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# Rural network assemblages – disentangling egocentric networks of digital pioneers in peripheral German regions

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## ABSTRACT

Digital solutions are seen as promising ways of addressing current challenges in rural regions. Individual or group key actors accessing resources foster these developments through networks. In light of regional clustering and agglomeration effects on the one hand and increased virtual mobility on the other hand, assumptions about the spatiality of such networks are highly controversial. Our paper takes this as a point of departure, asking how spatiality is constructed in the networks of so-called ‘digital pioneers’ (DPs). The sampling process took place in two German rural regions with different preconditions for digital technology adoption, where we conducted egocentric network analysis and qualitative interviews. Employing the assemblage perspective, we analysed networks of 30 individuals in terms of the analytical categories of territoriality, stability and connectivity. Our findings distinguish between three important roles of network contacts: (1) multipliers in social networking, (2) users of the DP’s products and services, as well as (3) close family members that are important in professional contexts. Although DPs are often deeply embedded in and feel attached to their region, networks vary significantly in their territorial radius, also including highly functional problem-solving contacts to distant places. Consequently, our evidence challenges static territorial models of innovation processes, advocating for processual and multidimensional perspectives that consider social networks and individual agency. Likewise, our study complements current research on rural governance by shifting the focus from key institutions and formal networks to less formally integrated actors and problem-solving networks.

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## 1. Introduction

Rural regions are often described as the periphery, facing demographic shrinkage and a thin institutional density (de Souza, 2017; Pike et al., 2024). Digital solutions such as information and communications technology (ICT) promise to mitigate spatial disadvantages by creating regional governance networks and new ways of value creation through knowledge transfer (Bar et al., 2024; Bonfiglio et al., 2017; Holl & Rama, 2009), even if rural regions are shaped by disadvantages regarding digital connectivity as well as pre-conditions for technology adoption and digital literacy (Holl & Rama, 2024; Salemink et al., 2017). More generally, territorial models of innovation processes emphasise the role of geographical proximity and regional context conditions for accessing crucial resources as knowledge or institutional support; often focusing on urban advantages, based on agglomeration effects (Gust-Bardon, 2012; Tödtling & Trippel, 2005). As an example, small- and medium-sized enterprises (SMEs) located in rural locations are adopting digital technologies with a clearly lower probability than their counterparts in small or large towns (Holl & Rama, 2024). The current research on social network analysis relates to this by studying the role of social networks for regional development (Panitz, 2025), network governance (Albornoz et al., 2024) and social innovation (Esparcia, 2014; Georgios & Barraí, 2023). In these discourses, social networks are understood as a form of organisation of collective action (Knieling & Kunzmann, 2005). By analysing such networks relating to individual actors and their agency, the spatial dimension becomes a central point of interest. How do those

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actors relate to administrative borders and construct relational arrangements such as the region? Considering rural network assemblages, we highlight the socially constructive and relational character of space, tracing the regional collage that is both constructed and deconstructed through egocentric networks. Within the debates on rural development and entrepreneurship, both perspectives are highlighted in Müller and Korsgaard (2018), developing the concepts of ‘resource embeddedness’ and ‘bridging across spatial contexts’. Whilst the former refers to trust and dense social networks in the regions where the respective actors are based and have biographical ties, the latter relates to strategically selected inter-regional ties for accessing those resources that are not available at closer distances.

