markets. And this means that despite locality you have to turn to the actor you need. Knowledge about possible sources could be the first stumbling block.

E7 and E6 are examples of more central brokering actors in this network. They use local-level knowledge in their innovation-related activities more than the other interviewed firms, and can therefore transfer the knowledge obtained to other local

firms, too. For example, E7 uses the rural environment and difficulties of the locality (such as wet land and forest, a sparse population, few internet service providers and quality problems) to foster innovation. This has led to opportunities and the need to develop high-level innovations concerning the internet and TV service provision with the help of radio connections and radio masts. In addition, problems linked to rurality have created opportunities for one firm while providing a wide range of services for varied locals (private persons, municipalities, firms, etc.). In contrast, E2 and E5 represent enterprises that seem to have no knowledge connections with other regional actors and whose connections with other local actors seem to be highly limited.

Furthermore, E7 stretches the regional network in two ways. First, it gathers knowledge about new technologies mostly from the international level. Second, after inventing and testing solutions among local customers, they sell the innovations to customers in other Estonian regions and neighbouring Nordic countries where similar conditions exist. E6 is a member of the health, spa and tourism sub-networks or clusters. Therefore, this node links these clusters with the other regional actors (especially small tourism companies and other service providers) who would not otherwise be connected. With the help of the local college, this actor is transferring knowledge about novel business ideas using scientific research results.

4.2 Nature of relationships in the knowledge network

It is crucial to further elaborate on the nature of the relationships between knowledge transferring actors. In what follows, the types of relationships are analysed according to their activity and strength considering their effect on innovation. Table II summarises these ties between the actors of the current knowledge network from the point of view of the rural actors interviewed. As already noted, most of the changes are rather low level, incremental innovations. However, it was also possible to find examples of more rapid

Network actor	Activity	Strength	Locality	Type of innovation
Market based				
Customer	Reactive	Strong	National/international	Low
Special customer	Proactive	Strong	Local/international	High
Supplier	Reactive	No information	National/international	Low
Non-market based				
Other business (e.g. competitors)	Reactive	No information	Local/national/international	
Supportive organisation	Proactive	Weak	Local/national	Low
Union of firms (only in certain sectors)	Proactive	Strong	Local/national	Low
Scientific organisation	Proactive/ reactive	Strong/ weak	Local/national/international	High
Non-human				
Trade fair	Proactive	Strong/ weak	International	High
Internet	Proactive	Weak	National/international	Low

Source: Author's compilation

Table II. Nature of relationships of rural enterprises in the knowledge network

improvements that deliver greater changes and are more remarkable compared with the general standard in this locality, and these are classified here as higher-level innovations.

The market-based actors, such as customers and suppliers from the national and international level, were reported to be among the main actors who provide input for further innovation. Not all customers are equally significant. Most of them are linked to low-level innovations and step-by-step improvements. However, some special clients strongly guide the direction of the higher level technical as well as organisational innovations. The rural firms tend to have proactive and strong relationships with these special actors.

For example, a larger advanced international-level business client affects the innovation activities of E3 a lot. To be a subcontractor of a firm that produces high-level products means that this firm also has to adhere to the standards and quality control procedures equal to others and implement more radical innovations if the entire product is introducing changes. In addition, for example, the special clients of E2 are professional sportsmen who are using their products 24/7. This kind of intensive testing can give valuable feedback and detailed input for further improvements quicker than any other group of customers. The higher-level innovations of these two firms (E2 and E3) are not dependent on local actors.

By contrast, E7 described how the special conditions of that county caused specific problems for the customers, which had to be solved via new solutions and technology. These obstacles pushed them to further technical innovations, which turned out to be a useful business model for selling their products also in neighbouring countries. These kinds of actors seem to have a great contribution to higher-level innovations.

The relationships with ordinary clients seem to be more often reactive and weaker than with special clients. This reactivity can be characterised by the following statement: "Our client is innovating its products, and we have to change and engage in product development" (E5).

Step-by-step improvements to meet the new needs are common among these enterprises. The special example of a strong relationship was presented by E4, who explained how they have thoroughly studied their visitors with the help of sociologists and, based on their expectations, made changes.

The ties with suppliers seemed to be reactive and weak, and the amount of evidence found of innovations directly obtaining input from suppliers was lower. E1 presented an attitude that often appeared while mentioning that "if you are a larger firm in the region" (even though in absolute categories it is still a small- or medium-sized firm), "and want to buy something, as soon as technology providers hear this, they come knocking at our door". Acting in rural areas does not seem to be a problem in terms of getting knowledge from suppliers. In such a small market like Estonia, every client and purchase is important. Offers usually come via the internet and e-mails, and the bigger problem is how to decide which is useful and needed and what should be rejected.

Based on the evidence found, the non-market actors can be diversified a great deal according to their effect on innovation. The few ties with other businesses (e.g. competitors) were usually reactive and weak. Exporting firms have to know what is happening on the international market but here the limited workforce can create some obstacles to observing the activities of others.

The importance of supporting organisations that can finance innovation-related activities cannot be underestimated. Although this donor-recipient relationship does not usually transfer innovation-related knowledge directly, it is a means for providing additional resources for contacting other actors in the network and obtaining

supplementary knowledge. The support for marketing, product and process innovations helped these firms get many steps ahead of some competitors. In addition, this is intellectual support that can be very valuable:

> Start-up capital is a sign that someone else also believes in our idea (E10).

This relationship is proactive, definitely initiated by firms, as one has to apply for the funds but it is usually weak, as special emotions do not prevail, although in some cases, the support can be given on a rather regular basis.

Unions of firms as mediators play a major role in innovation in the tourism and spa sector but this was not evident for other firms. These existing links tended to be proactive and strong with unions at local and national level. Many examples of marketing innovations were mentioned during the interviews:

> Our marketing is highly specialised. The main marketing is done via the Estonian Spa Association and Health Tourism Cluster (E4).

Another important issue, where the union for tourism and spas was reported to play an important role in acquiring new knowledge, was joint visits at the international level to see other firms and participate in trade fairs.

Only a limited number of the firms interviewed had relationships with scientific organisations that are relevant in terms of innovation. These ties were proactive as well as reactive, and similarly, it is not possible to state weather stronger or weaker relations are more typical. A production company proactively turned to national and international research organisations when they needed to take a larger step in product development; they had had no contact earlier. The local tourism and spa organisations are more connected with the local college because of their common interests – research. The spa enterprises have great expectations regarding the research in order to use the findings in marketing as well as in service development. The position of an official partner of the competence centre "will hopefully bring an opportunity to be the first one to use new solutions" (E4) that are developed and tested at the local college. This will hopefully lead to innovations and revenues in the future.

From the college's perspective, they also feel the problems of not understanding each other's needs and problems in communication: "Inclusion of entrepreneurs; this is the hardest part; we do not have proper skills for that" (U4).

In addition to concrete organisational actors, non-human actors such as trade fairs and the internet seemed to have a much greater role than expected based on previous studies. Both of these represent proactive national- and international-level relationships. There were a number of examples proving that visits to highly specialised trade fairs play a highly valued role in the knowledge networks of smaller firms. For example, E3 and E7 brought this up as a systematic activity pursued basically since the founding of the company.

In addition, many actors mentioned the internet and Google search as the primary and most convenient means of finding possible solutions and technologies:

> Knowledge is just one mouse click away from us (E1); Google always helps (E6).

ICT enables the actors to contact everybody in the world, and the use of e-mails, Skype and internet search opportunities and digital technologies in production is believed to already be so widespread and ordinary that the interviewees did not want to go into the details:

> This is so common today that it is not innovation anymore (E3).

The interviewees said that they use the internet regularly to get (first) knowledge from international sources. However, they also admitted that only relying on ICT is not a solution. Personal contacts remain important, but this is an additional means to save costs and be in contact despite geographical distances.

To visualise and summarise the discussion, the knowledge network is modified so that only the proactive ties of rural enterprises remain in Figure 2.

Contrary to the health and tourism sector, the other firms are mostly proactive towards some specific international-level actors. The figure also clearly visualises the rather limited variety of links the reasons for which could be the limited resources of rural small- and medium-sized firms (including time and personnel resources).

5. Discussion

Analysing the configuration of the knowledge network of rural innovative SMEs in this Central-Eastern European locality in Estonia, the research ascertained that both firm and non-firm actors are part of these knowledge networks, and the firms use both market-based and non-market-based relations to acquire new knowledge needed for innovation. However, the business-related actors and market-based relations are considered to be the most vital concerning knowledge leading to innovations. Most of the firms obtain input from customers, but the evidence related to suppliers and competitors remains weaker. The importance of the science sector and mediators was contradictory. Most of the firms see these organisations contributing nothing to their innovations, but there were some SMEs that valued these actors more. Nevertheless, it must be admitted that the variety of the different types of *alter* actors revealed is modest.

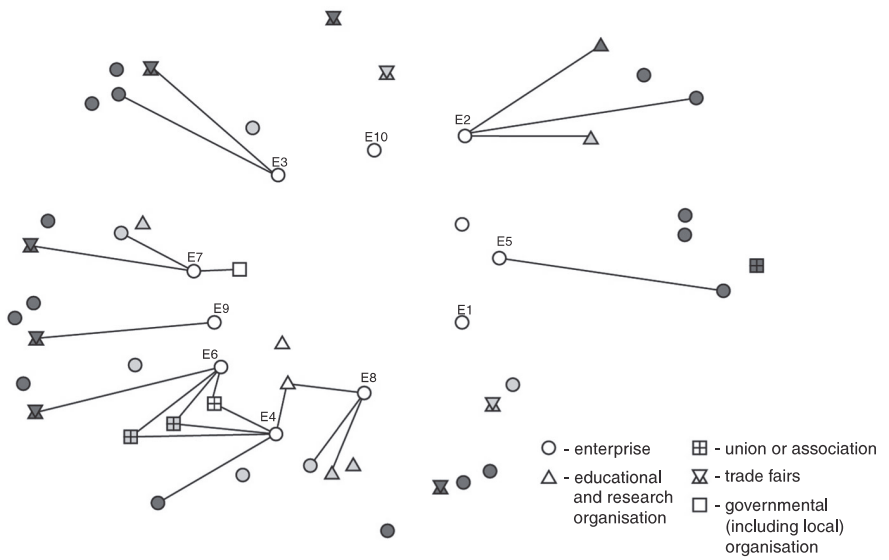


Figure 2.
Proactive relationships in the knowledge networks of innovative rural enterprises

Notes: The geographical location of actors from Lääne County's viewpoint: the regional (white), national (grey) and international (dark grey) actors
Source: Author's compilation

Therefore, in general, the importance of market-based actors is similar to the results of Dubois (2013), North and Smallbone (2000) and Virkkala (2007) and contrary to the results of Moyes *et al.* (2012), whose study revealed the importance of social networks. However, the modest position of scientific organisations is different compared, for example, to the Finnish case (Virkkala, 2007). The low impact of local social networks might be due to a lack of local buzz (Bathelt *et al.*, 2004). Limited contact with scientific organisations could be related to the different types and lower levels of innovations in the studied firms, as certain development levels and previous knowledge helps to interpret new knowledge and seems to be prerequisites for using the knowledge of the scientific actors.

The location of these SMEs does not seem to hinder their links to sources of knowledge. Most of their *alter* actors are extra-local, forming global pipelines (Bathelt *et al.*, 2004). These firms often skip the national level, and seem to be highly oriented towards international knowledge. Therefore, it is possible to compensate for the lack of local actors. Probably also due to the smallness of the country, innovative enterprises have to be export-oriented and sell their products and services on larger markets, and therefore, also have more direct international contacts. Although these firms tend to be highly oriented towards international knowledge sources, these contacts tend to be geographically rather limited, stretching mostly only to neighbouring countries.

Firms in the more central position in these networks have additional possibilities for innovation. They have access to wider sources of knowledge via indirect links. The example of a broker shows how a central actor can acquire knowledge about the problems of different rural actors (people, firms as well as public and other organisations), combine different types of international knowledge in the locality to solve the problems, and then come up with higher level innovations.

Analysing the nature of the relationships with different actors takes us a step further from previous studies and shows that proactive and strong relationships with extra-local *alter* actors, usually from the international level, lead to higher level innovations. Relationships with special clients, especially proactive ones, seem to be highly beneficial in innovation processes while giving more detailed and useful input for service or product development. Although only a limited number of the firms studied had relationships with scientific organisations and other higher educational units, one can state that strong proactive links with these actors are likely to be expressed in higher-level innovations. The examples show that all level scientific organisations (from local to international) can provide some novel knowledge to the rural firms. No evidence was found that reactive and weak relationships with scientific organisations are linked to higher-level innovations.

However, the reactive and weak relationships still help firms to be more open to future opportunities. If there are no relationships beforehand, and human resources are as limited as they are in these rural firms, they do not have the people or time for constant systematic searches in order to be ready to notice opportunities either. Considering the existing local educational organisations in this area, personal social networks might help in recognising opportunities, but being totally distant, it is highly unlikely that something comes to you if you are not looking for it at all.

The analysis revealed the relatively high value of non-human actors and the valued relations with them. This study found examples of traditional behaviour where the interviewees went to fairs to look around, discover issues, new and sometimes unexpected customers, solutions or suppliers. This is similar to Maskell (2014), who classified trade fairs as places for looking for knowledge if the problem and possible

sources are unknown. However, at least for the rural firms analysed here, it does not have to be so simple. These wider forums can have additional meaning for them. They can be places for acquiring systematic knowledge in a time-saving and cost-effective way. Therefore, they are wider arenas and non-human actors for personal networking with foreign actors belonging to their existing network partners as well as potential new partners. Proactive behaviour with this kind of non-human actor also seems to be needed for greater input in innovation.

6. Conclusion

The current research focuses on the configuration of knowledge networks used by innovative rural SMEs and the nature of the relationships in these networks and their special role for innovation. Rural SMEs in particular face contradictory effects from these networks because the local actors needed for innovation are usually highly limited, but they can also stretch their networks beyond their locality, and therefore, widen the number of knowledge sources. Knowledge flows depend on the overall existence of relationships, but the nature of these connections also shape their value for innovation. Therefore, in this paper the configuration of knowledge networks and the nature of the relationships in these networks as two dimensions are combined in a novel way. This combination allowed to propose a framework for analysing knowledge networks of innovative SMEs. The study in a concrete rural setting based on this framework allows us to draw conclusions and make contributions to the existing body of knowledge.

This research shows that higher-level innovations tend to be connected with proactive and strong relationships with preferably international actors such as customers, scientific organisations and non-human actors such as trade fairs. However, most of the studied SMEs said that customers and other market-based actors are the main knowledge providers needed for their innovations and not so much the scientific or intermediary organisations. A greater variety in proactive relationships also helps to achieve higher-level innovations. This study also illustrates well the heterogeneity of knowledge networks of rural innovative SMEs, which are not always deliberately designed, but rather emerge over time incorporating an existing small number of market-based contacts. Limited resources, including labour resources, could be one reason for the narrow set of direct connections between *alter* actors. However, this reliance on a small number and well-known business partners contains a lock-in threat and may inhibit more radical innovation and new partnerships.

The current explorative study contributes to the small volume of research practice focusing on rural innovation networks by proposing a framework for analysing knowledge networks in two dimensions and adding a new territorial setting – a locality in Central-Eastern Europe – to the literature. In addition, this research shows that SNA in combination with content analysis is a useful tool in analysing knowledge networks. Therefore, this abovementioned novel combination of methods provides opportunities not only to explore the configuration of knowledge networks, but also to evaluate the nature (activity and strength) of relationships in this network and thus provides additional possibilities for analysing knowledge flows. While considering that knowledge networks used by rural innovative firms can be stretched far beyond their locality, this study used SNA to not only study inter-regional networks as has traditionally existed in innovation studies, but also considered the extra-local relationships.

Furthermore, these results offer some useful insights for policy makers. They indicate the need to reconsider and add some instruments to the toolbox of regional

development programmes. As the same solutions do not fit everywhere (Tödtling and Trippl, 2005) or for everyone, specific locational factors, including limited resources (not only financial ones), and other peculiarities of small firms, have to be considered. Additional aspects that could be discussed further by politicians could be the possibility to help SMEs find contacts with scientific organisations and broaden the overall variety of their extra-local proactive contacts. For example, sometimes a push is needed to create personal contacts that could help overcome the barriers to building knowledge connections with unfamiliar actors, which seem to be one of the reasons for the lack of contacts.

It can be concluded that in a globalising world where communication is increasingly accessible, network capital needs to be understood better by entrepreneurs in localities where resources and local actors are limited. The current paper has set out to contribute to knowledge about the potential and limitations of network capital considering the peculiarities of rural SMEs and their relationships in networks.

The study also raised questions that should attract further attention in future. The nature of relationships – activity and strength – as dimensions of factors influencing innovation need to be tested in different regional settings. Granovetter's widely referenced concept highlights that weak ties are more beneficial for radical innovation (Ruef, 2002), but not all studies support this (Jack, 2005) and stress strong relationships more. The latter also applies to the current study, where reactive and weaker relationships tend to be related with lower innovation levels. This does not mean that weak ties are unimportant, but their role in knowledge networks should be studied at greater depth in future. Non-human actors, wider forums like trade fairs, the internet and so on, are topics that have not been overly elaborated, but seem to have a special role for rural SMEs.

References

Ahuja, G. (2000), "Collaboration networks, structural holes, and innovation: a longitudinal study", *Administrative Science Quarterly*, Vol. 45 No. 3, pp. 425-455.

Asheim, B.T. and Isaksen, A. (2002), "Regional innovation systems: the integration of local 'sticky' and global 'ubiquitous' knowledge", *Journal of Technology Transfer*, Vol. 27 No. 1, pp. 77-86.

Asheim, B.T., Smith, H.L. and Oughton, C. (2011), "Regional innovation systems: theory, empirics and policy", *Regional Studies*, Vol. 45 No. 7, pp. 875-891.

Atterton, J. (2007), "The 'strength of weak ties': social networking by business owners in the highlands and Islands of Scotland", *Sociologia Ruralis*, Vol. 47 No. 3, pp. 228-245.

Bassi, I., Zaccarin, S. and De Stefano, D. (2014), "Rural inter-firm networks as basis for multifunctional local system development: evidence from an Italian alpine area", *Land Use Policy*, Vol. 38 No. 1, pp. 70-79.

Bathelt, H., Malmberg, A. and Maskell, P. (2004), "Clusters and knowledge: local buzz, global pipelines and the process of knowledge creation", *Progress in Human Geography*, Vol. 28 No. 1, pp. 31-56.

Borgatti, S.P., Everett, M.G. and Freeman, L.C. (2002), *Ucinet 6 for Windows: Software for Social Network Analysis*, Analytic Technologies, Harvard, MA.

Clark, L. (2010), "Seeing the social capital in agricultural innovation systems: using SNA to visualise bonding and bridging ties in rural communities", *Knowledge Management for Development Journal*, Vol. 6 No. 3, pp. 206-218.

Copus, A., Dubois, A. and Hedström, M. (2011), "Expanding horizons: local embeddedness and local engagement among small firms in the European countryside", *European Countryside*, Vol. 3 No. 3, pp. 164-182.

Copus, A., Skuras, D. and Tsegenidi, K. (2008), "Innovation and peripherality: an empirical comparative study of SMEs in six European Union member countries", *Economic Geography*, Vol. 84 No. 1, pp. 51-82.

Crossing Boundaries (2013), "Knowledge, technology and innovation flows across national boundaries: developing a research agenda", No. 13-1, Crossing Boundaries, Tallinn.

de Nooy, W., Mrvar, A. and Batagelj, V. (2005), *Exploratory Social Network Analyses with Pajek*, Cambridge University Press, Cambridge.

Dubois, A. (2013), *Managing Distance. Small Firm Networks at the Geographic Margins*, Stockholm University, Stockholm.

Edquis, C. (2006), "Systems of innovation: perspectives and challenges", in Fagerberg, J., Mowery, D.C. and Nelson, R. (Eds), *The Oxford Handbook of Innovation*, Oxford University Press, Oxford, pp. 181-208.

EMÜ (2012), *Maapiirkonna ettevõtluse arenguvajadused ja -takistused Läänemaal ja Valgamaal*, EMÜ, Tartu.

Fink, M., Lang, R. and Harms, R. (2013), "Local responses to global technological change – contrasting restructuring practices in two rural communities in Austria", *Technological Forecasting and Social Change*, Vol. 80 No. 2, pp. 243-252.

Fløysand, A. and Sjøholt, P. (2007), "Rural development and embeddedness: the importance of human relations for industrial restructuring in rural areas", *Sociologia Ruralis*, Vol. 47 No. 3, pp. 205-227.

Granovetter, M.S. (1973), "The strength of weak ties", *American Journal of Sociology*, Vol. 78 No. 6, pp. 1360-1380.

Gronum, S., Verreynne, M. and Kastelle, T. (2012), "The role of networks in small and medium-sized enterprise innovation and firm performance", *Journal of Small Business Management*, Vol. 50 No. 2, pp. 257-282.

Heanue, K.P. and Jacobson, D. (2008), "Embeddedness and innovation in low and medium technology rural enterprises", *Irish Geography*, Vol. 41 No. 1, pp. 113-137.

Hermans, F., Stuiver, M., Beers, P.J. and Kok, K. (2013), "The distribution of roles and functions for upscaling and outscaling innovations in agricultural innovation systems", *Agricultural Systems*, Vol. 115 No. 1, pp. 117-128.

Hoang, H. and Antoncic, B. (2003), "Network-based research in entrepreneurship", *Journal of Business Venturing*, Vol. 18 No. 2, pp. 165-187.

Huggins, R. and Johnston, A. (2009), "Knowledge networks in an uncompetitive region: SME innovation and growth", *Growth and Change*, Vol. 40 No. 2, pp. 227-259.

Huggins, R. and Johnston, A. (2010), "Knowledge flow across inter-firm networks: the influence of network resources, spatial proximity, and firm size", *Entrepreneurship and Regional Development*, Vol. 22 No. 5, pp. 457-484.

Jack, S.L. (2005), "The role, use and activation of strong and weak network ties: a qualitative analysis", *Journal of Management Studies*, Vol. 42 No. 6, pp. 1233-1258.

Jack, S.L. (2010), "Approaches to studying networks: implications and outcomes", *Journal of Business Venturing*, Vol. 25 No. 1, pp. 120-137.

Jack, S.L. and Anderson, A.R. (2002), "The effects of embeddedness on the entrepreneurial process", *Journal of Business Venturing*, Vol. 17 No. 5, pp. 467-487.

Kalantaridis, C. and Bika, Z. (2011), "Entrepreneurial origin and the configuration of innovation in rural areas: the case of Cumbria, North West England", *Environment and Planning A*, Vol. 43 No. 4, pp. 866-884.

Kauffeld-Monz, M. and Fritsch, M. (2013), "Who are the knowledge brokers in regional systems of innovation? A multi-actor network analysis", *Regional Studies*, Vol. 47 No. 5, pp. 669-685.

Kvale, S. (2007), *Doing Interviews*, Sage Publications, Los Angeles, CA.

Lasagni, A. (2012), "How can external relationships enhance innovation in SMEs? New evidence for Europe", *Journal of Small Business Management*, Vol. 50 No. 2, pp. 310-339.

Lorentzen, A. (2008), "Knowledge networks in local and global space", *Entrepreneurship & Regional Development*, Vol. 20 No. 6, pp. 533-545.

Lundvall, P. (2007), "National innovation systems – analytical concept and development tool", *Industry & Innovation*, Vol. 14 No. 1, pp. 95-119.

Maskell, P. (2014), "Accessing remote knowledge – the roles of trade fairs, pipelines, crowdsourcing and listening posts", *Journal of Economic Geography*, Vol. 14 No. 5, pp. 883-902.

Massard, N. and Autant-Bernard, C. (2015), "Editorial: geography of innovation: new trends and implications for public policy renewal", *Regional Studies*, Vol. 49 No. 11, pp. 1767-1771.

Moyes, D., Whittam, G. and Ferri, P. (2012), "A conceptualisation of the relationship capital of rural small service firms", *Local Economy*, Vol. 27 No. 2, pp. 136-151.

Murdoch, J. (2000), "Networks – a new paradigm of rural development?", *Journal of Rural Studies*, Vol. 16 No. 4, pp. 407-419.

Neumeier, S. (2012), "Why do social innovations in rural development matter and should they be considered more seriously in rural development research? Proposal for a stronger focus on social innovations in rural development research", *Sociologia Ruralis*, Vol. 52 No. 1, pp. 48-69.

North, D. and Smallbone, D. (2000), "The innovativeness and growth of rural SMEs during the 1990s", *Regional Studies*, Vol. 34 No. 2, pp. 145-157.

O'Donnell, A. (2004), "The nature of networking in small firms", *Qualitative Market Research: An International Journal*, Vol. 7 No. 3, pp. 206-217.

O'Donnell, A. (2014), "The contribution of networking to small firm marketing", *Journal of Small Business Management*, Vol. 52 No. 1, pp. 164-187.

OECD (2005), "OECD regions at a glance", available at: www.oecd.org/gov/regions-at-a-glance.htm (accessed 24 March 2015).

Ozman, M. (2009), "Inter-firm networks and innovation: a survey of literature", *Economics of Innovation and New Technology*, Vol. 18 No. 1, pp. 39-67.

Patton, M.Q. (2002), *Qualitative Research & Evaluation Methods*, Sage Publications, Thousand Oaks, CA.

Pugliese, P. (2001), "Organic farming and sustainable rural development: a multifaceted and promising convergence", *Sociologia Ruralis*, Vol. 41 No. 1, pp. 112-130.

Ruef, M. (2002), "Strong ties, weak ties and islands: structural and cultural predictors of organizational innovation", *Industrial and Corporate Change*, Vol. 11 No. 3, pp. 427-449.

Slotte-Kock, S. and Coviello, N. (2010), "Entrepreneurship research on network processes: a review and ways forward", *Entrepreneurship Theory and Practice*, Vol. 34 No. 1, pp. 31-57.

Spielman, D.J., Davis, K., Negash, M. and Ayele, G. (2010), "Rural innovation systems and networks: findings from a study of Ethiopian smallholders", *Agriculture and Human Values*, Vol. 28 No. 2, pp. 195-212.

Stathopoulou, S., Psaltopoulos, D. and Skuras, D. (2004), "Rural entrepreneurship in Europe: a research framework and agenda", *International Journal of Entrepreneurial Behaviour & Research*, Vol. 10 No. 6, pp. 404-425.

Tödtling, F. and Trippl, M. (2005), "One size fits all?", *Research Policy*, Vol. 34 No. 8, pp. 1203-1219.

Trettin, L. and Welter, F. (2011), "Challenges for spatially oriented entrepreneurship research", *Entrepreneurship & Regional Development*, Vol. 23 Nos 7-8, pp. 575-602.

Trippl, M., Toedtling, F. and Lengauer, L. (2009), "Knowledge sourcing beyond buzz and pipelines: evidence from the vienna software sector", *Economic Geography*, Vol. 85 No. 4, pp. 443-462.

van Hemert, P., Masurel, E. and Nijkamp, P. (2011), "The role of knowledge sources of SMEs for innovation perception and regional innovation policy", *Regional Science Policy & Practice*, Vol. 3 No. 3, pp. 163-179.

van Hemert, P., Nijkamp, P. and Masurel, E. (2012), "From innovation to commercialization through networks and agglomerations: analysis of sources of innovation, innovation capabilities and performance of Dutch SMEs", *The Annals of Regional Science*, Vol. 50 No. 2, pp. 425-452.

Varis, M. and Littunen, H. (2010), "Types of innovation, sources of information and performance in entrepreneurial SMEs", *European Journal of Innovation Management*, Vol. 13 No. 2, pp. 128-154.

Virkkala, S. (2007), "Innovation and networking in peripheral areas – a case study of emergence and change in rural manufacturing", *European Planning Studies*, Vol. 15 No. 4, pp. 511-529.

Ward, N. and Brown, D.L. (2009), "Placing the rural in regional development", *Regional Studies*, Vol. 43 No. 10, pp. 1237-1244.

Young, N. (2010), "Business networks, collaboration and embeddedness in local and extra-local spaces: the case of Port Hardy, Canada", *Sociologia Ruralis*, Vol. 50 No. 4, pp. 392-408.

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Article II

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How local resources shape innovation and path development in rural regions. Insights from rural Estonia

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Abstract

This paper examines the role of local resources (physical, human, immaterial, social and community, and financial) in shaping firm innovation and path development in rural areas. Existing research in spatially informed innovation studies has largely overlooked the place-specific resources of rural regions as innovation facilitating qualities. This paper addresses the following research questions: (i) what is the role of local rural resources in a firm's innovation activities, and (ii) how do these resources shape regional development paths? We propose a framework that takes a holistic view of rural resources and their role in shaping innovation and regional development paths. The empirical analyses suggest that rural resources offer valuable and diverse opportunities for firm innovation, providing that firms (pro-)actively mobilize and purposefully exploit these resources as part of their innovation endeavors. We find that rural resources have the potential to extend and upgrade regional development paths and operate as ingredients to enrich existing paths with additional functions and, thereby, to make them more future-oriented. However, merely relying on rural resources does not suffice to facilitate substantial changes in regional paths. Our analyses are based on semi-structured interviews with representatives of firms located in rural Estonia, active in different manufacturing and service industries. This paper contributes to the emerging, but still fragmented, literature on rural innovation and offers a contextually grounded micro-level framework on the role of local rural resources for firm innovation in rural areas. Furthermore, the study adds an empirical contribution from a rarely studied Central and Eastern European regional context.

Keywords: *local resources, rural regions, innovation, development path, resources, Estonia*

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INTRODUCTION

A central assumption in economic geography is that innovation is largely influenced by local and regional conditions (Isaksen & Karlsen, 2016; Müller & Korsgaard, 2018). While firm innovation is generally assigned a key function in regional development (Torre & Wallet, 2016), the discourse on innovation and space can be linked to a distinct urban bias in both theoretical and empirical accounts (Shearmur, 2017; Solesvik & Gulbrandsen, 2014; Torre, 2015). As urban qualities such as density, proximity and diversity support interactive processes of knowledge creation and diffusion, city regions are widely considered the centers of the innovation machine (Florida, Adler, & Mellander, 2017). Consequently, the innovation capacities of rural and peripheral regions, as well as their actors, remain substantially understated (Eder, 2019; Graffenberger & Vonnahme, 2019).

In this paper, we define innovation as an interactive process which results in products or processes that are at least new on the firm level (OECD/ Eurostat, 2005). Due to prevailing high-tech perceptions of innovation (Hansen & Winther, 2011), specific qualities of rural regions, such as historically embedded knowledge and physical or social resources (Ring, Peredo, & Chrisman, 2010; Spyridakis & Dima, 2016; Stathopoulou, Psaltopoulos, & Skuras, 2004), are commonly considered irrelevant and, consequently, largely neglected in theoretical debates and empirical studies. However, it is increasingly stressed that rural regions and their distinct physical, social and economic milieus can act as productive environments for innovation and entrepreneurship (Fitjar & Rodríguez-Pose, 2011; Korsgaard, Ferguson, & Gaddefors, 2015; Mayer & Baumgartner, 2014). Notwithstanding, the extent to which local resources in rural regions facilitate innovation and how firms exploit these resources and shape regional trajectories have so far received only minor attention (Eder & Trippl, 2019; Pylak, 2015; Shearmur, Carrincazeaux, & Doloreux, 2016). By applying a holistic view on the role of rural resources in firm innovation, this paper addresses these gaps.

Evolutionary perspectives suggest that regional industrial trajectories follow path-dependent developments, i.e., present and future economic action is directed by past activities, contexts, and events (Martin & Sunley, 2006). Path development processes operate along a continuum ranging from rather continuity-driven and incremental developments to considerable change and novelty (Garud & Karnøe, 2001; Grillitsch, Asheim, & Trippl, 2018; Isaksen, Jakobsen, Njøs, & Normann, 2019). Consequently, current exploitation practices of resources in rural (and urban) regions have partly been shaped by past economic cycles. In turn, local resources, as determinants of firm innovation, directly and indirectly condition future paths. Nevertheless, path development

does not constitute a fully deterministic process but points to an open-ended nature (Martin & Sunley, 2006), highlighting the importance of agency (Huggins & Thompson, 2019; Isaksen et al., 2019; Sotarauta & Suvinen, 2018).

Agency, broadly defined as the capacity to do certain things (and not others) to produce particular effects (Emirbayer & Mische, 1998; Garud, Kumaraswamy, & Karnøe, 2010; Sotarauta & Suvinen, 2018), can be understood as a process through which opportunities are consciously recognized, mobilized and exploited (Garud, Kumaraswamy, & Karnøe, 2010; Huggins & Thompson, 2019). In rural regions, such opportunities might relate to specific endowments with physical, human, social, and immaterial resources. A common message from different agency conceptions is that it operates as an essential enabler for regional development (Grillitsch & Sotarauta, 2018; Huggins & Thompson, 2019). In particular, it has been argued that its facilitating function is potentially more significant in rural than in institutionally thick regions (Isaksen et al., 2019; Plüschke-Altof & Grootens, 2019). In this paper, the notion of agency is used as a lens that allows one to understand more comprehensively how firms construct and exploit local resources.

Along these lines, this paper aims at providing contextually grounded micro-level understandings on the use of local rural resources for innovation. It addresses the following research questions: (i) what is the role of local rural resources in a firm's innovation activities, and (ii) how do these resources shape regional development paths? Our results suggest that rural resources provide valuable and diverse opportunities for firm innovation, which, however, have to be recognized and actively exploited. We also find that rural resources have the potential to extend and upgrade regional development paths and, thereby, operate as valuable ingredients to renew regional paths and to make them more future-oriented. Nonetheless, the exploitation of rural resources alone does not suffice to facilitate substantial changes in regional development paths but needs coupling with extra-local (re)sources.

Methodologically, this study adopts an exploratory, qualitative case design and is based on interviews with owners/managers of innovating firms. Due to its conceptual and methodological orientations, this paper contributes to emerging discussions and expands existing literature on innovation in rural regions, in particular on the role of rural resources in shaping innovation and regional development paths. It analyses five distinct resource categories and proposes a model on the role of local resources in innovation. Furthermore, it broadens the scope of existing research in regional innovation studies, as we provide rather rare empirical insights from Central and Eastern Europe and the north-eastern fringe of the European Union (Eder, 2019; Golejewska, 2018; Květoň & Blažek, 2018).

The remainder of the paper is structured as follows: The second section presents the theoretical framework, illustrating the function of rural resources in innovation processes and how innovations that build on these resources might shape regional development paths along continuity and change. The third part provides a contextual description of the study area and presents the methodological approach to data collection and analysis. The fourth section presents and details the central findings. The results are further discussed, reflected upon, and linked to the outlined theoretical perspectives in the fifth section. The paper finishes with concluding remarks and reflections regarding policy implications.

LITERATURE REVIEW

Rural resources and firm innovation

Both urban and rural regions are highly heterogeneous spatial units which offer particular, yet distinct, resources for innovation and regional development. Features such as human resources, knowledge bases, institutional arrangements, and networks are emphasized as innovation supporting elements (Isaksen & Karlsen, 2016). Rather than adopting mainstream perspectives that frame rural conditions foremost as constraints, place-specific features of rural regions such as embedded knowledge, preserved routines and physical resources as well as cultural and historical landscapes can, and should be, more broadly perceived as valuable resources for entrepreneurship and innovation (Eder & Trippl, 2019; Golejewska, 2018; Müller & Korsgaard, 2018; Korsgaard, Ferguson, & Gaddefors, 2015). However, it should not be supposed that innovation based on resources locally available to rural firms lead to similar (i.e., high-tech and science-based) outcomes that can be frequently observed in urban areas.

The value of local rural resources, and in particular their purposive exploitation, is not fully determined but can be shaped by local firms. In this sense, the capacity to identify, access and construct specific meaning(s) from these resources reflects the agency of firms and actors in rural regions (Garud, Kumaraswamy, & Karnøe, 2010; Huggins & Thompson, 2019; Ray, 2001). To successfully utilize and exploit local resources, firms need to have basic understandings – which might relate to single individuals, firms and organizations (individual agency) or be exercised through interdependent action, coordinated for example by local and extra-local groups/networks (collective agency) (Emirbayer & Mische, 1998; Sotarauta & Suvinen, 2018). Furthermore, as the value of these resources is subjective, there will be

differences in the extent to which firms mobilize and exploit rural resources. In the following sections, we conceptualize the resources of rural regions along with a heuristic developed by Müller and Korsgaard (2018), differentiating five interrelated dimensions: physical resources, human resources, immaterial resources, social and community resources, and financial resources.

Physical resources

Many rural firms, especially when active in traditional sectors such as food, agriculture and fishery, timber, energy, etc., intensively use physical resources which continue to be important factors for rural economies (Ring, Peredo, & Chrisman, 2010). Physical resources comprise, e.g. natural resources, raw materials, infrastructure, (immaterial) landscapes or vacant buildings (Müller & Korsgaard, 2018). Physical resources have a vital position in generating recreational opportunities and link to tourism activities (Mayer & Baumgartner, 2014; Torre, 2015). The remoteness of rural regions, coupled with low population densities, has allowed the preservation of unique scenery, which favors the leverage of environmental features (Stathopoulou, Psaltopoulos, & Skuras, 2004). Exploiting physical resources in contemporary and non-traditional ways can help to create new value. In addition, distance, perceived as a physical resource, might prevent knowledge and technology diffusion and, consequently, induce the emergence of specific local niche developments (Eder & Trippl, 2019).