We searched for actors with digital literacy who shape regional development processes. The sample of so-called ‘digital pioneers’ (DPs) consisted of individuals whose agency was attributed to their use of ICT to address local challenges. We define DPs as public or private individuals or groups who can play a pioneering role in the context of digitalisation in peripheral rural areas. Drawing on resources such as knowledge, creativity and technical and digital skills, they drive social innovation in those places. Hence, DPs are ‘early adopters’ (Rogers, 1962) of new technologies, and as such, they are ‘actors of change’ in terms of leadership (Binder & Witting, 2022; Píša, 2023), playing an emergent role in rural governance constellations. In analysing the social networks of these actors from an agency perspective (Calignano & Nilsen, 2024), we take a closer look at the attributes of space. With its focus on the density and quality of networks, network analysis has a blind spot to the interrelation between the characteristics of the networks and their spatial context (Viry et al., 2022). Our paper addresses this research gap by examining the impact of spatiality in rural egocentric network analysis with a focus on ‘problem-solving networks’ (Fürst, 2005). It relates to further blind spots by focusing on rural digitalisation beyond the now in many places, significantly improved infrastructures of broadband and mobile coverage (Holl & Rama, 2024; Maruseva & Kroll, 2025), among other things, focusing on the interrelation between entrepreneur [respectively key actors], place and community (Saleminik et al., 2025). Through including basic service providers in the fields of public health and mobility, the perspective is broadened beyond the rural innovation discourses focused on small- and medium-sized enterprises. By reconstructing ego-centred networks, we complement current governance research, tracing regional overall networks. Therefore, the main research question is: How is spatiality constructed in the egocentric networks of digital pioneers? The subordinated research questions examine (a) the impact of territoriality in the constitution of bridging and bonding ties and (b) the characteristics of these networks. Hence, we define spatiality as dynamic, flexible and place-bound and develop three analytical categories, which will be further discussed in Section 2. Employing this perspective, we challenge Fürst’s assumption that networks are built where there is already a culture of cooperation (Fürst, 2005, p. 712). In referring to the egocentric networks of the DPs as rural network assemblages, we argue instead for a relational perspective with reference to our network data and highlight the multiple, heterogeneous character of these relations.

Mettenberger et al. (2024) explore how DPs make use of different kinds of resources via their agency. Besides personal and regional, network resources were identified as one of the three crucial dimensions. The present article follows on from that, presenting a deepened assemblage theory-driven analysis of the spatial relationships of egocentric networks and their implications for regional development, governance and entrepreneurship in rural areas. Our paper is composed of four sections. Section 2 discusses the current state of research and introduces our three analytical categories of territoriality, stability and connectivity. Section 3 contains the research design of the study and our methodological approach. Section 4 presents the empirical data of our egocentric network analysis ( $n = 30$ ), which are discussed by asking how spatiality is constructed in these networks. We focus on three phenomena: key contracts (so-called ‘alteri’) in the roles of multipliers, users, and family members. In Section 5, we discuss our findings, relating to current debates on rural development, regional governance and egocentric network analysis. Section 6 concludes with the challenges and limits of our study and expand on future research.

## 2. Rural governance networks as assemblage

Social networks are seen as important for rural development in Germany and Europe (Meador, 2019; Richter, 2019). Such processes are often steered through multi-sectional and multi-level governance arrangements. In contrast to governmental leadership, governance is substantially exercised through network

structures, bringing together heterogeneous sets of actors from the public as well as from the private and civil sectors (Edwards et al., 2001; Zürn, 2000). Often, a crucial aim in rural development schemes is ‘decentralisation’, meaning the inclusion of new stakeholders, thereby benefiting from their knowledge and networks (Küpfer & Kundolf, 2021). Such stakeholders could be individual (e.g., majors or founders) as well as group actors (e.g., companies or initiatives).

Previous research on rural development has already highlighted the question of spatiality, examining the impact of spatiality in integrating resourceful actors into governance arrangements (Bosworth et al., 2016; Edwards et al., 2001). For a long time, the focus lay on endogenous potentials, which could be leveraged by activating and relating stakeholders within the respective regions (Ray, 1999). From this perspective, a spatial concept of the *region as a container* is proclaimed that spatially determines the actors and their networks. Over recent decades, the so-called ‘neo-endogenous’ paradigm has gained momentum, shifting attention towards supra-regional relationships and emphasising the relevance of including spatially distant resourceful key institutions (Dargan & Shucksmith, 2008; Georgios & Barraí, 2023). From this point of view, the notion of the *region as a container* is not challenged either, though it already highlights the fuzzy character of assigning administrative borders with the attribute of ‘supra-regional’.