Human resources

Human resources refer to the capacities of employees as well as regionally distinct local knowledge and practical expertise embedded in firms' processes and products (Müller & Korsgaard, 2018). While rural human resources are often characterized in negative terms such as brain-drain, productivity deficiencies, etc. (Kalantaridis, 2009; Ring, Peredo, & Chrisman, 2010; Ward & Brown, 2009), it can be observed that traditional knowledge and practical experience have been sustained precisely because of a certain state of remoteness (Gibson, 2016; Spyridakis & Dima, 2016; Stathopoulou, Psaltopoulos, & Skuras, 2004). Such embedded practices and techniques offer opportunities for innovation, especially when coupled with contemporary marketing approaches (Dinis, 2006) and/or scientific research (Cannarella & Piccioni, 2011). Accordingly, this knowledge might lead to innovations not possible elsewhere.

Moreover, the implementation of innovation also relates to the individual level. As the workforce of rural firms is often loyal (Isaksen & Karlsen, 2016; Kalantaridis, 2009) and less receptive to labor poaching (Eder & Trippl, 2019),

firms can draw on rich sets of human resources which, accumulated over time, might substantially contribute to a firm's internal capacities. Furthermore, collaboration with local/regional research institutions and professional schools can offer additional advantages by supporting human resource development and regional innovation capacity (Huggins & Johnston, 2009). Such institutions also act as brokers for accessing external networks (Virkkala, 2007).

Immaterial resources

Immaterial resources such as traditions, cultural amenities and heritage, historic buildings, distinct images and specific local identities can be transformed into place-specific outcomes and brands (Dinis, 2006; Müller & Korsgaard, 2018). The interpretation and deliberate exploitation of immaterial resources can add regionally distinct value to a firm's innovation activities (Anderson, 2000). It has been highlighted that in particular, the food and tourism industries benefit from place-specific marketing that draws upon immaterial resources (Stathopoulou, Psaltopoulos & Skuras, 2004). Immaterial resources are directly and indirectly coupled with other sets of rural resources, such as human resources: new opportunities are identified and mobilized by existing knowledge bases and experiences of actors (Garud, Kumaraswamy, & Karnøe, 2010). In this sense, locally embedded knowledge and specific traditions can be treated as essential parts of local images which, if proactively and strategically exploited as part of agentic action, can operate as effective marketing instruments (Dinis, 2006; Plüschke-Altof & Grootens, 2019).

It has also been mentioned that the entrepreneurial intentions of firms in rural regions are not always purely economic, efficiency seeking and pecuniary. Rather, a firm's intentions also relate to specific motivations to creatively mobilize local resources, images, and associations to expose localities to broader visibility (Huggins & Thompson, 2019; Lafuente, Vaillant, & Serarols, 2010). Furthermore, reputations for a high-quality of life and good living environments might operate as benefits and help to attract talented individuals to rural regions (Eder & Trippl, 2019; Shearmur, 2017).

Social and community resources

Collective action, which emerges from interactive connections and surfaces as social networks, firm networks, partnerships and cooperatives (Müller & Korsgaard, 2018) is widely considered an essential innovation enabler (Camps & Marques, 2014). As for supplements to limited internal resources, it is particularly important for small firms (van Hemert, Nijkamp, & Masurel, 2012). In rural regions, collective action can be effectively facilitated through

institutional arrangements such as common understandings, coordinated goals, or shared identity and, thereby, become a place-specific quality (Isaksen & Karlsen, 2016). Sharing information, knowledge and skills expresses collective agency and assists the constructing of (individual and collective) meanings regarding local resources (Sotarauta & Suvinen, 2018). In this sense, social and community resources provide access to capacities located both within and outside a given locality (Ratajczak-Mrozek, 2014; Šumane et al., 2018). Moreover, it has been highlighted that the low actor densities of rural regions encourage interactions between rather dissimilar actors, inducing potentially productive diversity into social ties and firm networks (Mcpherson, Smith-Lovin, & Cook, 2001).

Family and friendship ties are important elements of business networks in rural regions (Siemens, 2010; Stathopoulou, Psaltopoulos, & Skuras, 2004). Family members and friends provide emotional support and are frequently recruited as employees. Thus, family and friendship ties are expanded into the business sphere and blur the boundaries between social and economic relations. Furthermore, connections between local actors favor the exploitation of embedded skills and knowledge (Cannarella & Piccioni, 2011). In this regard, Petrov (2011) concludes that social and community resources take on a central function for firm innovation in rural regions – providing that innovators actively involve communities and their diverse resources (e.g., human, financial, etc.). In addition, relations with local and regional decision takers, based on personal acquaintance, can facilitate extended support and equip governance processes with specific qualities (Eder & Trippl, 2019). However, it has also been highlighted that network relations that are socially too tightly knit are at risk of becoming over-embedded and hamper innovative potential (Atterton, 2007; Boschma, 2005).

Financial resources

Innovation activities typically require upfront investments. Due to their rather small size, firms in rural areas lack internal financial resources and require access to external finance (van Hemert, Nijkamp, & Masurel, 2012). These can be grants, loans or special support and subsidy schemes available to rural firms on local (e.g., locally administered LEADER funds), national (e.g., funds from ministries) and EU levels. Conversely, it has been found that venture capital or angel funding sources are less important to rural firms (Müller & Korsgaard, 2018). Furthermore, rural firms appreciate support from location-specific funding schemes as these are associated with a broader recognition of innovative ideas – even though financial support is typically rather small (Müller & Korsgaard, 2018; Reidolf, 2016). Additionally, it can be highlighted

that rural areas account for cost advantages, as wages and land prices are lower compared to those in agglomerations.

Although firms from rural areas can access generic funding schemes, small and inexperienced firms especially, face distinct problems applying for and administering external funds and, thus, might choose not to apply for external finance (Korsgaard, Ferguson, & Gaddefors, 2015; Mayer & Baumgartner, 2014; Müller & Korsgaard, 2018). Consequently, these firms rely on self-financing, using savings or smaller sums acquired via informal channels (e.g., friends, family, acquaintances) (OECD, 2014; Siemens, 2010).

The previous sections provided a discussion on rural resources as innovation inputs. It should be pointed out that these resources are not strictly separated from each other but should rather be understood as interlinked. As an illustration, an empty house itself can be regarded as a rural physical resource, but in combination with immaterial resources (e.g., historical legend) it has greater value for marketing. Similarly, jam from local berries is assigned additional value if it is made according to a traditional regional recipe (Dinis, 2006). Moreover, local social networks can facilitate access to further resources and opportunities (Šumane et al., 2018), and amplify outcomes when local actors act jointly.

Path development between continuity and change

The central understanding of path development processes is that present, current and future economic action is, to varying degrees, directed by past events and economic cycles (Martin & Sunley, 2006). In this evolutionary perspective, new information is interpreted through the lens of existing knowledge. Hence, path development processes emphasize the role of local and regional resources and the function of place-specific features and actors in shaping regional development paths.

However, path development is not a fully deterministic concept that generates predictable outcomes. Its directions are, in fact, open-ended and contingent (Martin & Sunley, 2006; Strambach & Halkier, 2013). Path development processes can be understood along a continuum ranging from rather continuity-driven developments to processes that induce substantial change and novelty and genuinely new futures (Asheim, Grillitsch, & Trippl, 2017; Garud & Karnøe, 2001; Martin & Sunley, 2006). Linked to its frequent mobilization in evolutionary economic geography, the path development notion has been extended and nuanced in a number of ways. This contribution adopts the typology recently outlined by Isaksen et al. (2019), who differentiate between *path extension, path upgrading, path diversification* and *path creation.*

Path extension processes represent continuity and consist mostly of incremental, step-wise innovations in existing industries and along prevailing economic and technological orientations (Isaksen, 2015). Path upgrading processes relate to more substantial degrees of change and move existing regional paths in new directions. Upgrading processes are for instance induced through the mobilization of new technologies, substantive organizational changes, the accumulation and development of specialized skills, the identification of industrial niches or novel use of symbolic knowledge (Grillitsch, Asheim & Trippl, 2018). Both path extension and path upgrading represent rather incremental changes through which existing organizational and regional competencies are strengthened. As a result, existing processes operate more efficiently and contribute to sustaining regional competitiveness (Isakesen, 2015; Isaksen et al., 2019). In cases where existing capabilities are combined with related or unrelated knowledge from local and/or extra-local sources, available paths might be diversified (Neffke, Hartog, Boschma, & Henning, 2018) and new knowledge accumulated. Innovations exploited through these processes allow firms and regions to access new markets (Isaksen et al., 2019). At the end of the spectrum are path creation processes, which imply high degrees of change and, consequently, represent a comprehensive mode of regional industrial change (Martin & Sunley, 2006; Simmie, 2012). Path creation relates to the emergence of new industries and technologies, scientific discoveries, or business models in a region (Isaksen, 2015; Hassink, Isaksen, & Trippl, 2019). It has been debated that the resources underlying path diversification and path creation are more likely to be found in metropolitan regions, whereas extension and upgrading processes might also be facilitated in rural regions and rather traditional resources – despite a state of organizational thinness (Isaksen, 2015).

These nuanced path development processes link to the notion of path plasticity. Path plasticity supposes that the direction of paths can be actively shaped and molded by actors (Strambach, 2008), indicating that opportunities for innovation are available within existing paths – which has also been highlighted for rural regions (Atterton, Newbery, Bosworth, & Affleck, 2011; Ray, 2001). Consequently, the effective use of local resources provides an effective means for shaping regional development trajectories (Isaksen, 2015; Mitchell, 2013; Petrov, 2011). This, however, requires comprehensive knowledge about embedded resources to generate new options out of them. In this regard, recent studies highlight the pivotal role of agency in path development processes (e.g., Garud, Kumaraswamy, & Karnøe, 2010; Huggins & Thompson, 2019; Isaksen et al., 2019; Sotarauta & Suvinen, 2018). Essentially, it is supposed that the initial conditions for path development are not entirely exogenously given but constructed by actors, for example through mobilizing their agency (Garud, Kumaraswamy, & Karnøe, 2010;

Sotarauta & Suvinen, 2018) or by acquiring knowledge via multi-scalar social action (Hassink, Isaksen, & Trippl, 2019; Simmie, 2012). In this sense, agency itself becomes an endogenous resource for regional development (Ray, 2001; Sotarauta & Beer, 2017). Moreover, it has been argued that collective agency, i.e., the coordinated and orchestrated action of multiple and diverse actors, is especially important for rather radical processes of path diversification and creation (Isaksen et al., 2019).

However, it might also happen that self-reinforcing stabilization mechanisms lock regional systems into existing trajectories. Actors and regions become insensitive to change, and potential future opportunities are overlooked (Martin, 2010; Strambach & Halkier, 2013). As a consequence, innovation potentials are substantially limited as influxes of novelty are not sufficiently recognized or even blocked (Martin & Sunley, 2006). Rural regions can be regarded to be particularly exposed to the latent danger of lock-in as they provide only for rather limited opportunities to alter existing development paths (Pylak, 2015). Again, these arguments bring to the fore, the potential function of agency to prevent, moderate, or even exploit lock-in situations.

While lock-in situations have mainly been discussed in negative terms, Gibson (2016) illustrates how traditional skills, embedded knowledge, technologies, production methods, etc. are transformed into distinct qualities – precisely because modernization pressures were resisted and traditional practices maintained. Likewise, Anderson (2000) illustrates that actors in rural regions nurse and transform obsolete and out-dated technologies and values into economically viable outcomes which, if coupled with suitable marketing instruments, become articulations of place, traditions, and cultural landscapes. Thus, adhering to historical economic legacies should not be merely perceived a constraint as long as actors proactively and continuously search for feasible extensions within existing paths. Along these lines, Garud, Kumaraswamy, and Karnøe, (2010) perceive lock-in as temporary, provisional and inevitable stabilization mechanisms of evolving paths.

RESEARCH METHODS

Regional context

We follow a general definition of rurality according to which the population density is less than 150 inhabitants per km^2 and the majority of the population lives in settlements with less than 10,000 inhabitants (OECD, 2006). Despite such characterizing features, it must be highlighted that rural regions themselves are highly heterogeneous spatial units. The firms

(cases) investigated as part of this study are located in rural Estonian regions. Estonia is situated in the north-eastern part of Europe, on the Baltic Sea. It has a population of 1.3 million and an average population density of about 30 inhabitants per km2. The firms investigated are located in the counties of Lääne, Järva, Viljandi, and Võru (see Figure 1).

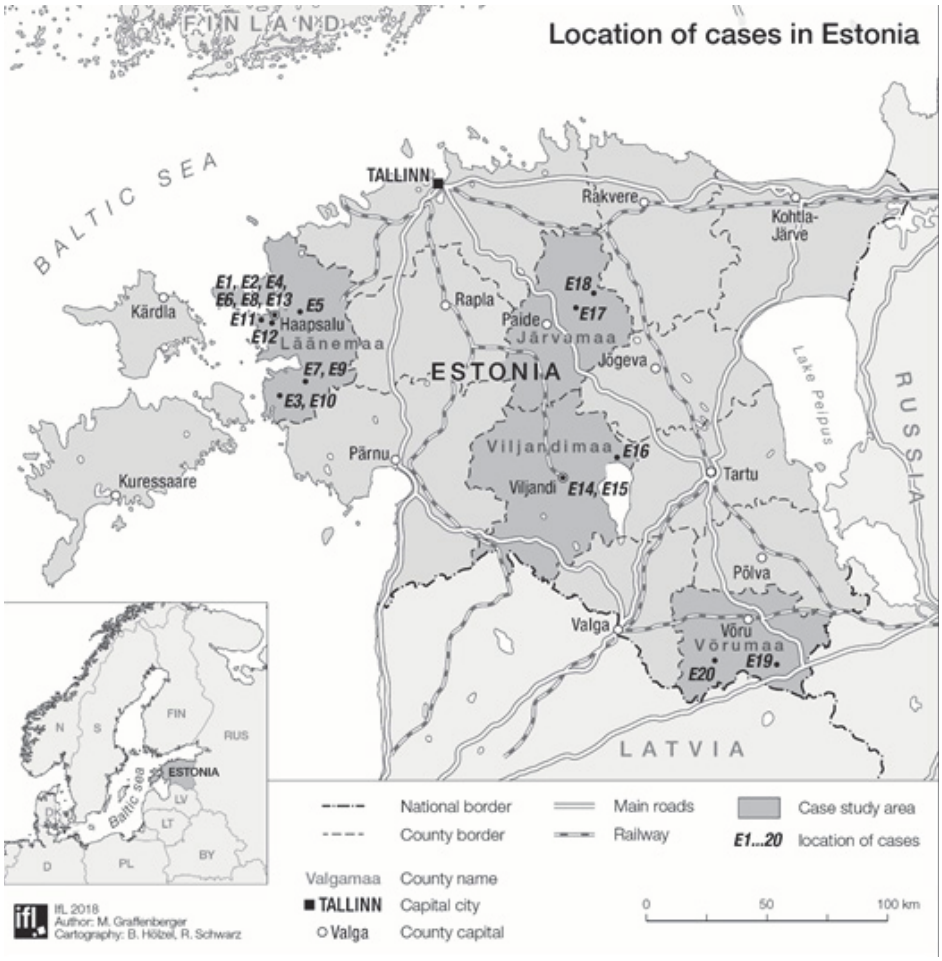

Figure 1. Location of cases

Source: Leibniz Institute for Regional Geography (IfL) (2018).

In addition to their relative distance to the main national agglomerations of Tallinn and Tartu, the counties that constitute the study area share a number of socio-structural characteristics. All the counties exhibit low population densities, have experienced a decline in population, which exceeds the national average and account for rather low levels of GDP per

capita (see Table 1). In terms of economic structure, the regional economy of the study area can be described as "typically rural." The contribution of agriculture and forestry to total value added is relatively high and exceeds 10% for the counties of Viljandi and Võru. Additionally, manufacturing and industrial production, especially in low- and medium-tech activities, such as metal, wood and food, are significant contributors to regional value added.

Conversely, compared to the national average, the service sector is substantially less important. However, Lääne county can be seen as a particular exception in this regard. The tourism industry has traditionally been a backbone of the regional economy and continues to play a major role, especially in the well-known spa town and county capital Haapsalu (see Table 1). Viljandimaa and Võrumaa have a long tradition in manufacturing, with wood, metal and furniture manufacturing being particularly important. Järvamaa is a traditional Estonian agricultural area.

Table 1. Characteristics of counties in the study area

	Population			**GDP**		**GDP** (share in value added, 2016)		
	Total population 2017	Density	Change in population 2000-2017	Per capita 2017	Relative to Estonian average	Agriculture, forestry and fishing	Industry and construction	Services
Estonia	1 315 635	30,3	-6%	17,925	100%	2,6	26,9	70,5
Järvamaa	30 378	12,4	-20%	10,877	61%	9,4	37,2	53,4
Läänemaa	24 301	10,1	-17%	12,024	67%	7,4	28,3	64,2
Viljandimaa	47 288	13,8	-20%	11,222	63%	14,1	37,7	48,2
Võrumaa	33 505	14,5	-16%	8,729	49%	11,6	39,8	48,6

Source: authors, based on data from Statistics Estonia.

Data collection and analysis

A qualitative approach was chosen to provide contextually grounded and micro-level perspectives, which allow for interpretations through the understandings of research participants (Creswell, 2013). Interviews with management representatives of 20 firms were conducted in several waves from 2014 to 2016 (see Table 2). These were complemented by interviews with individuals from the regional development arena. Interviews focussed on the firms' innovation activities and followed a semi-structured approach, including substantial narrative sections. This interview approach enabled interviewers to cover intended topics while leaving freedom for the interviewees to elaborate on and prioritize their own ideas and perspectives (Gomm, 2004).