Regional economic perspectives are often based on territorial innovation models. Regional development is regarded as a ‘box’ with certain inputs and outputs (Gust-Bardon, 2012). Clusters and regional innovation systems emerge in relation to these series of sequential changes characterised as innovation processes, and contribute to the performance of networks (2012, p. 11). Such models rely on the crucial assumption that spatial clustering and agglomeration effects promote entrepreneurship and economic success within a region (Gust-Bardon, 2012). Explanations relate to knowledge spillovers (Galliano et al., 2019); the exchange of tacit knowledge (Tödtling & Trippel, 2005), shortened supply chains, or local skills development (Merrell & Charles, 2025). Such analyses often emphasise the disadvantages of peripheral rural regions (Bonfiglio et al., 2017, p. 78; Fanelli, 2018, p. 582; Favre-Bonte et al., 2019, p. 1038), which are characterised by low company activity and knowledge density. As Galliano et al. (2019) we challenge this deficit-oriented territorial approach to innovation in rural areas by taking a closer look at the networking processes.

Against the backdrop of a thin institutional density in our regions, characterised as ‘very rural’ through the ‘Thünen-Typology’ (Küpfer, 2016), we focus on rural networks that shape regional development. However, these networks relate to different local/regional spatial scales. Hence, our analysis requires a relational perspective. From the perspective of regional governance, we discuss some of the promising theoretical approaches of assemblage that can be useful for our ego-network analysis in rural peripheral regions.

### 2.1. A relational perspective on regions

Derived from the French structuralist philosophy of Deleuze and Guattari, assemblage theory is considered a ‘novel approach to social ontology’ (DeLanda, 2006). It challenges spatial deterministic argumentation, such as the region as a container or regional development as a box and labels social entities as ‘conception-independent’ (2006, p. 3). Since Deleuzian conceptual work on assemblages is dispersed and fragmented, DeLanda’s monography (2006) serves as a key reference for clarifying the assemblage perspective relevant to our paper. ‘Regional assemblages’ are central to the work of Allen and Cochrane (2007) and, from 2010 onwards, the discourse has increasingly shifted toward the urban context (Durose et al., 2022; Kamalipour & Peimani, 2015; McFarlane, 2011).

Allen and Cochrane define a region as ‘a product of networked flows and relations fixed in a more or less provisional manner’ (2007, p. 1162). With this conceptualisation of regions, two key dimensions can be highlighted. First, the primary focus is on the flows and relations that constitute a region. Second, the processes through which regions are constituted are described as dynamic. While networks are used to describe these flows, they are not methodologically referenced as a means to operationalise a study of flows and relations. With this approach in mind, we developed our first analytical category, *territoriality*, and hereby refer to our network data, e.g., the spatial relation between the ego (DP) and its alteri. In planning literature, we correspond with the notion of territoriality (Pecqueur, 2014) as ‘geographical space’ (Favre-Bonte et al., 2019, p. 1038), referring to territoriality as the spatial boundaries of administrative borders.

The second category, *stability*, seeks to qualify the constitution of these networks ‘in a more or less provisional manner’ (Favre-Bonte et al., 2019, p. 1038). Network analysis provides the methodological tools to

characterise the dynamic processes of the constitutive character of networks. By discussing the frequency of contact within our sample of ego-networks, this second dimension of analysis places particular emphasis on geographical proximity. A key question is the impact of spatial location in shaping and qualifying these contacts, especially considering that the actors are characterised by their digital literacy in the use of ICT, thus making them potentially independent from local copresence.

*Connectivity*, as the third category, shifts the attention to the relational processes of place attachment. Here, processes that relate to spatial boundaries are examined with a special focus on the impact of ICT. The question of whether these technologies ‘blur the spatial boundaries of social entities by eliminating the need for copresence’ (DeLanda, 2006, p. 13) will be tackled in the empirical section of our paper and will be discussed further. Agency is shaped through the concept of place as developed by Massey (1994). From this perspective, social networks are also shaped by relational positioning towards places (place attachment), meaning ‘an affective bond between a particular person and a particular place or a generic type of place and its characteristics’ (Birnbaum et al., 2021, p. 190).

Employing the analytical lens of assemblage thinking thus enables us to tackle the problem of linking the macro spatial dimension, characterised by two very rural regions in Germany, and the micro dimension, constituted by the agency of the DPs. The next section will discuss how this agency can be described in relation to resources.

## 2.2. Resource transfer from an ego-centric network perspective

Theoretical reflections on ego-centric networks refer to widespread concepts and differentiations. In his research in the early 1970s, Granovetter distinguished between *strong ties* and *weak ties* (1973). Strong ties exist between individuals close to each other and are often based on friendship and kinship. In contrast, weak ties bond people through greater social distances and are often functional. He emphasises the ‘strength of weak ties’ because this kind of relationship can provide access to new information or knowledge not available in one’s closer social surroundings.

A second important strand of thinking for our study is based on the concept of social capital, in Putnam’s understanding as a common resource among group members (Putnam, 2016). Whilst *bonding social capital* occurs out of resource exchange among members of a close group, *bridging social capital* is based on specific relations between otherwise separate groups or networks (Larsen et al., 2004).

All these forms of network relations and resource exchange depend on opportunities to create and maintain social contacts. These opportunities can be created by physical as well as by digital proximity, as already reflected with the concepts of territoriality, stability and connectivity. Likewise, the DPs’ digital affinity could explain the comparatively high importance of virtual foci on the internet.

Debates on rural entrepreneurship provide promising indications, which kind of network relations could be especially relevant for DPs’ resource access under rural context conditions. Assuming that peripheral rural regions are shaped by a low density of companies, activities and knowledge, therefore less favourable for innovation (Favre-Bonte et al., 2019), specialised networks could compensate for such resource scarcities within the nearer territory (Galliano et al., 2019). Supra-regional contacts could help in accessing further knowledge, e.g., from universities and research centres, as well as interacting with private actors as e.g., suppliers and customers (Fanelli, 2018; Galliano et al., 2019). Besides contacts within the market economy, rural entrepreneurs heavily rely on support from public actors (Esparcia, 2014; Galliano et al., 2019). In this regard, our analysis follows the ‘systems of innovation approach’ tracing communication and collaboration processes, involving not only the innovative individual or group actors as such, but also resource exchange with other institutions, as universities, innovation centres or governmental funding agencies (Tödting & Trippel, 2005). Furthermore, it is assumed that rural entrepreneurs have the best access to social capital when they have lived or worked for a long time within the respective regions (Habersetzer et al., 2021).

To conclude our reflections on the literature, the crucial role of governance arrangements in rural development leads to the question of the ways in which our DPs coproduce the respective actor networks on a regional as well (as emphasised by the neo-endogenous paradigm) as on a supra-regional scale. A special focus is on the meaning of spatial distances within the ego-centred networks. Some arguments support the idea of the predominant importance of regional contacts, e.g., referring to the meaning of face-to-

face exchange, regional-specific knowledge and (biographically grown) place attachment (e.g., Steiner & Atterton, 2015; Vilaclara Fatjo, 2016). Other lines of argumentation concur on the importance of supra-regional contacts and networks within the neo-endogenous paradigm (Bock, 2016; Georgios & Barraí, 2023; Richter, 2019) or emphasise the role of physical space to promote networking opportunities (Marmo et al., 2025).

Based on these theoretical reflections, we approach the empirical and network data that were selected by the research design.