Table 2. Characteristics of interviewed firms

Interview ID	No. of employees	Year established	Industry	Interview respondent	Date of interview
E1	150	1991	Manufacturing (doors, windows)	Manager	12.03.14
E2	120	1994	Manufacturing (e.g. life jackets)	Owner	21.03.14
E3	60	1991	Manufacturing (wire products)	Manager	06.03.14
E4	80	2005	Tourism (spa hotel)	Manager	12.02.14
E5	65	1994	Manufacturing	Manager	16.04.14
E6	80	1997	Tourism (spa hotel)	Owner/manager	12.03.14
E7	5	2007	Information Technology	Owner/manager	09.05.14
E8	138	1958/2003	Medical Treatments	Manager	12.03.14
E9	3	2003	Tourism	Owner/manager	16.04.14
E10	2	2014	Manufacturing (modular houses)	Owner	03.06.14
E11	50	1996	Manufacturing (furniture)	Manager	15.04.15
E12	100	1992	Manufacturing (furniture)	Manager	15.04.15
E13	-	1992	Handicraft	Manager	16.04.14
E14	75	2005	Manufacturing (furniture)	Production Manager	14.01.16
E15	3	2014	Manufacturing (food)	Owner	15.01.16
E16	7	2014	Manufacturing (saunas)	Owner	05.02.16 & 07.11.16
E17	5	2011	Farming/Manufacturing	Owner	22.03.16
E18	106	1910	Manufacturing (food)	Manager	13.04.16
E19	11	2002	Manufacturing (food)	Owner	02.02.16 & 02.11.16
E20	9	1992	Manufacturing/Wholesale (food)	Owner	21.03.16

Most of the interviews took place at the company/institution of the interviewees. The interviews were conducted in both Estonian and English. The interviews lasted between 40 and 90 minutes and were tape recorded and transcribed. Partly software supported, these transcripts were analyzed through coding and categorization processes (Kvale, 2007). The relevant aspects were extracted from the interview material and organized along with coding categories reflecting the topics of interest (e.g., innovation activities, mobilization of local resources, coupling of existing resources). Coding was organized in several steps. First, the resource types, following a typology similar to that of Müller and Korsgaard (2018) were used as a basis to sort the data. The data in these groups were re-reviewed using in vivo coding (Creswell, 2013) to systematically and inductively develop new codes. Finally, these codes were thematically categorized.

Table 2 provides an overview of the firm selection of this research. Case selection for this study reflects activities that are of economic importance in the counties that constitute the study area (see Table 1). Most of the manufacturing firms exhibit a clear orientation towards export markets, and the service firms target domestic as well as international clients, mostly from neighboring countries. The firms that were selected have all innovated in the past. Furthermore, case selection was aimed at covering firms of different size and with activities within low- and medium-tech manufacturing (e.g., food and wood) as well as service industries (e.g., tourism and IT). Accordingly, the selection strategy relates to purposive and variation sampling (Gummesson, 2000), partly guided by snowballing techniques. Data from secondary sources such as company websites and social media accounts, official documents, newspaper articles, etc., complemented the interview material.

FINDINGS

The function of rural resources for innovation

The focus of this part is to provide an overview of how the investigated case firms mobilized local resources for innovation. Based on our empirical analysis, we suggest that place-specific rural resources play a substantial role when it comes to inducing novelty and change into the local economy. However, we also find that these resources facilitate mostly incremental innovation processes along existing trajectories.

Physical resources

Our data highlight that physical resources such as landscape, natural assets, vacant buildings, etc. are frequently mobilized by firms from rural regions in the innovation context. These resources have place-specific features and allow firms involved in diverse economic activities to create regionally distinct products that satisfy existing, and generate new, demand. Tourism, health and recreational firms stress the importance of landscape as a general resource, referring to the sea and forests not only as a particular aspect of scenery but also concerning the health and rehabilitation services offered. Specifically, we find, for instance, that in the health and spa sector, traditional treatments using local mineral mud are widespread and that firms seek to widen these traditional applications through consultations with local research organizations.

[…] The Centre of Excellence does research about curative mineral mud to find new applications. Today, we [in the spa] use mineral mud in a traditional

way, which means that we heat it and use it only once. The Centre of Excellence has ideas how to make mineral powder that could be used for massages and other treatments. […](Spa hotel manager)

Accordingly, these natural resources are featured prominently in marketing activities, and health and spa firms have added nature-related services to their existing portfolios, such as guided walking tours. Further examples of the proactive and contemporary use of physical resources are observed within food manufacturing. For instance, a dairy began to harvest birch sap, a traditional Baltic beverage, on a larger scale to meet increasing demands from international health and organic food markets, thereby generating new value from the abundantly available birch forests:

There is clearly a new trend in [international food] markets. We have received several export requests for birch sap. […]. We have also developed new birch sap products like lemonade. (Food manufacturer)

Additionally, it has been mentioned that vacant buildings are considered a specific resource in rural areas and have been used to establish additional service/production sites or even to start new businesses. Thus, there might be situations in which firms can benefit from real estate vacancies, which are typically considered liabilities for rural communities. Furthermore, the state of the buildings themselves could push firms to be creative and to innovate in order to be able to use and maintain the buildings in the long run. As pointed out by one spa firm, there are no ready-made solutions available for these activities. Thus, renovations rely heavily on developing and testing creative solutions that could potentially be re-applied in future projects.

Human resources

Human resources are an important local resource through which innovation is facilitated and implemented. Innovation and entrepreneurship are supported by historically embedded knowledge, giving rise to the continuation of the specific skills and competencies of both the available workforce and local firms. For instance, Viljandi is reported to be the (former) center of furniture production in Estonia. Accordingly, the county provides an experienced workforce with specific practical knowledge of furniture production. Similarly, the availability of a skilled workforce, especially with experience and knowledge in the sewing industry and other light industries, has been mentioned as attracting related firms to Haapsalu. Our data reveal that such a specialized workforce is not only appreciated for its loyalty but also that

its specific knowledge facilitates the emergence of (incremental) innovation regarding proposed changes and improvements of products and processes.

Furthermore, knowledge about old handicraft techniques is a particular example of how embedded human resources continue to be economically relevant and unique. Lääne county is well-known for its specific lace shawl. Knowledge about related production techniques is typically passed down the generations or shared within local handicraft circles. More recently, this embedded knowledge has been mobilized to create additional demand by directly engaging customers in the production process, offering, for instance, extended workshops during which experienced handicrafters and customers jointly co-create items – rather than merely offering traditionally made handicraft products through classical sales channels.

However, the lack of a qualified workforce, coupled with rising wages, has frequently been mentioned as an innovation barrier across industries. Consequently, the response of firms in addressing labor shortages might facilitate innovation. In particular, manufacturing firms are considering the reorganization of production routines through technological modernization and by rationalizing production to implement new production processes. However, employees continue to be a critical factor when it comes to operating highly specialized machinery:

One thing is to buy a machine […] another is to train employees and change their mindset. The latter is more complicated […] at least in the beginning. When we bought our first 'smarter' machines […] people did not get near them. […] Today, nobody is afraid anymore. We use some machines […] as practical tools for training and experimentation. (Wire manufacturer)

Moreover, firms also facilitate knowledge exchange between experienced and new staff and try to secure the existing employees to further build and expand their internal capacity and thus compensate for the shortage of available workforce.

We use a lot internal training. […] We don't let employees who are trained according to our [firm] values and needs leave. This region is not large enough to find new employees. (Spa hotel manager)

Furthermore, all organizations located in the area benefit from human capital. For example, the Centre of Excellence in Health Promotion and Rehabilitation is located in Läänemaa. It connects wellness and treatment firms and other regional actors in this field and, thus, diffuses knowledge regionally. Thus, these local organizations can be seen as not only providing

relevant knowledge to local actors but also as brokers through which local firms can mediate access to extra-local competences. Multiple health and spa firms have expressed expectations that these research capacities and transfer activities might eventually facilitate product and process innovations.

Immaterial resources

In combination with other resources, immaterial resources provide complementary qualities that allow firms to mobilize additional value. Immaterial aspects emerge as articulations of place attachment, emotional engagement, relations to cultural heritage, embedded traditions and the mobilization of rural images and associations. For instance, when establishing a new sauna manufacturing business, the owner, based in Tallinn, highlighted that the locational choice was substantially driven by his personal attachment to the area:

My roots are from here, my grandparents live here, and I have a big summer house nearby. (Sauna manufacturer)

Likewise, regional development actors indicated that the owners of summer houses in rural areas are considered potential facilitators for local innovation. Such actors potentially couple their emotional and local attachment with distinct experiences and external networks. Multiple cases reflect that local cultural heritage is actively mobilized as part of the innovation activities, for instance, for marketing purposes. We observe that relations to cultural heritage and traditions help firms to differentiate themselves and their products from competitors. For instance, a food manufacturer activates the local Estonian Mulgi heritage[3] as part of its brand identity – transported, for instance, through marketing and packaging:

My entire family has been living in Mulgimaa. I am Mulgi, too. Mulgi is my identity. And this is why we have Mulgi chips […]. The logo of the business is a traditional Mulgi motive. (Food manufacturer)

Tourism businesses in Haapsalu mobilize tales about the Russian Tsar family's visits to the town and enjoyment of mineral mud treatments hundreds of years ago. Similarly, the fact that local mineral mud is used instead of generic powder is actively promoted. These practices illustrate a certain place attachment referred to as 'local patriotism' and signal to

3 Until the end of the 19th century, Muligmaa was a distinct ethnographic and linguistic area within south Estonia. Five historical parishes (Halliste, Paistu, Karksi, Helme and Tarvastu) constituted the Mulgi area. Its population used to speak, and a small part still speaks, Mulgi dialect.

customers that local traditions are maintained. Furthermore, firms were found to actively mobilize images and associations of rural and idyllic landscapes. Thereby, places and rural spaces are purposefully commodified, for example, as part of packaging, online activities, and social media. A rural location allows firms to authentically mobilize such images. By highlighting that landscape and scenery support relaxation and healing, such practices are adopted in the health and spa sector but also beyond (craft-based food production, sauna manufacturing). Furthermore, firms from the food sector use particular food labels awarded by public institutions (e.g., indicating sources of origin, quality aspects, etc.) to support rural associations and to position themselves accordingly.

Social and community resources

We find that local social resources and firm innovation are linked in multiple dimensions, such as mobilizing local/regional supply chains, mitigating access to other resources, the coupling of social and business ties and governance aspects. Our data suggest that social ties and business practices are interwoven and constituted by an underlying social fabric that builds upon mutual trust and common understanding. It has been frequently mentioned that, if possible, firms seek to source goods and services from local and regional suppliers. Motivations for local and regional cooperation relate to intentions to strengthen local economic structures and to build authenticity for handcrafted local products, but also to speed up processes:

For changing fittings, we have a really good local welding guy at hand, a good friend of mine. The first thing we try is to do everything locally. […]. If you have some local guy, you just drive there. It takes 20 minutes. He makes it right away. (Furniture manufacturer)

Firms expand personal relationships with friends, family members, and acquaintances to specific business intentions. This coupling ranges from the provision of emotional support and critical feedback to the establishment of formal business relations and even co-ownership of newly established firms. Furthermore, joint production initiatives and sales/marketing cooperatives have emerged based on the established trust and shared values between the partners involved. Generally, the investigated cases reflect high levels of trust and mutual understanding of local expertize and matters. Consequently, it has been highlighted that familiarity within small communities facilitates the activation of social ties for economic purposes:

We stick together. […] If everyone knows everyone, then there is a lot of trust. […] you don't have to start explaining yourself if you need something and contact people. (Spa hotel manager)

Further aspects from the social and community dimension relate to local and regional governance. Some firms highlight that, despite being small companies, they experience a high level of appreciation and practical support, for instance, when it comes to licensing and building permit procedures. Local governance structures can operate as a productive and supportive resource in small and non-anonymous communities:

I even feel that if you are located in a really small place, the local government treats you differently. It is much easier to negotiate because you are important. In Tallinn, a company like us is nobody, because we are so small. (Sauna manufacturer)

However, social connections that are too tight might lead to the lock-in of existing networks, and some areas of potential may thus be left unattended. For instance, disharmony was identified in local governments' support for new ideas and interest in general business development. It was explained that not all persons who know each other and occasionally meet during other events discuss business-related issues and the support that local government could offer. Interestingly, an actor from the regional development arena mentioned that second-home owners, by mobilizing their diverse networks, can be considered a kind of gatekeeper who might potentially mediate and moderate connections between rural and metropolitan actors such as universities. Thus, these actors extend the spatial scope of the local social resources. Thereby, the difficulties small firms in rural areas tend to have in attracting the interest of high-level scientific partners, and consequently in obtaining input for their development activities, could be moderated.

Financial resources

For most of the innovation projects investigated as part of this study, internal financial resources were mobilized. Nevertheless, firms also used a number of different external finance opportunities to facilitate processes. Although access to formal and, specifically, rural funding schemes does not seem to have a substantial function, some firms accessed such schemes, for example, via the LEADER program or the national agricultural ministry. A few firms pointed out that their engagement with local research partners could provide opportunities to access additional science-related finance, which is often administered by scientific

partners. Although financial support is directly linked to the implementation of innovation, this is not the only aspect. Many of the interviewees acknowledged that receiving competition-based funding is perceived as approval of an idea, which is a vital aspect, especially for small firms.

In addition to the use of public funding schemes, it can be observed that entrepreneurs, throughout the process of establishing new ventures, frequently mobilize financial resources from within their social networks. Thereby, family members, friends, and acquaintances who live locally and have an interest in the venture's wellbeing not only become investors but potentially also co-owners. These indications illustrate how social ties are expanded into the business sphere.

DISCUSSION

Local resources shaping economic paths

In the previous sections, we illustrated the various ways in which firms from rural Estonian regions mobilized local resources as part of their innovation activities. Our empirical analyses highlight that the particular physical, human, social, immaterial, and financial resources of rural regions provide diverse and valuable opportunities for regionally distinct innovations. Based on these analyses we propose an empirically grounded model (see Figure 2) that helps to understand the role of rural resources for firm innovation, the various dimensions of these resources and their role in shaping regional development paths.

Even though we find a highly diverse picture across cases, it is important to note that the individual resources analyzed should not be perceived separately. Rather, we suggest that these resources are interlinked and operate as complements. A large number of the investigated firms strategically couple multiple local resources to drive their innovation activities. For instance, firms from food and tourism as well as wood-related manufacturing construct particular marketing images that draw upon the existence of specific physical resources which are not ubiquitously available (e.g., birch sap, mineral mud, idyllic landscape).

Furthermore, our findings suggest that in particular social and community resources, such as local business networks, family and friendship ties, operate as essential facilitators – for instance by providing access to resources such as embedded knowledge and finance or by mobilizing wider cultural heritage. In this regard, social and community resources provide a pivotal ground to mobilize collective agency based on shared understandings and, consequently, to construct value and meaning of resources and common goals beyond

individual firms. A particular example to be mentioned is the initiative of one case firm to coordinate the activities of multiple regional birch sap collectors under the umbrella of a joint cooperative.

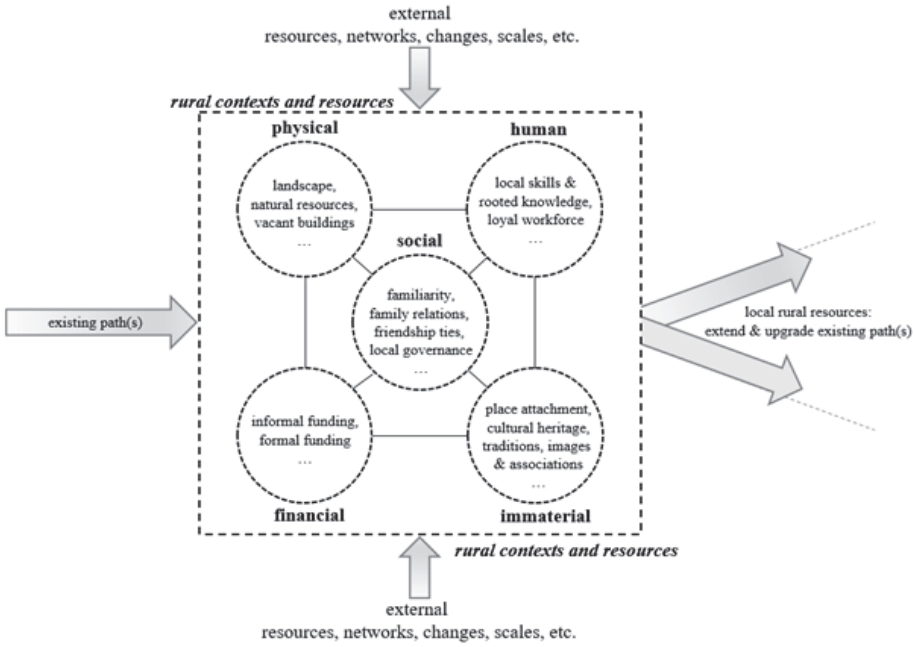

Figure 2. Model on the role of local rural resources in firm innovation and path development

However, this particular enabling function presupposes that local firms are prepared and willing to engage with local communities. Only then do local social resources induce synergies which have been found to considerably shape entrepreneurial processes and innovation activities in rural areas (e.g., Korsgaard, Ferguson, & Gaddefors, 2015; Petrov, 2011; Šumane et al., 2018). As Petrov (2011, p. 168) highlights, 'innovation […] in the periphery relies on social capital and community efforts as much as on other traditional factors of successful innovation'. Furthermore, it has been suggested that collective action based on mutual understanding and shared goals can induce more fundamental processes of regional change (Isaksen et al., 2019; Sotarauta & Suvinen, 2018).

Even though our empirical analyses indicate that, if proactively and purposefully mobilized, local rural resources provide productive assets for firm innovation, we find that these resources mainly facilitate the emergence of incremental innovation. According to the typology outlined by Isaksen

et al. (2019), local rural resources primarily stimulate continuity driven processes of regional change, i.e., path extension and path upgrading. Our empirics do not suggest that regional economic structures are drastically diversified or genuinely new paths are created. Consequently, we suggest that rural resources alone, typically, do not suffice to activate genuinely new trajectories. The results are confirmed in a recent study on regional contexts in Czechia and Poland (Květoň & Blažek, 2018).

However, such continuity-driven extensions of existing paths must not be perceived as simply reproducing and creating more of the same. Rather, available paths are enriched with additional opportunities, functions and economic values and, consequently, existing structures are renewed and strengthened. It has been highlighted that these moderate change processes are of substantial value to rural economies: 'Innovation in the periphery can have a stronger impact on a community's economic path, and can be more pivotal […] for a given remote locality' (Petrov, 2011, p. 186). The impact of incremental innovation for regional development in rural regions derives from its cumulative effects. Especially if incremental innovation occurs across a diverse range of economic activities relevant for rural economies, such as the ones investigated in the study, overall economic structures and practices are upgraded and, collectively, might facilitate the emergence of more heterogeneous and resilient regional economies. Future-oriented economic practices, as well as viable path extensions and upgrades, require agency through which the continuous search for change and activation of alternatives to shape and mold existing paths in rural regions is supported.