### 3. Case study design and methods

The case study design, including the selection of case study regions, the sampling of DPs (the egos) in the two regions, and the analysis of expert interviews, is presented in Mettenberger et al. (2024). In this paper, we present the dataset of our egocentric network analysis, which was carried out with the help of name generators. As already mentioned in the introduction, we understand social networks as a form of organisation for group actors (Knieling & Kunzmann, 2005). The relationship patterns of the networks reconstructed with the help of name generators are complemented by qualitative interview material. In the following table, we explain our case study approach step by step (Table 1).

First, we selected two federal states, Baden-Württemberg (BW) and Mecklenburg-Western-Pomerania (MVP), that have large rural regions but differ significantly in terms of their socio-economic structures. Rurality and socio-economic status according to the Thünen typology (Küpper, 2016) are the key criteria for our case selection. According to the typology, both regions are very rural, but the region in Baden-Württemberg is in a good socio-economic situation, while the region in Mecklenburg-Western Pomerania is in a less good socio-economic situation. The public technical digital infrastructure was analysed using the Broadband Atlas (Bundesnetzagentur, 2021) to select the case regions. While over 75% of households in BW have access to at least 100 Mbit/s, the figure in MVP is just 50%. However, the situation has improved significantly by 2025. In MVP, 90% of households now have 100 Mbit/s, and in BW, 92%. In addition, over 70% of households in both federal states already have 1000 Mbit/s available (Bundesnetzagentur, 2025). This means that technical infrastructure no longer represents a major obstacle to digital development in rural areas (see also Maruseva & Kroll, 2025).

The next step in the research process was to identify DPs in the rural regions of both federal states, which was achieved by conducting extensive online research with a focus on social digital innovations. The criteria for identifying these innovations were outlined in Mettenberger et al. (2024). To locate the DPs, a range of sources was consulted, including grey literature and databases. In the third step, one region in BW (four smaller neighbouring counties) and one in MVP (two bigger neighbouring counties) show structural similarities in the sense of a very rural character and structural differences, regarding socio-economic and digitalisation-related context conditions. The specific regions within the two federal states were selected using theoretical sampling and desktop research. This identified projects and initiatives that were expected to involve digital social innovations (Qureshi et al., 2021) in rural areas of BW and MVP. In order to determine regional differences in digitisation more precisely, the selection of regions was analysed on the basis of three additional key dimensions. The first dimension concerns digital labour markets, the second the importance of the ICT sector, and the third, broadband infrastructure. Table 2 shows how the respective counties in the regions of BW and MVP compare to all 401 German counties (Handelsblatt, 2018). It shows that the four

**Table 1.** Methodical approach of sampling.

Sampling Approach
1. Selection of German federal states that comprise large 'very rural' regions but are different in socio-economic terms (Küpper, 2016).
2. Online and document analysis to identify potential DPs (in the rural areas of these states).
3. Selection of two regional sub-sections in these federal states that display a certain concentration of DPs and the contrasting structural data (socio-economic situation/development, digitalisation).
4. Survey of multipliers to find more 'hidden' DPs in these two regions.
5. Prioritising pioneering projects through criteria based on the concept of social innovation.
6. Requesting and conducting interviews (including name generators) with key persons from DPs projects.
7. Transcription and data analysis with MAXQDA and Excel.

Source: Own representation.

**Table 2.** Level of digitisation in our case regions compared to the 401 German counties.

	Counties	Overall ranking	Digital labour market	ICT sector	Broadband infrastructure
BW	Main-Tauber-County	256	146	205	331
	Schwäbisch-Hall	233	125	281	278
	Hohenlohe County	207	86	207	295
	Ostalb County	174	57	261	285
MVP	Mecklenburg Lake County	375	366	376	347
	Western Pomerania-Greifswald	380	392	393	350

Source: Own representation based on (Handelsblatt, 2018).

counties in BW perform better than the two counties in MVP. This has resulted in two regions where digital pioneering is particularly pronounced. Further details can be found in Mettenberger et al. (2024).