However, modest ambitions to change and a mere focus on local resources such as local employees, static social and community relations or local educational organizations, coupled with only a few external knowledge-oriented network linkages in rural regions (Reidolf, 2016) might, in the long run, exhaust existing opportunities, eventually resulting in actors, practices and regions becoming locked-in. However, it has also been suggested that the maintenance of established knowledge/routines does not necessarily preclude positive change (Anderson, 2000; Gibson, 2016). If attuned to contemporary consumer preferences and coupled with modern marketing methods, the retention of these practices allows firms to build distinctive features and to set themselves apart. For example, teaching traditional local handicraft techniques helps to open new tourist and sales segments, and customs related to the consumption of fermented birch sap provide a base to develop soft drinks corresponding to international market preferences.

As the aim of this paper is to access the role of local rural resources in firm innovation, its analytical focus is deliberately inward looking. Consequently, more substantial path development processes, such as diversification and

path creation, might have been excluded. However, we acknowledge the central position of external and outward-looking dimensions in spatially informed innovation research – evidence from our cases also sheds light on their importance. It has been corroborated that the integration of external resources through multi-scalar network linkages plays a significant and productive role in the innovation activities of firms from rural regions (e.g., Fitjar & Rodríguez-Pose, 2011; Reidolf, 2016; Strambach & Halkier, 2013). The activation of non-local resources and linkages provides for the influx of new ideas and knowledge which complement endogenous rural resources and support the capacity of firms and regions to adapt to change. It is precisely this duality of mobilizing local resources and recognizing extra-local factors and resources which is at the core of the wider debate on neo-endogenous (rural) development (Atterton et al., 2011; Ray, 2001; Ward & Brown, 2009). The effective coupling of local and extra-local resources might prevent regional lock-in and give rise to more substantial regional change – potentially leading to processes of path diversification and path creation (Isaksen, 2015; Isaksen et al., 2019). Thus, for future research, we suggest complementing this inward-looking perspective with an exogenous dimension and, thereby, assess the interplay between local and extra-local resources, and their collective, and potentially more substantive, impact on regional path development processes.

CONCLUSION

This exploratory, contextually grounded and micro-level study examined the role of local resources (physical, human, immaterial, social and community, and financial) in shaping firm innovation and path development processes in rural areas. The empirical analyses suggest that rural resources can play an important role in the innovation activities of firms in rural regions. Local rural resources provide valuable and diverse assets that can be proactively exploited by firms. However, the value and meaning of these resources have to be recognized by firms, a stage in which individual and collective agency takes on a pivotal function.

The results of the study were synthesized as part of a model. This model illustrates the multiple dimensions and mobilization mechanisms of rural resources and outlines that rural regions account for endogenous resources which, when mobilized separately or in concert, provide opportunities for extensions and upgrades of existing paths and, thereby, increase the opportunities for both firm progress and regional development. Within this diverse set of rural resources, we find a particularly pivotal role of social

and community resources. They have a central function for mobilizing further resources and for facilitating collective action and sense-making. Furthermore, social ties constitute central mechanisms to mediate relations to extra-local actors and resources.

However, rural resources were mainly found to provide a base for incremental innovations and, consequently, tend to impact rather modestly on existing regional development paths. Hence, it seems that the mere exploitation of rural resources alone does not suffice to facilitate substantial changes in these paths. Moreover, our research reveals examples in which the deliberate continuation of existing development paths and local resources, such as locally embedded knowledge or customs, were used as specific qualities in firms' innovation endeavors, often in combination with certain modernization elements, such as marketing. Overall, these reflections indicate that local resources in rural areas should be considered valuable ingredients to extend, upgrade, and renew existing paths, thereby, inducing additional functions and elements which make them more future-oriented. Such extension and upgrading processes relate to the plasticity of paths and highlight that possibilities for innovation are endogenously available. Interpreted in such a way, our findings confirm existing scholarship on the complementary function of rural resources (e.g., Eder & Trippl, 2019; Korsgaard, Ferguson, & Gaddefors, 2015; Mitchell, 2013). The cumulative effects of moderate change processes support the emergence of more heterogeneous and resilient regional economies, especially in rural areas. However, merely relying on (modified) endogenous factors might eventually exhaust the opportunities of existing paths and pose the long-term risk of lock-in.

This study expands the debate on the role of local rural resources for innovation by proposing an empirically grounded model on the role of rural resources in shaping regional development paths. For analytical purposes, our study deliberately excluded firm relations to external actors – precisely because its focus is on the underexplored issue of local rural resources. So far, the productive properties and qualities of urban areas, such as actor density or localized knowledge spill-overs, are assigned a key role in conventional, i.e. agglomeration-oriented, narratives on regional innovation. This study illustrates that rural contexts, typically portrayed in the existing innovation literature from a problem-centered perspective (Graffenberger & Vonnahme, 2019), offer place-specific, yet often hidden, opportunities for innovation which firms need to recognize and proactively exploit. Thereby, this paper supplements emerging studies (e.g., Anderson, 2000; Eder & Trippl, 2019; Gibson, 2016; Müller & Korsgaard, 2018) that also discuss the role and productive properties of rural resources. However, we have to be cautious when making conclusions, as one cannot conclude from our study that all firms in rural Estonia have the

possibility to (equally) mobilize local resources for innovation, or that firms who do so operate per se more successfully. Furthermore, our empirical focus on rural Estonia complements existing studies in the field with a rather rare contextual setting from Central and Eastern Europe.

Finally, the results of this paper allow us to reflect on the implications for regional and innovation policy targeting rural areas. A central question to be posed is how innovation policy can effectively support processes of building, mobilizing and exploiting rural resources to facilitate innovation. One option for policymakers is to support regional capacity and resource building in organizations such as regional development centers, vocational schools, or research centers to assist firms in the process of generating value from rural resources. Furthermore, actors in rural regions might benefit from initiatives that provide financial support and advisory services to local bottom-up initiatives and firms to facilitate the emergence of regionally distinct (incremental) innovation. Related to our finding on the importance of social and community resources, the importance of support measures that target overall networking activities should be emphasized. Networking activities can be framed along with Faulconbridge's reflections on relational policy approaches (2017) and be understood as mechanisms to supplement the individual agency of firms with coordinated and collective action – found to support more substantial change processes (Isaksen et al., 2019). Policy initiatives that provide opportunities for firms to build regional, as well as extra-regional linkages, can effectively support the emergence of collective action. Furthermore, collective agency and coordinated action might also be facilitated through the initiation of joint regional marketing strategies. The direction of such regional marketing and branding initiatives should be to emphasize place-based resources as distinct local/regional qualities and assets that cannot easily be found and imitated elsewhere.

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References

Anderson, A. R. (2000). Paradox in the periphery: An entrepreneurial reconstruction? *Entrepreneurship and Regional Development*, *12*(2), 91–109. https://doi.org/10.1080 /089856200283027

Asheim, B., Grillitsch, M., & Trippl, M. (2017). Introduction: Combinatorial knowledge bases, regional innovation, and development dynamics. *Economic Geography*, *93*(5), 429–435. https://doi.org/10.1080/00130095.2017.1380775

Atterton, J. (2007). The "Strength of Weak Ties": Social networking by business owners in the Highlands and Islands of Scotland. *Sociologia Ruralis*, *47*(3), 228–245. https://doi.org /10.1111/j.1467-9523.2007.00435.x

Atterton, J., Newbery, R., Bosworth, G., & Affleck, A. (2011). Rural enterprise and neo-endogenous development. In G. Alsos, S. Carter, E. Ljunggren, & F. Welter (Eds.), *Handbook of Research on Entrepreneurship in Agriculture and Rural Development* (pp. 256–280). Cheltenham, UK: Edward Elgar.

Boschma, R. (2005). Proximity and Innovation: A critical assessment. *Regional Studies*, *39*(1), 61–74. https://doi.org/10.1080/0034340052000320887

Camps, S., & Marques, P. (2014). Exploring how social capital facilitates innovation: The role of innovation enablers. *Technological Forecasting and Social Change*, *88*, 325–348. https://doi.org/10.1016/j.techfore.2013.10.008

Cannarella, C., & Piccioni, V. (2011). Traditiovations: Creating innovation from the past and antique techniques for rural areas. *Technovation*, *31*(12), 689–699. https://doi.org/10.1016 /j.technovation.2011.07.005

Creswell, J. W. (2013). *Qualitative Inquiry & Research Design: Choosing Among Five Approaches* (3rd ed.). Los Angeles: Sage Publications.

Dinis, A. (2006). Marketing and innovation: Useful tools for competitiveness in rural and peripheral areas. *European Planning Studies*, *14*(1), 9–22. https://doi.org/10.1080 /09654310500339083

Eder, J. (2019). Innovation in the periphery. *International Regional Science Review*, *42*(2), 119–146. https://doi.org/10.1177/0160017618764279

Eder, J., & Trippl, M. (2019). Innovation in the periphery: Compensation and exploitation strategies. *Papers in Economic Geography and Innovation Studies*, *07*, 1–17.

Emirbayer, M., & Mische, A. (1998). What is agency? *American Journal of Sociology*, *103*(4), 962–1023. https://doi.org/10.1086/231294

Faulconbridge, J. R. (2017). Relational geographies of knowledge and innovation. In H. Bathelt, P. Cohendet, S. Henn, & L. Simon (Eds.), *The Elgar Companion to Innovation and Knowledge Creation* (pp. 671–684). Cheltenham, UK: Edward Elgar Publishing.

Fitjar, R. D., & Rodríguez-Pose, A. (2011). Innovating in the periphery: Firms, values and innovation in Southwest Norway. *European Planning Studies*, *19*(4), 555–574. https://doi.org/10.1080/09654313.2011.548467

Florida, R., Adler, P., & Mellander, C. (2017). The city as innovation machine. *Regional Studies*, *51*(1), 86–96. https://doi.org/10.1080/00343404.2016.1255324

Garud, R., & Karnøe, P. (2001). Path creation as a process of mindeful deviation. In R. Garud & P. Karnøe (Eds.), *Path Dependence and Creation* (pp. 124–209). New York: Psychology Press.

Garud, R., Kumaraswamy, A., & Karnøe, P. (2010). Path dependence or path creation? *Journal of Management Studies*, *47*(4), 760–774. https://doi.org/10.1111/j.1467-6486.2009.00914.x

Gibson, C. (2016). Material inheritances: How place, materiality, and labor process underpin the path-dependent evolution of contemporary craft production. *Economic Geography*, *92*(1), 61–86. https://doi.org/10.1080/00130095.2015.1092211

Golejewska, A. (2018). Innovativeness of enterprises in Poland in the regional context. *Journal of Entrepreneurship, Management and Innovation*, *14*(1), 29–44. https://doi.org/10.7341 /20181412

Gomm, R. (2004). *Social Research Methodology. A Critical Introduction*. Basingstoke: Palgrave MacMillan.

Graffenberger, M., & Vonnahme, L. (2019). Questioning the "periphery label" in economic geography: Entrepreneurial action and innovation in South Estonia. *ACME: An International Journal for Critical Geographies*, *18*(2), 529–550.

Grillitsch, M., Asheim, B., & Trippl, M. (2018). Unrelated knowledge combinations: The unexplored potential for regional industrial path development. *Cambridge Journal of Regions, Economy and Society*, *11*(2), 257–274. https://doi.org/10.1093/cjres/rsy012

Grillitsch, M., & Sotarauta, M. (2018). *Regional Growth Paths: From Structure to Agency and Back* (Papers in Innovation Studies No. 2018/1). Retrieved from http://www.circle.lu.se /publications

Gummesson, E. (2000). *Qualitative Methods in Management Research*. (E. Gummesson, Ed.) (2nd ed.). California, US: Sage Publications.

Hansen, T., & Winther, L. (2011). Innovation, regional development and relations between high- and low-tech industries. *European Urban and Regional Studies*, *18*(3), 321–339. https://doi.org/10.1177/0969776411403990

Hassink, R., Isaksen, A., & Trippl, M. (2019). Towards a comprehensive understanding of new regional industrial path development. *Regional Studies*, 1–10. https://doi.org/10.1080 /00343404.2019.1566704

Huggins, R., & Johnston, A. (2009). Knowledge networks in an uncompetitive region: SME innovation and growth. *Growth and Change*, *40*(2), 227–259. https://doi.org/10.1111/j.1468-2257.2009.00474.x

Huggins, R., & Thompson, P. (2019). The behavioural foundations of urban and regional development: Culture, psychology and agency. *Journal of Economic Geography*, *19*, 121–146. https://doi.org/10.1093/jeg/lbx040

Isaksen, A. (2015). Industrial development in thin regions: Trapped in path extension? *Journal of Economic Geography*, *15*(3), 585–600. https://doi.org/10.1093/jeg/lbu026

Isaksen, A., Jakobsen, S. E., Njøs, R., & Normann, R. (2019). Regional industrial restructuring resulting from individual and system agency. *Innovation: The European Journal of Social Science Research*, *32*(1), 48–65. https://doi.org/10.1080/13511610.2018.1496322

Isaksen, A., & Karlsen, J. (2016). Innovation in peripheral regions. In R. Shearmur, C. Carrincazeaux, & D. Doloreux (Eds.), *Handbook on the Geographies of Innovation* (pp. 277–285). Cheltenham, UK, Massachusetts, USA: Edward Elgar. https://doi.org/10.4337/9781784710774

Kalantaridis, C. (2009). SME strategy, embeddedness and performance in East Cleveland, North East England. *International Small Business Journal*, *27*(4), 496–521. https://doi.org/10.1177 /0266242609335019

Korsgaard, S., Ferguson, R., & Gaddefors, J. (2015). The best of both worlds: How rural entrepreneurs use placial embeddedness and strategic networks to create opportunities. *Entrepreneurship and Regional Development*, *27*(9–10), 574–598. https://doi.org/10.1080 /08985626.2015.1085100

Kvale, S. (2007). *Doing Interviews*. Los Angeles: Sage Publications.

Květoň, V., & Blažek, J. (2018). Path-development trajectories and barriers perceived by stakeholders in two Central European less developed regions: Narrow or broad choice? *European Planning Studies*, *26*(10), 2058–2077. https://doi.org/10.1080/09654313.2018.1509061

Lafuente, E., Vaillant, Y., & Serarols, C. (2010). Location decisions of knowledge-based entrepreneurs: Why some Catalan KISAs choose to be rural? *Technovation*, *30*(11–12), 590–600. https://doi.org/10.1016/j.technovation.2010.07.004

Martin, R. (2010). Roepke lecture in economic geography-Rethinking regional path dependence: Beyond lock-in to evolution. *Economic Geography*, *86*(1), 1–27. https://doi.org/10.1111/j.1944-8287.2009.01056.x

Martin, R., & Sunley, P. (2006). Path dependence and regional economic evolution. *Journal of Economic Geography*, *6*(4), 395–437. https://doi.org/10.1093/jeg/lbl012

Mayer, H., & Baumgartner, D. (2014). The role of entrepreneurship and innovation in peripheral regions. *DisP - The Planning Review*, *50*(1), 16–23. https://doi.org/10.1080/02513625.2014.926720

Mcpherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: Homophily in social networks. *Annual Review of Sociology*, *27*, 415–444. Retrieved from www.jstor.org /stable/2678628.

Mitchell, C. J.. (2013). Creative destruction or creative enhancement? Understanding the transformation of rural spaces. *Journal of Rural Studies*, *32*, 375–387. https://doi.org/10.1016/j.jrurstud.2013.09.005

Müller, S., & Korsgaard, S. (2018). Resources and bridging: The role of spatial context in rural entrepreneurship. *Entrepreneurship and Regional Development*, *30*(1–2), 224–255. https://doi.org/10.1080/08985626.2017.1402092

Neffke, F., Hartog, M., Boschma, R., & Henning, M. (2018). Agents of structural change: The role of firms and entrepreneurs in regional diversification. *Economic Geography*, *94*(1), 23–48. https://doi.org/10.1080/00130095.2017.1391691

OECD/Eurostat. (2005). *Oslo Manual: Guidelines for Collecting and Interpeting Innovation Data* (3rd ed.). Paris: OECD Publishing. https://doi.org/10.1787/9789264013100-en

OECD. (2006). *The New Rural Paradigm: Policies and Governance*. Paris: Organisation for Economic Development. Retrieved from http://www.oecd.org/gov/regional-policy/thenewruralparadigmpoliciesandgovernance.htm

OECD. (2014). *Innovation and Modernising the Rural Economy*. OECD Publishing. https://doi.org/dx.doi.org/10.1787/9789264205390-en

Petrov, A. N. (2011). Beyond spillovers: Interrogating innovation and creativity in the peripheries. In H. Bathelt, M. P. Feldman, & D. F. Kogler (Eds.), *Beyond Territory: Dynamic Geographies of Knowledge Creation, Diffusion, and Innovation* (pp. 168–190). Oxon: Routledge. https://doi.org/10.4324/9780203814871

Plüschke-Altof, B., & Grootens, M. (2019). Leading through image making? On the limits of emphasising agency in structurally disadvantaged rural places. In T. Lang & F. Görmar (Eds.), *Regional and Local Development in Times of Polarisation. New Geographies of Europe* (pp. 319–341). Singapore: Palgrave Macmillan. https://doi.org/10.1007/978-981-13-1190-1

Pylak, K. (2015). Changing innovation process models: A chance to break out of path dependency for less developed regions. *Regional Studies, Regional Science*, *2*(1), 46–72. https://doi.org/10.1080/21681376.2014.979433

Ratajczak-Mrozek, M. (2014). The importance of locally embedded personal relationships for SME internationalisation processes – from opportunity recognition to company growth. *Journal of Entrepreneurship, Management and Innovation*, *10*(3), 89–108. https://doi.org /10.2139/ssrn.2578709

Ray, C. (2001). *Culture Economies: A Perspective on Local Rural Development in Europe*. Newcastle: Centre for Rural Economy.

Reidolf, M. (2016). Knowledge networks and the nature of knowledge relationships of innovative rural SMEs. *European Journal of Innovation Management*, *19*(3), 317–336. https://doi.org/http://dx.doi.org/10.1108/EJIM-06-2015-0043

Ring, J. K., Peredo, A. M., & Chrisman, J. J. (2010). Business networks and economic development in rural communities in the United States. *Entrepreneurship Theory and Practice*, *34*(1), 171–195. https://doi.org/10.1111/j.1540-6520.2009.00307.x

Shearmur, R. (2017). Urban bias in innovation studies. In H. Bathelt, P. Cohendet, S. Henn, & L. Simon (Eds.), *The Elgar Companion to Innovation*

and Knowledge Creation (pp. 440–456). Cheltenham, UK: Edward Elgar Publishing.