Fourthly, we surveyed multipliers to find more ‘hidden’ pioneers, not traceable through online research, but highly relevant for our research interest in low-threshold social innovations and problem-solving networks, following the assumption that even the adoption of rather simple digital technologies can bear significant potential (Holl & Rama, 2024). This approach, known as ‘snowball sampling’, involved contacting 190 people in the two case regions, including mayors, heads of administration, district staff and LEADER (Liaison Entre Actions de Développement de l’Économie Rurale - Liaison Between Rural Economy Development Actions) representatives. This method resulted in the identification of 192 DPs in the two regions. Fifthly, a shortlist of DPs in both regions was compiled, and 40 of them were contacted and agreed to an interview. However, not all of them were suitable candidates for our network analysis due to various reasons. Some were not suitable due to the progress of the project, some did not want to conduct a network analysis due to a lack of time, and for some, attempts were made to conduct a network analysis, but there were too many gaps due to limited background information on the relevant contacts. Consequently, our network analysis was conducted with 30 DPs (Table 3). In network analysis terms, DPs are referred to as ‘egos’, and ‘alteri’ are their network contacts. The analysis only considered larger or smaller groups of DPs, not individuals. For each group, a key person who had long-term insight into the project was interviewed. The interviewees were asked about alteri that were particularly helpful for the respective project – not those that seemed useful to the interviewee personally. However, it remains critical that the naming of the alteri was based on the individual perception of the respective key person.

Sixth, the data collection was carried out using a mixed method, with the network analysis integrated into the interviews as a systematic, egocentric and standardised block. The interviews were conducted via telephone and web calls, whereby the network data and supplementary interview statements from the project implementers were recorded. An ego-centred network analysis was conducted as part of this study, in which a specific actor (the ego) serves as the starting point for reconstructing their network. A systematic and comparative analysis of the networks of the DPs was conducted using ‘name generators’ (Mollenhorst et al., 2008). The egos are the DPs that we selected as part of our sampling strategy. With the help of name generators, the important actors (alteri) in their network are recorded from the egos’ perspective (Table 4). It is important to note that all alteri are thus an integral part of the network of the respective DP.

We focused entirely on ego-alteri relationships in the networks. The qualitatively oriented network analyses provide deeper insights into the structure of individual ego-centred networks and, above all, into the subjective meaning attributed to the individual relationships (Binder et al., 2023). The network analysis followed a multi-stage pattern that is widely used in research (cf. Herz, 2012). It is important to note that the network analysis was embedded in the qualitative interviews. If statements relevant to the network analysis had already been made in the open narrative, these were partly adopted by the interviewer and put forward

**Table 3.** Categorisation of the field of action according to the two regions.

Field of action	Number of networks per region	
	BW = 18	MVP = 12
Companies and entrepreneurship	9	7
Co-working	2	4
Agriculture	1	0
Mobility	3	0
Health and education	3	1

Source: Own calculation based on desktop research.

**Table 4.** Contents of the name generators for determining the alteri.

Type of questions	Question content
Name generator	Important individuals/institutions for the idea and concept. Important individuals/institutions for implementation. Important individuals/institutions for digital issues. Important individuals/institutions for formal support. Most important individuals/institutions overall.
Characterisation of the Alteri	Institutional background of alteri. Institutional locations of alteri.
Ego-alteri-relationship	How helpful are/were the mentioned alteri for the project/plan? (Scale) Ways/'focuses' of getting to know each other. Frequency of replacement. Communication channels/bridging geographical distances.

Source: Own representation.

as suggestions with follow-up questions. The specific name-generating questions were based on different development phases, and respondents were also asked to identify individuals or institutions that were particularly helpful in digital matters and formal supporters. The second step involved characterising the alteri, whereby their institutional contexts and locations were recorded. The latter served as a central basis for analysing the egocentric networks of the DPs in their spatial dimension. Here, the ways and places where people got to know each other, the frequency of exchange and, in particular, the communication channels used were documented and discussed further in the context of our categories of stability and connectivity.