Shearmur, R., Carrincazeaux, C., & Doloreux, D. (2016). The geographies of innovations: Beyond one-size-fits-all. In *Handbook on the Geographies of Innovation* (pp. 1–16). Cheltenham, UK: Edward Elgar Publishing. https://doi.org/10.4337/9781784710774

Siemens, L. (2010). Challenges, responses and available resources: Success in rural small businesses. *Journal of Small Business & Entrepreneurship*, *23*(1), 65–80. https://doi.org/10.1080/08276331.2010.10593474

Simmie, J. (2012). Path dependence and new technological path creation in the Danish wind power industry. *European Planning Studies*, *20*(5), 753–772. https://doi.org/10.1080/09654313.2012.667924

Solesvik, M., & Gulbrandsen, M. (2014). Interaction for innovation: Comparing Norwegian regions. *Journal of Entrepreneurship, Management and Innovation*, *10*(3), 7–28. https://doi.org/doi.org/10.7341/20141031

Sotarauta, M., & Beer, A. (2017). Governance, agency and place leadership: Lessons from a cross-national analysis. *Regional Studies*, *51*(2), 210–223. https://doi.org/10.1080/00343404.2015.1119265

Sotarauta, M., & Suvinen, N. (2018). Institutional agency and path creation: Institutional path from industrial to knowledge city. In A. Isaksen, R. Martin, & M. Trippl (Eds.), *New Avenues for Regional Innovation Systems - Theoretical Advances, Empirical Cases and Policy Lessons.* (pp. 1–17). New York: Springer.

Spyridakis, M., & Dima, F. (2016). Reinventing traditions: Socially produced goods in Eastern Crete during economic crisis. *Journal of Rural Studies*, *53*, 269–277. https://doi.org /10.1016/j.jrurstud.2017.04.007

Stathopoulou, S., Psaltopoulos, D., & Skuras, D. (2004). Rural entrepreneurship in Europe: A research framework and agenda. *International Journal of Entrepreneurial Behaviour & Research*, *10*(6), 404–425. https://doi.org/10.1108/13552550410564725

Strambach, S. (2008). *Path Dependency and Path Plasticity: the Co- evolution of Institutions and Innovation - the German Customized Business Software Industry* (Working Papers on Innovation and Space). Marburg. Retrieved from http://hdl.handle.net/10419/111860 %0AStandard-Nutzungsbedingungen

Strambach, S., & Halkier, H. (2013). Editorial. Reconceptualizing change. *Zeitschrift Fur Wirtschaftsgeographie*, *57*(1–2), 1–14. https://doi.org/10.1515/zfw.2013.0001

Šumane, S., Kunda, I., Knickel, K., Strauss, A., Tisenkopfs, T., Rios, I. des I., … Ashkenazy, A. (2018). Local and farmers' knowledge matters! How integrating informal and formal knowledge enhances sustainable and resilient agriculture. *Journal of Rural Studies*, *48*, 232–241. https://doi.org/10.1016/j.jrurstud.2017.01.020

Torre, A. (2015). New challenges for rural areas in a fast moving environment. *European Planning Studies*, *23*(4), 641–649. https://doi.org/10.1080/09654313.2014.945811

Torre, A., & Wallet, F. (2016). *Regional Development in Rural Areas. Analytical Tools and Public Policies*. *Springer Briefs in Regional Science*. Cham, Switzerland: Springer. https://doi.org /10.1007/978-3-319-02372-4

van Hemert, P., Nijkamp, P., & Masurel, E. (2012). From innovation to commercialization through networks and agglomerations: Analysis of sources of innovation, innovation capabilities and performance of Dutch SMEs. *The Annals of Regional Science*, *50*(2), 425–452. https://doi.org/10.1007/s00168-012-0509-1

Virkkala, S. (2007). Innovation and networking in peripheral areas - a case study of emergence and change in rural manufacturing. *European Planning Studies*, *15*(4), 511–529. https://doi.org/10.1080/09654310601133948

Ward, N., & Brown, D. L. (2009). Placing the rural in regional development. *Regional Studies*, *43*(10), 1237–1244. https://doi.org/10.1080/00343400903234696

Abstrakt

Niniejszy artykuł analizuje rolę lokalnych zasobów (fizycznych, ludzkich, niematerialnych, społecznych, społeczniościowych oraz finansowych) w kształtowaniu innowacyjności przedsiębiorstw i rozwoju ścieżek na obszarach wiejskich. Istniejące badania nad innowacyjnymi badaniami przestrzennymi w dużej mierze pominęły specyficzne dla danego regionu zasoby obszarów wiejskich jako cechy ułatwiające innowacje. Niniejszy artykuł porusza następujące pytania badawcze: (i) jaka jest rola lokalnych zasobów wiejskich w działalności innowacyjnej firmy oraz (ii) w jaki sposób te zasoby kształtują ścieżki rozwoju regionalnego? Proponujemy ramy, które przyjmują całościowy obraz zasobów wiejskich i ich roli w kształtowaniu innowacji i ścieżek rozwoju regionalnego. Analizy empiryczne sugerują, że zasoby wiejskie oferują cenne i różnorodne możliwości wzrostu innowacyjności firmy, pod warunkiem, że firmy (pro) aktywnie mobilizują i celowo wykorzystują te zasoby w ramach swoich wysiłków na rzecz innowacji. Stwierdzamy, że zasoby wiejskie mają potencjał, aby rozszerzyć i ulepszyć ścieżki rozwoju regionalnego i działać jako składniki wzbogacające istniejące ścieżki o dodatkowe funkcje, a tym samym uczynić je bardziej zorientowanymi na przyszłość. Jednak samo poleganie na zasobach wiejskich nie wystarcza do ułatwienia istotnych zmian w ścieżkach regionalnych. Nasze analizy oparte są na częściowo ustrukturyzowanych wywiadach z przedstawicielami firm zlokalizowanych w wiejskiej części Estonii, działających w różnych branżach produkcyjnych i usługowych. Niniejszy artykuł przyczynia się do powstawania, ale nadal fragmentarycznej, literatury na temat innowacji na obszarach wiejskich i oferuje (kontekstowo) oparte, na poziomie mikro, ramy dotyczące roli lokalnych zasobów wiejskich dla trwałych innowacji na obszarach wiejskich. Ponadto badanie stanowi empiryczny wkład rzadko badanego kontekstu regionalnego w Europie Środkowej i Wschodniej.

Słowa kluczowe: *zasoby lokalne, obszary wiejskie, innowacje, ścieżka rozwoju, zasoby, Estonia*

Bibliographical notes

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Article III

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Tradition and innovation: Between dynamics and tensions

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Tradition is certainly not new to the domain of innovation research. However, the interplay between the two has attracted less nuanced attention than it should have. Drawing on institutional theory, the purpose of this paper is to explore the dynamics and tensions between traditions and innovations, by proposing an analytical framework. It also applies the framework using a case study approach, where the practices involved in the innovation process constitute the unit of analysis. The findings of the paper show that the interplay between the tradition and innovation is seldom a linear process; rather, there are dynamics and tensions related to both, with the enabling or restricting nature of tradition in innovative processes and the contribution of innovation to the preservation of tradition, be it in the form of knowledge or local cultural values.

Keywords: tradition, innovation, institutionalism

Highlights

- Tradition and innovation are complex dynamics and not linearly related.
- Varied types of innovation emerge from mixing traditional and modern approaches.
- Traditions may be supported by modern 'add-ons' and are not generally reinvented.
- Past knowledge is often seen as a major contributor to the innovation process.

Introduction

Tradition is a known concept in innovation research; however, it has attracted relatively little attention. Innovation studies tend to specialize in technological innovation (Godin 2012) and concentrate on science-based, high-tech and radical innovation, using proxies like R&D and patents (Hong, Oxley, and McCann 2012) which are easier to measure, but refer to only a certain type of innovation. However, innovation is far from being just a technological process. It is mostly a mental attitude (Pugliese 2001), a social process (Asheim and Isaksen 2002) where, for example, beliefs and social structures have a crucial role. Non-technological innovations and traditional knowledge, which can be decisive for economic growth and the development of the marginal (Doloreux, Dionne, and Jean 2007), have been overlooked.

Researchers from various fields have attempted to understand the meaning of tradition and innovation, the forms they take, their role and implications. Yet, only a limited number of scholars have explored the relations, the dynamics and the tensions that exist between innovation and tradition. Notwithstanding the scholarship exclusions, it is widely acknowledged that past knowledge transmitted through various generations or, more precisely, knowledge stored in various traditions, possesses enormous value (Calafati 2006; Nogueira, Pinto, and Guerreiro 2014; Petruzzelli and Albino 2012). One thread of literature tends to see tradition as synonymous with the ideas of obsolescence, stasis, antiquity and inefficiency (Cannarella and Piccioni 2011) and thus quite contrary to innovation, which has its etymological roots in 'innovare', meaning 'restoration' or 'renewal'.

Nonetheless, any ostensible tensions between tradition and innovation can also be considered as an opportunity to shape the future (Cannarella and Piccioni 2011; Voyatzaki 2013). Mitchell (2013) introduced the concept of creative enhancement, where innovation is seen as an addition to existing tradition. This concept contradicts the idea of 'creative destruction' (Schumpeter 1942) where it is believed that the creation of current innovations destroys previous innovations originating from an earlier economic system. It is clear that the interplay between these two concepts is a complex topic. This interplay can be a special construct for settings that are often characterized by historical reliance on traditional sectors and natural resources (Ring, Peredo, and Chrisman 2010).

Institutionalism offers a conceptual understanding for research on the interplay between tradition and innovation. It provides insights into the following aspects: (i) the appraisal of innovation in relation to an institutional-traditional background and, therefore, within a context and rules-based perspective; (ii) the attention to actors and agency in the discussion on change; (iii) the acknowledgement of the role of historic institutions, both in their restrictive and enabling nature, in the emergence and development of innovations; (iv) the role of innovation in the maintenance of tradition.

Keeping this context in mind, the purpose of this paper is to explore the dynamics and tensions between tradition and innovation, proposing and applying an institutionalist analytical framework. The illustration of the dynamics and tensions between tradition and innovation is based upon case studies in different contexts, where the innovation processes correspond to the unit of analysis. The three cases set in three different countries are a mud-based spa

treatment in Estonia, water management systems in India and cork harvesting in Portugal. In all these cases, we study the introduction of new practices, technologies and other forms of modernization as innovations that could support or threaten traditional institutions (including often traditional knowledge and manual practices), foregrounding the most relevant factors in this process.

Accordingly, with this explorative study, we contribute to interdisciplinary innovation-related literature. We add to the small body of research practice that tries to conceptualize the subject of innovation by considering the interplay between tradition and innovation.

As a first step, we need to unpack the words 'tradition' and 'innovation' to understand the way they are interlinked, which we do in the next section. The institutionalist approach is presented in the section that follows and proposes an analytical framework to analyze and discuss the interplay between tradition and innovation highlighted by the cases. The section thereafter presents the methodological options of the empirical research and a brief description of the cases. The penultimate section presents the main results of the analysis. The final section provides the conclusions and findings of the paper.

A perspective on tradition and its role in innovation activities

In *Questions of Tradition*, Phillips and Schochet (2004) argue that the concept of tradition has been scarcely examined in detail, despite the fact that the topic of tradition itself has attracted a wide range of academic disciplines. Each of the various disciplines have created their own vocabularies and interpretations of tradition leading to obfuscation and disjointed approaches. 'Tradition' is derived from the Latin root meaning 'to transmit or to send' (Cannarella and Piccioni 2011). Tracing the roots of the word to Roman jurisprudence, the historian David Gross defines tradition as a 'material transaction' and points out that tradition designates that 'something precious or valuable is given to someone in trust after which the person who receives the gift is expected to keep it intact and unharmed out of a sense of obligation to the giver' (Gross 1992, 9). Anthropologists and sociologists view tradition as an 'assortment of time-honoured customs' and a conscious choice of past actions (Linnekin 1983, 241). For instance, Linnekin (1983, 241) argues that 'tradition is a conscious model of past life ways that people use in the construction of their identity'. As a self-conscious category, tradition is inevitably 'invented'. Tradition is not a 'coherent body of customs, lying "out there" to be discovered, but an *a priori* model that shapes individual and group experience and is, in turn, shaped by it' (Linnekin 1983, 241). That is, it is an institutional framework that influences human interactions where power and different interests are at stake.

There is also general agreement among various scholars that tradition is related to transmitting things from generation to generation. For instance, Shils (1981) considers that 'anything' to be qualified as tradition, the 'things' handed down need to be created through human action, should be handed down from the past to the present and must include

> all accomplished patterns of the human mind, all patterns of belief or modes of thinking, all achieved patterns of social relationships, all technical practices and all physical artefacts or natural objects are susceptible to become objects in a process of transmission; each is capable of becoming tradition. (Shils 1981, 12)

The essence of this view is that traditions are 'preserves of great bodies of knowledge and skill' that have been developed through the ages which, if left unincorporated in traditions, ideas and practices, are ephemeral. Thus tradition, represents a stock and repository of wisdom accumulated over generations, ensuring continuity with the past (Shils 1981; Hibbert and Huxham 2010). Traditional knowledge is also considered as an important resource for economic development (Calafati 2006). It has a tacit nature and can be rooted in environmental characteristics and in raw materials (Nogueira, Pinto, and Guerreiro 2014).

Many innovation studies have highlighted the significance of past knowledge and of learning processes at the organizational level (Katila 2002; March, Sproull, and Tamuz 1991). Nelson and Winter (1982) are very clear about the central role played by the past knowledge embodied in firm routines, in shaping the innovative behaviour of organizations.

The link between novelty and what has existed previously (past knowledge) has been well established since the publication of Schumpeter's work (1934; 1939). Schumpeter (1939) argued that innovations are a 'new combination' of old components. For example, he defines a technological innovation as a new combination of the means of production. These new combinations involve the apparatus and knowledge assimilated in the products and processes in the past, which are later put together into additional innovations by the 'revolutionary entrepreneur'. However, Schumpeter neither explicitly referred to this stored knowledge as traditional knowledge nor did he scrutinize its economic significance. What he argued was that past innovations (accumulation of past knowledge) will be replaced by current innovations through the process of creative destruction which, to Schumpeter, would launch the next economic system. According to Mitchell (2013), creative destruction, the concept propounded by Schumpeter, runs contrary to creative enhancement where traditions are complemented by modernization.

Innovation, according to the scholarship, does not occur only at the level of an individual organization or at any actor level (Knickel et al. 2009) but is a wider social process involving the interplay of many actors and sectors. Consequently, values of a specific territory and a community's ethics can engender wider meanings thus giving rise to rural nostalgia or the (re)production of change (Galani-Moutafi 2013). When modernization fits the existing structures of communities very well, it is much easier to implement a change (Barkin and Barón 2005).

Nevertheless, the emergence of novelty (innovation) does not necessarily have to lead to the destruction of

the old (tradition). In fact, some recent studies have highlighted the relationship between traditional knowledge and innovation and how this recombinant process generates novelty (Petruzzelli and Albino 2012). Here novelty is considered as an 'unusual recombination of antecedent knowledge' (Trapido 2015, 1489). Innovations, according to Mitchell (2013), might be needed for complementing traditions or for preserving traditional activities. Some scholars, like Petruzzelli and Albino (2012), uphold the opinion that some traditions become necessary to legitimize certain varieties of innovations and to favour their acceptance. Innovations, it should be clarified here, can assume different forms. For instance, Cannarella and Piccioni (2011) divide innovations into two types: 'solution spotting innovations' (innovations that identify new ways to implement parts of existing praxes of techniques) and 'need spotting innovations' (innovations providing answers to known problems).

As flagged above, tradition can be malleable, subjective and capable of directing changes in society. Subsequently, this recombinant process and the renewal of tradition can have a vital role in value/opportunity creation and economic development processes in specific contexts, both at sectoral and geographical levels.

There are various economic and non-economic reasons for reintroducing traditional practices or approaches to support different forms of 'local development based on local traditions' or the development of 'traditional sectors' where the term 'traditional' refers to the dependence on innovative clusters of local resources (Cannarella and Piccioni 2011). According to Cannarella and Piccioni (2011) these 'traditiovations' arising from mixing traditional knowledge with modern practices are especially common to rural territories.

After exploring the nuances of tradition and its potential impact on new knowledge generation, the next section focuses on the interplay between the 'old' and the 'new' through the lens of an institutionalist approach.

Tradition and innovation: An institutionalist approach

The discussion of the interplay between tradition and innovation remits to the importance of institutional aspects, that is, norms, social rules, collective beliefs and habits. Institutionalists depart from the models of rational choice and stress the role of institutions in shaping human activity.

Institutions have been defined in multiple ways using multiple perspectives. Accordingly, there are a plethora of definitions on institutions in the literature. Among old institutionalists, these range from the Commons analogy of 'a building, a sort of framework of laws and regulations, within which individuals act like inmates themselves' (Commons 1934 [2003], 69) to Veblen's 'widely prevalent habits of thought in a given community such that they are analogous to cultural themes […]' (in Morgan et al. 2012, 25). Neo-institutional economists define institutions as 'rules of the game in a society' or 'more formally the humanly devised constraints that shape human interaction' (North 1991, 36).

Despite this conceptual diversity, it is possible to identify common aspects among old and new institutionalist approaches, which, we contend, present analytical grounding for research on the interplay between tradition and innovation. For instance, the idea of social embeddedness of human action (a 'situated social actor' [Reisman 2012, 23]) involves traditional and stable/routinized patterns of behaviour and is related to the idea of tradition as a handing-down process described in the previous section. These aspects are visible in both Hamilton and Hodgson's concepts of institution. According to Hamilton, institutions are 'a way of thought or action of some prevalence or permanence, which is embedded in the habits of a group or the customs of a people' (Reisman 2012, 5). On the other hand, according to Hodgson, institutions connote 'a social organization which, through the operation of tradition, custom or legal constraint, tends to create durable and routinized patterns of behaviour' (Hodgson 1988, 10).

The constraining and deterministic nature of the institutions debate motivated us to scrutinize it further, using cross-country cases. This debate is mainly important for the discussion on the interplay between tradition and innovation, particularly if we consider that innovation involves change and agency.

The interplay between tradition and innovation, as argued in this paper, involves two apparent paradoxes. First, institutions involve tradition and stability, but they also allow change and innovation; second is the simultaneous constraining and enabling nature of institutions and the role of agency in the process. Regarding the first paradox, it is important to mention that it is precisely the stable and routinized nature of institutions that creates the conditions for change and innovation. Institutions are constantly evolving incrementally, 'connecting the past with the present and the future as a part of sequential story' (North 1991, 97). Moreover, 'institutions produce order, encode knowledge, reconcile expectations, promote cooperation, reduce transaction costs and keep down uncertainty. […] We look backward because we look forward' (Reisman 2012, 11; 18). To put it differently, '[S]table expectations do not so much stifle new departures as provide the firm foundation upon which dynamic entrepreneurship can confidently build' (Reisman 2012, 28).