Seventh, the interviews were transcribed and analysed using MAXQDA and Excel software. In our analysis with MAXQDA, we followed a deductive-inductive approach with two code levels: The upper level was primarily determined on the basis of key aspects of the guidelines, while the lower level was also based on points highlighted in the narratives. In addition, we used Excel to systematically evaluate the name generators on the basis of the tape recordings and notes. As part of the analysis, the standardised information from the network analysis was combined with the interview statements. The interview passages thus serve as complementary elements promoting understanding.

## 4. Results

Out of the 30 egocentric networks, twelve are based in our case region in MVP and 18 are based in the case region in BW. Despite the diverse fields of action, the DPs have a lot in common, as already described in our case selection, and interestingly, similar phenomena can be found in the networks despite the different regions and fields of action.

The egocentric networks are highly heterogeneous, with a range from zero to ten or more alteri. The naming of the alteri also varies, with some individuals or organisations being mentioned by name, while others provide only a general indication, such as the involvement of several regional companies. Due to the highly divergent subjective perceptions of the pioneers concerning the definition of alteri within their respective networks, a quantitative assessment of the size of the networks is not the aim of the article. With the help of the network analysis and interviews, it was possible to recognise whether a pioneer had only a small number of contacts for specific purposes or had an extensive network with diverse, very different alteri. We therefore differentiate here between smaller and larger networks.

Spatial distances play a significant role, present in the networks of DPs, vary significantly and therefore are of special interest for our research question, which examines how spatiality is constructed in egocentric networks. This paper distinguishes between 'local' (city/municipality), 'regional' (district to state level) and 'supra-regional' (beyond state level).

A focused analysis was conducted on the alteri within egocentric networks, as similarities concerning the type of actor can be identified across the 30 networks. In 26 of these networks, alteri were identified by the pioneers as institutional and/or political contacts. These alteri encompass a diverse range of actors and institutions in the public sector. They include local/regional political figures (mayors/district councillors), public institutions (city or district administrations/ministries at state/federal levels), educational institutions (schools/universities), chambers (Chamber of Industry and Commerce (DHIK)), business development agencies, health insurance companies, associations of statutory health insurance physicians, funding bodies,

various associations and start-up centres. In 23 networks, companies or company networks were named as alteri, which can be both SMEs and large global corporations. In five networks, potential users were named as alteri, whereby this refers to the target group who were involved in the development of the digital project at an early stage. Three pioneers stated that their networks were very family-oriented and that the important alteri in all phases were family members, while three networks also named volunteers and civil society alteri. One individual pioneer stated that he did not feel adequately integrated into any network and named hardly any alteri.

The potential for alterations to contact channels<sup>1</sup> and frequencies due to the impact of the COVID-19 pandemic is a salient consideration. Despite variations like the interaction between DPs and their alteri, telephone communication and email correspondence emerge as equally favoured methods, irrespective of geographical distance.<sup>2</sup> Notably, face-to-face interactions assume particular significance for local/regional actors. The intensity of contact exhibits significant variation, contingent on various factors including the respective phases, the contact partners and the nature of the contact. It is worth noting that certain interactions were initiated through events and continued exclusively via these channels.

#### 4.1. Categories of analysis

Three analytical categories were developed as part of the present study to carry out a detailed analysis. These categories illustrate three phenomena within our sample. The first category, *territoriality*, addresses the question as to the extent or at what level the phenomenon shows a spatial balancing of contacts (at city and municipality, local county, further regional or federal state level). The second category, *stability*, addresses the question of how the relevant contacts can be characterised in terms of their stability. This includes data derived from the network analysis, such as the contact frequency, contact channels and relevance over several project phases. The third category, *connectivity*, aims to examine the role of place attachment in the construction of networks by DPs. It analyses the extent to which the pioneers adhere to places in their actions and perceptions, even though they could act spatially independently through ICT. We highlight three phenomena that relate to both regions but vary in frequency. The order of presentation is therefore from frequent to less frequent network attributes.