As far as the second paradox is concerned, it involves 'embedded agency' (Holm 1995), and corresponds to an important debate within institutionalism (Battilana, Leca, and Boxenbaum 2009). In fact, the debate on institutional change is closely related to that of 'action and agency' where 'the old institutionalism assertions attempt at reconciling a theory of institutional constraints and a theory of action' (Djelic 2012, 30). Rules are fixed and likewise they can vary depending on actors (individuals, organizations or groups).

Recent developments in neo-institutionalism on 'agency' relate to embedded action, and institutions as constraints but also as resources. These developments also highlight institutions as institutional entrepreneurship as a result of a 'spatially dispersed, multimodal, and complex process' ('collective kind') with 'several stages and consequences' and 'unexpected results' (Djelic 2012, 34). Institutional entrepreneurs are the agents of institutional change, contributing either to transforming existing institutions or the creation of new ones (DiMaggio 1988). They leverage

resources, initiate changes and actively participate in their implementation and can act in groups or networks (Battilana, Leca, and Boxenbaum 2009).

Institutional change can result from the 'gap that may emerge between the intentions and actual outcomes of institution building' (Campbell 2012, 101). This change can be accidental or occur through intentional neglect by actors as institutional environment change (drift); redirection of institutional goals, functions or purpose (conversion); and finally through exhaustion where the 5institution gradually withers away as it is no longer fit for the purpose (Streeck and Thelen 2005).

Thus, there seems to be no contradiction between tradition and innovation or between constraint and freedom according to the institutionalist approach. In this paper, we argue that the interplay and dynamics between what seems to be opposite aspects of institutions (stability and change; restriction and freedom) should be assessed in particular cases considering that the production and reproduction of the 'material means of life' work within different and specific institutional frameworks, thus leading to 'context-specific decisions and solutions' (Djelic 2012, 29) in different cases.

The contribution of innovation to the persistence of tradition may be one of the results of the interplay between tradition and innovation. But the results would not be as obvious as anticipated; the creative power that emerges from traditional institutions can destroy them. This evolution of institutions presents a complex dynamic related not only to the contribution of tradition to innovation, but also to the diversity of the results associated with the innovation, that is, the reproduction or decay of tradition where the novelties are rooted.

Institutionalist theoretical insights presented so far provide us an analytical framework to examine the interplay between tradition and innovation by highlighting specific dynamics and tensions. We have highlighted them in Figure 1. Based on the above discussion, the following dimensions were considered for the analysis of the three case studies taken from three different countries, with the results presented in the results section:

- The context and the actors responsible for the innovation.
- Balance between the restrictive and enabling nature of tradition in the development of innovations.
- Results of innovation in terms of reproduction and persistence of tradition.

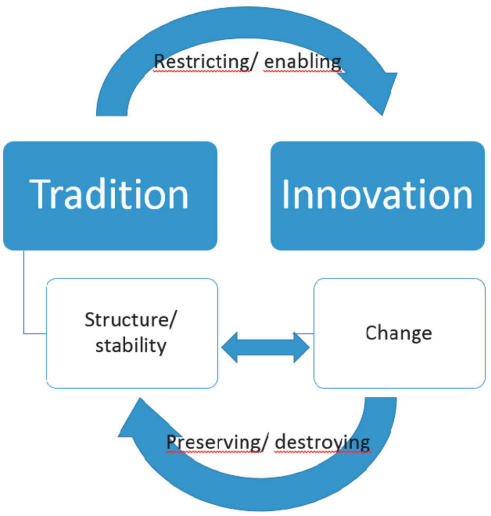

Figure 1: Tradition and innovation: Analytical dimensions.

Methodology

In this paper, the unit of analysis to study the relationship between tradition and innovation is an innovation process. We used three different cases to look at the practices historically. On the one hand, focusing on countries (Estonia, India, Portugal) (Table 1) with different economic statuses provides an opportunity to analyze cases in different settings and contexts regarding tradition-innovation dynamics. On the other hand, we observed that in all these cases innovation processes have been vital to the territories for a long time.

The Lääne County in Estonia is well-known for its natural beauty and coastal area and is heavily reliant on the tourism sector. Tilonia, in India, is well-known for its power looms and marble industry. The economic base of Coruche, Portugal, is characterized by a strong specialization in agriculture and forestry, especially cork and rice.

Turning to the unit of analysis, three innovation processes, one in each country, were chosen. In Estonia, a mud-based spa procedure was chosen. This mud is a local resource, which is excavated nearby from the sea. The traditional use of the natural form of the mud in its treatments (procedures), rather than variations of it, such as powders, is one of the reasons why this county is well-known as a health resort, thereby helping local markets and the local spa enterprises. For many visitors, especially those from Russia undergoing similar treatment, this historical link is a great attraction. The process here is the transporting of the mud in the local spas and using it in spa treatment.

In India, the focus is on the process of water management, which includes rainwater harvesting and desalination. The area where the case study was undertaken is susceptible to drought-like conditions and regularly suffers from insufficient rainfall. A major concern for the people living there is to get pure water for drinking and washing purposes. People in these areas are well-acquainted with the value of water and have mastered many traditional techniques for harvesting rainwater, but these skills are in danger of being forgotten and becoming obsolete. Accordingly, the Barefoot College of India has made several attempts to reinvent these traditional technologies and skills, and to disseminate them to these disparate rural communities to improve conditions and alleviate people from poverty.

Cork harvesting was selected in Portugal, a country where cork forests have an important role in socioeconomic and ecological terms. Cork oak forests are mostly privately owned, and the harvested cork continues to be

Table 1: An outline of national contexts.

Country	Estonia	India	Portugal
Case study area[a]	Lääne County	Tilonia village	Coruche municipality
Location in the country	Western part of the country	North-West of the country, Kishangarh, Rajasthan	Southern part of the country, Santarém region
Distance from the larger cities	100 km from the capital city Tallinn	370 km from New Delhi	100 km from the capital city Lisbon
Population (number of inhabitants)	23,800	7500	19,900
	9,9 per sq.km	130 per sq.km	17,8 per sq.km

[a]Territorial units are not similar in every country due to the different political and administrative systems.

sold as a raw material to companies who produce cork stoppers for wine, the main objective of cork production since the eighteenth century. Traditionally, men manually performed the process of stripping cork from the tree by using axes. More recently, machines have been produced that claim to make the stripping of the cork economically more effective.

This research draws on qualitative data, collected through face-to-face, semi-structured interviews in 2014. Purposive sampling (Gummesson 2000) in combination with the snowballing technique was used to identify innovative entrepreneurs and other key informants from the localities.

Interviews, ranging from 50 to 90 minutes, were conducted in each country. Interviewees were identified for their knowledge and opinions about the case process, and the role of innovation and tradition within them. In Estonia, this involved the managers of the tourism enterprises (identified as EE1 and EE2) and representatives of the local college (higher education organization) (identified as EU). In India, representatives of the Barefoot College were interviewed (identified as IB1 and IB2). In Portugal, managers of the cork production companies (identified as PE1 and PE2) and representatives of the local Association of Forest Producers (PA1) were interviewed. The interviews were recorded and fully transcribed in the interview language for meaning coding and thematic categorization (Kvale 2007). The information collected through interviews was complemented with information from secondary sources, including the organizations' websites and local official documents.

From the interview data, three cases, each one linked to a specific process, were developed for cross-analysis. The analysis used inter-rater reliability testing, involving the researchers individually analyzing the data and then comparing their findings, to identify the themes and agree on the key characteristics of the case being examined. The information collected through interviews was synthetized in analytical dimensions that structured the presentation of results; the use of the original discourses and sentences of the actors interviewed allows the illustration of some central aspects and main conclusions related to the cases selected.

Tradition and innovation: dynamics and tensions

The first stage of our analysis was to identify the context and the actors involved in the cases of innovation selected (Table 2). As far as the context is concerned, we dealt with cases located in rural settings. The leading entities involved in the innovation processes are enterprises (Estonia and Portugal cases) and a non-profit organization (Barefoot College, India). Despite the peripheral location of these cases, it is possible to find other actors involved in the development process. In the case of Estonia and Portugal, this includes universities responsible for the development of research related to the innovation process and are located at different territorial levels (local in the Estonian case; local/national and international in the Portuguese case). It is also worth mentioning the role of national level associations (forest producers in Portugal and Estonian spa association in the Estonian case). In addition, in Estonia and Portugal, other local and national firms have a significant part in the value chain and are involved in the innovation process.

Traditions are believed to give structure and stability. The appraisal of the restrictive and/or enabling nature of tradition in the innovation process requires the consideration of the traditional elements present in each case. As Table 3 summarizes, it is possible to find traditional institutions in our cases, namely knowledge and technology. In fact, old local knowledge, locally handed down from generation to generation, is vital in all cases and connected to local natural resources. Technology is also highly linked to sustainable usage of local resources.

Across the cases the 'old' or traditional is found to be related to local knowledge, techniques and practices strongly tied to natural resources. Past knowledge (rainwater techniques, usage of mud, and cork extraction and transformation practices) contributes heavily to the present activities of the core process.

Are traditions restricting or enabling innovations?

Having explored the traditional aspects of the processes and how they relate to the institutions of knowledge and technology, we now examine the enabling or restricting nature of those elements in the innovation process. The belief in traditional practices has led to the change in Estonia and India where alteration was needed to sustain the traditional core process.

In India, the Gandhian principles and ideologies of rural upliftment and knowledge sharing, as well as the empowerment of the women, to an extent, become the drivers for introducing pro-poor technologies. As a result, the water supply process designed by local communities and the experts at the Barefoot College is managed and controlled by the rural communities themselves with rural women being equal partners and sharing financial and budgetary powers as well. At the Barefoot College, underprivileged rural people learn to control 'technologies

Table 2: Actors involved in innovation process.

Estonia	India	Portugal
• Local spas • National level spa association • Other local and national firms that are part of the value chain in developing mud handling and other services because of getting tourists to the area • Health Promotion and Rehabilitation Competence Centre at the local college (research activities and development of new products from the mud and side products for using mud)	• Barefoot College, set up in 1971 as the Social Work and Research Centre (SWRC) • Local rural communities • Central University of Rajasthan	• Corticeira Amorim and other cork enterprises (local and national) • Cork Forest Producers' Association • Local and international universities

designed to meet the problems of real life, without assistance of specialized, paper qualified experts. Thus far, Barefoot College has created more than 1500 water harvesting structures through Barefoot architects in diverse eco-zones of hilly, mountainous, coastal, plains, desert and tribal regions of India. The structures are built using local knowledge and locally available resources. For instance, while talking to the most senior functionary at the Barefoot College about knowledge creation and knowledge blending, he responded saying that:

> Barefoot College (BFC), adopts a more reconciliatory approach. It intends to take formal knowledge to the very site through various translation mechanisms. The esoteric scientific or lab knowledge is first demystified and then explained to the people. For example, the sophisticated solar technology is elucidated to the rural people in Barefoot colleges to make the Barefoot Engineers. In programmes like in rain water harvesting, the knowledge of the people at the village level or a community level is not carried to the labs, but is used, tested and verified at the same local level, and the formal sector knowledge, once again, is encouraged to interact with this more site specific knowledge at the site of the work. (BF1)

'Such a mode of knowledge blending, in our view, does not offer uncritical supremacy to knowledge validated by logical reasoning over the knowledge validated through its efficacy in daily use' (IB1).

In Estonia, the introduction of technologies has changed (replaced hard manual work) the mud handling process before and after the treatment. However, the core of the treatment, greasing the customer with the mud is unchanged. It continues to rely on the powerful, centuries-old belief in the therapeutic value of the mud and the customs around that. The combination of technology and the traditional practice revived this old but dying traditional practice. This change, it looks today, was crucial to be able to continue with the old practices and therefore benefit the economy of the region. As the manager (EE1) explained:

> current employees are used to this hard, manual work while carrying the mud in buckets, but it would have been difficult to find new personnel to do this job in future as nobody wants to do heavy physical work and it is not efficient either.

This explains how the initiative for modernization came from the management level. The motive may be more commercial and marketing-driven than in the Indian case, but the outcome is similar: harmony between the old norms and customs and the introduction of modern technologies. In the case of Estonia, it is well-illustrated how keeping the harmony demands significant changes.

> So, we located the best specialists in Estonia in this field who could develop a solution that would simplify this process. During the renovation the mud storage facility was put in the basement, under the rooms where treatments are done. Then mud was heated using a heat pump and pumped up to the treatment room where it reached the bed through a hose. After the procedure mud can be very easily utilized by wiping it off the plastic covers. It goes to special tanks, which are emptied regularly by a car. As a result of this innovation the mud procedure was simplified by 9 degrees on a 10-degree scale. (EE1)

Today, there is a fully automatized system where mud and employee meet in the procedure room with a customer instead of carrying the buckets with mud through the long corridors. 'So this is a unique local solution and a good example of simplifying work procedures in the provision of services' (EE1).

In contrast, the Portuguese case is the only one in which the traditional aspects related with cork activities and ecology are contended (rather than supported) by the introduction of modern technologies. The traditional respect for the cork tree, the natural resource that is central to the sustainability of the livelihoods, economy and ecology of the rural territory, appears to be threatened and altered by the introduction of the cork stripping

Table 3: Traditional knowledge and technology.

Estonia Mud-based spa treatments	India Water management	Portugal Cork harvesting
Using mud excavated from the nearby sea in healing treatments; relocation of the mud in buckets in the spa building before and after the treatment; traditionally female work	Art of harvesting rainwater using local materials; learning from previous generations (not formal education); traditionally female work	Sustainable manual tree stripping techniques; traditional ecological system (*montado*) integrating cork oak forest and agricultural activities; traditionally male work

machinery. Nevertheless, the skills of the experienced male workers are still required for the use of the new machines. Temporarily, the local normative respect for the treatment of the natural resource is restored but the pending threat from the commercial drive for efficiency still looms large. The tense and conflicting nature of the relation between tradition and innovation in cork extraction is mentioned by the entrepreneurs interviewed. In fact, and according to the one of these entrepreneurs (PE1),

> the machine saves some work but the majority of workers do not want to use it, it is not practical for them, they are used to their old and traditional tools and do not want to substitute them. Besides, the machine is not so efficient in this task and it is always necessary to complement its use with human labour; the machine does not respect the natural shape of trees.

The new is primarily embodied in technology/machinery, products and systems, but also in new forms of knowledge sharing. Past knowledge (water supply, usage of mud and cork collecting practices) contributes greatly to the present activities of the core process. Different types of innovation are seen to emerge from the blending of traditional practices and new approaches. They also depend on the drivers and imperative behind changes within the case processes (market-driven, solutions or needs-driven, rural development-driven). It is possible to identify new techniques (water harvesting, mud handling), products (e.g., cork-based products like stoppers), new markets and brands (mud spas), but also social, community and institutional innovations (individual and social empowerment, community network, company-university networks, knowledge valuation and certification). In all cases, the blending of traditional institutions with innovations is purposeful, incremental and explicit.

Thus, when we consider the balance between the enabling and restricting nature of tradition, we see different situations in the three cases. In Estonia, tradition enables innovation: traditional knowledge about mud extraction and handling builds a foundation on which new techniques and practices are built and developed. In the Indian case, past knowledge was re-introduced and disseminated in new ways throughout the rural community. In these cases, there is a symbiotic or harmonic interplay between tradition and innovation. The Portuguese case shows how traditional local know-how with socioeconomic and environmental impacts is needed, even in the case of a total change of techniques, which can restrict new technologies and innovations. Traditional know-how about handling trees and cork is still crucial. Tradition is important to the development of innovations in different senses: traditional ecosystem, local know-how and material and immaterial heritage.

We have found that only in one of the cases the old knowledge remains wholly unchallenged or unaltered as new technologies in the core processes are introduced. This is the case of India where the core knowledge about water harvesting techniques is a reinvention of the old knowledge, complimented with new knowledge of treating and managing the water supply. In the other cases, the relationship between innovation, or the introduction (effective or essayed) of new technologies, and traditional knowledge is more complex.

The complexity of the interplay between tradition and innovation is visible also in the appraisal of the accidental or purposive decision of innovation of particular actors embedded in specific interactions and networks. In both the Estonian and Portuguese cases, there are deliberate searches for, and investments in innovations, even if it is foreseen that at some point new knowledge could change the old approved knowledge. For instance, in Estonia, the scientific research centre with the help of local spas is active in commissioning projects researching the mud's properties. These studies can confirm traditional beliefs with high-level knowledge and scientific evidence. On the other hand, there is also a threat that this research could find evidence, in the current ecological situation, against the mud and disprove beliefs about the natural qualities of the mud. Nevertheless, technological development in the process of handling the mud before and after spa treatment has changed the practices in the workplace (simplification of the physical work) as well as the need and qualification of staff. The intention is to enhance an old practice trough modernization. In the Portuguese case, research into modern tree stripping machines have led them, again temporarily, to a new level of knowledge that confirms the value of old techniques as being more sympathetic to the ecosystem of the cork trees and their environment. However, research continues to be driven and funded by commercial partners (industry and forest producers associations) in the cork process. If this research results in new machinery that strips the cork without damaging the tree, the old knowledge could indeed be contested again. Table 4 presents a synthesis of the main trends of the relation between tradition and innovation regarding enabling and restricting dynamics.

Are innovations preserving or destroying traditions?

According to institutionalist approaches mentioned above, the interplay between tradition and innovation can result in innovation supporting the persistence of tradition. Equally, however, the results can be otherwise: the creative power involved in innovation destroys tradition. In our study, the cases reveal different situations: old knowledge and traditional techniques or practices may be respected and supported by modern 'add-ons' that are welcomed and not generally reinvented/reintroduced, or they can be a threat to the traditional process. Thus, the relation between tradition and innovation presents a complexity that differs from case to case. As the Portuguese example shows, the introduction of new technology in trees harvest must be carefully considered because of the potential damage that can negatively impact the quality of the raw material directly which can damage business performance. Here innovations can compromise tradition. Where the preservation of traditional practices is an important imperative (Estonian and Indian cases), there is a strong emphasis on the local resource (mud, water) used in the case process (therapies, water harvesting) within a territorial logic (place marketing in the Estonian case). In Estonia and India, innovations are needed to sustain the traditional practices. Traditional practices can be used because they

Table 4: Traditions enabling or restricting innovations: Old norms and customs and introduction of modern technologies.

Estonia	India	Portugal
Enabling	Enabling	Restricting
Renovation of spa building as an opportunity for technical solutions envisaging a better use of local resources (mud)	Recovering of water harvesting techniques and empowerment of local communities	Machinery as a threat to ecological, social and cultural inheritance

work better for the case process (India, Portugal), the environmental resource is a key commodity in itself (cork, rain water/solar energy) and its preservation is central.

In fact, a key insight into the mutual effects of tradition and innovation is related to the use of natural resources in each case process (mud, rain water/solar energy, cork and water). The ownership of natural resources and respect towards the resources may change as the technology and market-driven motivations come in. At one extreme of the spectrum we find the Portuguese case, where the strongest market and business values and varied motives of actors seem to push towards the change, contrary to traditional institutions in the territory. At this end of the spectrum, the relationship between tradition and innovation is most in contention and traditional institutions are threatened by the introduction of new technologies, in spite of a local and increasingly global understanding of the urgent need for environmentally sustainable practices.

At the other end of the spectrum, in the Indian case of the rainwater management process, the balance between tradition and new technologies is most harmonious. Here we are dealing with a non-profit actor imbued with particular values (e.g., Gandhian principles), community-based and presenting social and cultural goals. It may be significant that respect for the natural resource is highest in this case even though it is clearly a commons. As already mentioned, Barefoot College in tandem with the local communities, plays a key role in reinventing traditional technologies related to water harvesting, thereby alleviating people from poverty. As flagged by the senior experts at the Barefoot College, the ancient knowledge is being invigorated and used. As of now no serious technical or financial support is provided by the local universities or technical institutions. The traditional technology of rainwater harvesting in Rajasthan is revived by Barefoot architects who are basically local villagers without any association or link to the formal education systems and have never been exposed to any engineering college. All structures are erected, designed, planned and implemented through a community managed process. The structures are built using locally and nearby available material. This initiative has zero maintenance costs after its completion and is managed and controlled by the communities themselves where rural women are equal partners having financial and budgetary powers. To develop this old technology further, Barefoot College has implemented and linked this technology with many modern methods of water solutions and water management. The most prominent are solar-powered reverse osmosis (R/O) water desalination plants, wells and ponds for groundwater recharge. A water mapping website (water sample test results) that is fully controlled and managed by rural communities, that, and according to one of the interviewees,

> have mastered this art of rain water harvesting from their ancestors, managed and controlled by the communities themselves where rural women are equal partners having financial and budgetary powers. The safeguarding of the traditional art of water harvesting itself is an asset. Its continuity is ensured at a time when modern technology is entering every home (IB2).

Moreover, BFC does not have any arrangement of rewarding, protecting or commercializing informal knowledge. Rather, knowledge is locally produced and reproduced, and not many financial or market-driven incentives are offered for large-scale commercial use.

Somewhere in the middle of the spectrum is the Estonian process, in which tradition and new technologies are complementary to some extent. The process involves a commercial relationship with the natural resource, which is a commons, and also has some form of local place marketing imperative. The wider spectrum of actors related to the process do not seem to raise tensions, as they seem to have a common purpose (development of the regionally important economic sector); consequently, the dynamics support working in partnership. The national-wide network of partners of the Competence Centre, including entrepreneurs and their unions, are waiting for the new or approved knowledge in the form of scientific research results. The expectations of entrepreneurs regarding the research developed by the Competence Centre are high. According to one of the entrepreneurs interviewed, 'We hope that you find from the mud even the things that are not there' (EE2). Table 5 presents a synthesis of the central trends related to the tension between tradition and innovation in the three case studies.

Conclusion

The three cases presented exemplify the complexity involved in the relationship between tradition and

Table 5: Innovation preserves or destroys tradition: Maintenance of old norms and customs (knowledge) with modern technologies.

Estonia	India	Portugal
Maintenance	Maintenance	Threat
Traditional knowledge and natural resources of spa treatments are protected and improved through modernization	Traditional knowledge of water harvesting is protected and disseminated through technological modernization	Traditional knowledge and natural resources are at risk with technological innovation

innovation. In Portugal, cork extraction is a traditional activity involving traditional knowledge handed down from father to son, with some craftsmanship around it. But its uses and product characteristics are continuously changing, mainly in response to strong R&D investments from stopper producers and there is an attempt to change cork extraction activity through the introduction of a machine. In Estonia, mud and its health curing impact, and the practitioner's knowledge are traditional, but the mode of business is new (marketing-based innovation). Moreover, the traditional knowledge about health impact may also be challenged by modifications in the environment (e.g. pollution) and by new knowledge produced by scientific research. In India, the property rights arrangement is traditional, while knowledge and material are a mixture of traditional and modern. But to what extent it can remain relevant depends on water use, which may change due to modern lifestyle.

Our findings show that we are not dealing with linear processes; rather, there are dynamics and tensions related to both the enabling or restricting nature of a tradition in innovative processes and the contribution of an innovation to the preservation as well as the fall of tradition, be it in the form of knowledge or local cultural values. Furthermore, the processes in the cases are based on natural resources and thus the relationships between tradition and innovation in these located and particular cases highlight the importance of ecology and nature in the identity of these territories. The maintenance of traditional knowledge, practices and other cultural aspects of local life reveals specific dynamics and, sometimes, tensions in the interface with novelty and innovation.

What becomes apparent from the discussion above is that sticky tradition (Petruzzelli and Albino 2012) forms a storehouse of knowledge comprising information, skills, concepts, products, etc. Yet, at the same time, it can be malleable, subjective and capable of directing the changes in a society. Many social groups can have different traditions within a society, and the involvement of individual perception adds to this debate. It proves that viewing tradition with one lens could provide a limited perspective. From our cases, we can see that different groups within a society can subjectively perceive 'tradition' and interpret it differently. This corresponds to the findings of Cannarella and Piccioni (2011) who stress the importance of subjective aspects like experiences, intuitions, memories, etc. and not only the technology, while discussing the impact of traditions for innovations.

From the discussion above it also becomes clear that whatever the reasons, traditions are not seen as immune to change; rather they are regularly invented and reinvented. Varied patterns are recognized while considering the dynamics and tensions of innovation and tradition. Innovations can be incorporated with traditions without any difficulty, at the same time traditional practices and know-how could be of great use. In our cases we found that different actors (firms, communities, etc.) have resorted to tradition for various benefits. Past knowledge in terms of experience, expertise and know-how is seen as a major contributor to the innovation process. Many view modern technologies as a fusion of past ideas and inventions discovered at different times. Thus, to dismiss the importance of past knowledge or tradition in the process of innovation would be erroneous. Innovation is needed to give tradition a kind of continuity and form to life; 'tradition cannot be categorically ignored or rejected because such an attempt produces social and political harm as well as and epistemic incoherence' (Polanyi in Mitchell, 2011, 207). This could be also corroborated by the fact that many communities around the world have either adopted traditions for rural, local development or have taken them on simply as an alternative to modern-day, free-market economics.

The findings from our study suggest that different types of innovation are seen to emerge from the blending of traditional practices and modern approaches – innovations in terms of social and community innovations, institutional innovations, environmental innovations, beyond more conventional types of innovation such as new products/markets. They also depend on the drivers and imperative behind changes within the case processes (market-driven, solution or needs-driven, rural development-driven).

Rather, the traditional techniques or practices themselves (traditional knowledge) are respected and supported by modern 'add-ons' that generally are welcomed and not generally reinvented/reintroduced, as some of the literature suggests. Similarly Mitchell (2013) noticed that the creative enhancement that introduces additions overrides the massive replacement of old innovations (traditions) by newer innovations, especially in smaller or more isolated rural settings. Each of our case processes is dependent on modernization and tradition working together but they remain somehow independent. Ultimately, in these cases, external knowledge (innovations, technologies, etc. from outside the local context) helps to preserve tradition; and combining traditional and modern approaches shapes new forms of innovation. Local traditions and practices are sometimes pushing toward the innovations.

Referring back to the discussion in the small volume of literature on tradition and innovation, our cases support the notion of combining tradition and new knowledge in novel ways, rather than the re-enactment of traditions. The desire to use local resources seem to support this combination. Likewise, Nogueira, Pinto, and Guerreiro (2014) stressed the role of local resources.

Our study contributes to the small volume of research practice on tradition in innovation by adding knowledge to the subject of innovation through considering the complex relation between tradition and innovation. Based on previous research, it is clear that this topic should be approached within a broad framework and contributes to the knowledge of the identity and maintenance of particular ways of life. In our study, we proposed an analytical framework for analyzing traditions and innovations. Although we considered only a small number of cases, we revealed a number of examples of tensions and dynamics. This points to the necessity of wider studies in different cultural contexts to confirm the identified patterns.

The interplay between tradition and innovation must be kept in mind by different level managers when implementing innovation processes inside a firm or designing innovation policies. Indeed, this study reminds us of the complexity of innovation systems when compared with

the linear processes that often seem to be the focus of different support schemes in innovation systems. This interplay should also be considered when innovation support programmes are developed.

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References

Asheim, B. T., and A. Isaksen. 2002. "Regional Innovation Systems: The Integration of Local 'Sticky' and Global 'Ubiquitous' Knowledge." *Journal of Technology Transfer* 27: 77–86.

Barkin, D., and L. Barón. 2005. "Constructing Alternatives to Globalisation: Strengthening Tradition through Innovation." *Development in Practice* 15 (2): 175–185.

Battilana, J., B. Leca, and E. Boxenbaum. 2009. "How Actors Change Institutions: Towards a Theory of Institutional Entrepreneurship." *Academy of Management Annals* 3 (1): 65–107.

Calafati, G. A. 2006. "'Traditional Knowledge' and Local Development Trajectories." *European Planning Studies* 14 (5): 621–639.

Campbell, J. L. 2012. "Institutional Reproduction and Change." In *The Oxford Handbook of Comparative Institutional Analysis*, edited by G. Morgan, John L. Campbell, C. Crouch, O. K. Pedersen, and R. Whitley, 87–115. Oxford: Oxford University Press.

Cannarella, C., and V. Piccioni. 2011. "Traditiovations: Creating Innovation from the Past and Antique Techniques for Rural Areas." *Technovation* 31: 689–699.

Commons, J. R. 1934. *Institutional Economics*. New York: Macmillan.

DiMaggio, P. J. 1988. "Interest and Agency in Institutional Theory." In *Institutional Patterns and Organizations*, edited by L. Zucker, 3–22. Cambridge, MA: Ballinger.

Djelic, M.-L. 2012. "Institutional Perspective – Working Towards Coherence of Irreconcilable Diversity?" In *The Oxford Handbook of Comparative Institutional Analysis*, edited by G. Morgan, John L. Campbell, C. Crouch, O. K. Pedersen, and R. Whitley, 15–40. Oxford: Oxford University Press.

Doloreux, D., S. Dionne, and B. Jean. 2007. "The Evolution of an Innovation System in a Rural Area: The Case of La Pocatière, Québec." *International Journal of Urban and Regional Research* 31 (1): 146–167.

Galani-Moutafi, V. 2013. "Rural Space (Re)produced – Practices, Performances and Visions: A Case Study from an Aegean Island." *Journal of Rural Studies* 32: 103–113.

Godin, B. 2012. "'Innovation Studies': The Invention of a Specialty." *Minerva* 50 (4): 397–421.

Gross, D. 1992. *The Past in Ruins: Tradition and the Critique of Modernity*. Massachusetts: The University of Massachusetts Press.

Gummesson, E. 2000. *Qualitative Methods in Management Research*. Thousands Oaks: Sage Publications.

Hibbert, P., and C. Huxham. 2010. "The Past in Play: Tradition in the Structures of Collaboration." *Organization Studies* 31 (5): 525–554.

Hodgson, G. 1988. *Economics and Institutions*. Cambridge: Polity Press.

Holm, P. 1995. "The Dynamics of Institutionalization: Transformation Processes in Norwegian Fisheries." *Administrative Science Quarterly* 40 (3): 398–422.

Hong, S., L. Oxley, and P. McCann. 2012. "A Survey of the Innovation Surveys." *Journal of Economic Surveys* 26 (3): 420–444.

Katila, R. 2002. "New Product Search Over Time: Past Ideas in their Prime?" *Academy of Management Journal* 45: 995–1010.

Knickel, K., G. Brunori, S. Rand, and J. Proost. 2009. "Towards a Better Conceptual Framework for Innovation Processes in Agriculture and Rural Development: From Linear Models to Systemic Approaches." *The Journal of Agricultural Education and Extension* 15 (2): 131–146.

Kvale, S. 2007. *Doing Interviews*. Los Angeles: Sage Publications.

Landes, D. S. 1998. *The Wealth and Poverty of Nations, Why Some Are So Rich and Some So Poor*. New York and London: W.W. Norton & Company.

Linnekin, J. S. 1983. "Defining Tradition: Variations on the Hawaiian Identity." *American Ethnologist* 10: 241–252.

March, J. G., L. S. Sproull, and M. Tamuz. 1991. "Learning from Samples of One and Fewer." *Quality Heath Care Research* 2: 1–13.

Mitchell, C. J. 2013. "Creative Destruction or Creative Enhancement? Understanding the Transformation of Rural Spaces." *Journal of Rural Studies* 32: 375–387.

Morgan, G., John L. Campbell, C. Crouch, O. K. Pedersen, and R. Whitley, eds. 2012. *The Oxford Handbook of Comparative Institutional Analysis*. Oxford: Oxford University Press.

Nelson, R., and S. Winter. 1982. *An Evolutionary Theory of Economic Change*. Cambridge, MA: Harvard University Press.

Nogueira, C., H. Pinto, and J. Guerreiro. 2014. "Innovation and Tradition in the Valorisation of Endogenous Resources: The Case of Salt Flower in Algarve." *Journal of Maritime Research* XI (I): 45–52.

North, D. C. 1991. "Institutions." *Journal of Economic Perspectives* 5 (1): 97–112.

Petruzzelli, A., and V. Albino. 2012. *When Tradition Turns into Innovation: How Firms Can Create and Appropriate Value through Tradition*. Oxford: Chandos Publishing Hexagon House.

Phillips, M., and G. Schochet. 2004. *Questions of Tradition*. Toronto: University of Toronto Press.

Pugliese, P. 2001. "Organic Farming and Sustainable Rural Development: A Multifaceted and Promising Convergence." *Sociologia Ruralis* 41 (1): 112–130.

Reisman, D. 2012. *The Social Economics of Thorstein Veblen*. Cheltenham: Edward Elgar.

Ring, J. K., A. M. Peredo, and J. J. Chrisman. 2010. "Business Networks and Economic Development in Rural Communities in the United States." *Entrepreneurship Theory and Practice* 34: 171–195.

Schumpeter, J. A. 1934. *Theory of Economic Development*. Cambridge, MA: Harvard University Press.

Schumpeter, J. A. 1939. *Business Cycles: A Theoretical, Historical, and Statistical Analysis of the Capitalist Process*. New York: McGraw-Hill.

Schumpeter, J. A. 1942. *Capitalism, Socialism and Democracy*. New York: Harper.

Shils, E. 1981. *Tradition*. Chicago: University of Chicago Press.

Streeck, W., and K. A. Thelen. 2005. *Beyond Continuity: Institutional Change in Advanced Political Economies*. Oxford: Oxford University Press.

Trapido, D. 2015. "How Novelty in Knowledge Earns Recognition: The Role of Consistent Identities." *Research Policy* 44 (8): 1488–1500.

Voyatzaki, M. 2013. "Handling Tradition for a Systemic Innovation." *Journal of Architecture and Urbanism* 37 (4): 231–238.

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Olaniyi E. O; Reidolf, M (2015). Organisational Innovation Strategies in the Context of Smart Specialization. Journal of Security and Sustainability Issues, 5 (2), 213−227.
Kindel, Kristiina; Venesaar, Urve; Reidolf, Merli (2013). Communication channel choice between enterprises and government. Databases and Information Systems VII: Selected Papers from the Tenth International Baltic Conference, DB&IS 201. In: Caplinskas, A.; Dzemyda, G.; Lupeikiene, A.; Vasilecas, O. Amsterdam (Ed): IOS Press, 218−231.
Raagmaa, G.; Masso, J.; Reidolf, M.; Servinski, M. (2013). Empowering people and enterprises with strong cultural and territorial identity: A case study of Setomaa, Estonia. In: Kinnear, S.; Charters, K.; Vitartas, P. (Ed.). Regional Advantage and Innovation. Springer-Verlag, 233−254.

Prause, G.; Reidolf, M. (2011). E – Governmental Services for Entrepreneurs in the Baltic Sea Region. China-USA Business Review, 10 (11), 1168−1178.
Reidolf, M.; Keerberg, A.; Hartikainen, A. (2011). Universities' Role in the Region: The Case of Saaremaa Small Craft Competence Centre. In: Prause, Gunnar; Venesaar, Urve (Ed.). University-Business Cooperation Tallinn 2011 (38−51). Berlin: Berliner Wissenschafts-Verlag.
Mäger (Reidolf), M.; Kiili, J. (2006). Conventional and aspatial peripherality: the case of Setomaa. XIV majanduspoliitika teaduskonverents: 14th scientific conference on economic policy : reports-papers of the XIV scientific and educational conference Berliner Wissenschafts-Verlag; Mattimar, 329−350.

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Olaniyi E. O; Reidolf, M (2015). Organisational Innovation Strategies in the Context of Smart Specialization. Journal of Security and Sustainability Issues, 5 (2), 213−227.

Kindel, Kristiina; Venesaar, Urve; Reidolf, Merli (2013). Communication channel choice between enterprises and government. Databases and Information Systems VII: Selected Papers from the Tenth International Baltic Conference, DB&IS 201. In: Caplinskas, A.; Dzemyda, G.; Lupeikiene, A.; Vasilecas, O. Amsterdam (Ed): IOS Press, 218−231.

Raagmaa, G.; Masso, J.; Reidolf, M.; Servinski, M. (2013). Empowering people and enterprises with strong cultural and territorial identity: A case study of Setomaa, Estonia. In: Kinnear, S.; Charters, K.; Vitartas, P. (Ed.). Regional Advantage and Innovation. Springer-Verlag, 233−254.

Prause, G.; Reidolf, M. (2011). E – Governmental Services for Entrepreneurs in the Baltic Sea Region. China-USA Business Review, 10 (11), 1168−1178.

Reidolf, M.; Keerberg, A.; Hartikainen, A. (2011). Universities' Role in the Region: The Case of Saaremaa Small Craft Competence Centre. In: Prause, Gunnar; Venesaar, Urve (Ed.). University-Business Cooperation Tallinn 2011 (38–51). Berlin: Berliner Wissenschafts-Verlag.
Mäger (Reidolf), M.; Kiili, J. (2006). Conventional and aspatial peripherality: the case of Setomaa. XIV majanduspoliitika teaduskonverents: 14th scientific conference on economic policy : reports-papers of the XIV scientific and educational conference Berliner Wissenschafts-Verlag; Mattimar, 329–350.