#### 4.2. Alteri in the role of multipliers

In 18 sample networks, the phenomenon emerged, with one or more alteri acting as multipliers within these egocentric networks. The DPs established contact with people or institutions in their network who were themselves involved in networks, and thus potentially gave the ego access to other relevant people and institutions.

##### 4.2.1. Territoriality

The first category of territoriality asks to what extent or at what level the phenomenon shows spatial balancing of contact. In asking how spatiality is constructed in the DPs' egocentric networks, our first category points at the territorial, geographical dimension of useful alteri in rural regions. The existing networks show that the egos often establish contact with alteri and personally enter their networks through events. The egos gain access to the networks through events organised by the alteri as multipliers, such as the DIHK, business development agencies, political institutions, associations or educational institutions. The primary purpose of these events is to facilitate network meetings, giving the egos access to existing networks. In some cases, however, the alteri are individuals who have an extensive personal network and are intent on expanding their network (interview\_2\_13-09-21, interview\_15\_12-10-21, interview\_39\_30-11-21). The contacts are usually informal, and participation in network meetings is rarely mandatory. This can be illustrated using the example of two networks from the field of co-working. The first network is located in BW. Compared to the entire sample, this network is large and has well over ten alteri, with many alteri being institutional partners such as the DIHK, business development, the association for start-ups and the nearby university. According to the DP, the ego was able to establish new regional contacts through these alteri (interview\_2\_13-09-21). The second network from MVP is also a larger network that, except for one alteri, is limited to its federal state. In this case, however, many individuals were named as important alteri. As in

the other network, the DP was able to access networks that operate close to each other via these individuals. This indicates that the alteri were located relatively close to the ego, i.e., within their own but very large district, or at most within the federal state of MVP. In addition, this pioneer had already built up a large company-related network through other activities and was able to benefit from this with the co-working project (interview\_13\_06-10-21). In sum, a majority of the alteri in the networks refer to the administrative border of the state.

#### **4.2.2. Stability**

In the second category, we ask how the communication processes are organised and how frequently they occur. This approach focuses on the characteristics of the networks and is characterised by its particular emphasis on geographical proximity. The 18 sample networks are characterised by a high degree of stability, which is due to the integration of the egos into various other networks. These networks are maintained through regular events and contacts, which ensure continuous and effective interaction between the players. These networking events are face-to-face rather than digital. The only exception was during the COVID-19 pandemic. The egos see themselves as being well-integrated into networks and benefit from this. It should be noted that the quality of the exchange in these networks is not necessarily characterised by a high frequency of meetings, but rather by the regularity of the events. It is quite possible that networks only invite their members to network meetings once or twice a year. The example cited above shows that the ego not only meets its alteri at monthly meetings or various events but also in its networks. One example of this form of networking is the twice-monthly meeting of university representatives, at which the ego itself organises events to build and strengthen its network. These events are also attended by the pioneer's alteri (interview\_2\_13-09-21). Stability is characterised through continuity, and face-to-face events are an important part of strengthening these networks. However, the data collection took place in 2021 during ongoing COVID-19 restrictions with limited physical contact options and increased remote working (Clarke, 2025), the ego in these 18 networks highlights the importance of regular events. The egos emphasised how important close contact with the alteri is to them. They intend to use geographical proximity to facilitate the alteri's integration into their network. This introduces our third analytical dimension, which focuses on the relevance of place and asks why and how the local context matters.

#### **4.2.3. Connectivity**

As already indicated, local and regional alteri play an important role for some DPs. The local and regional connections primarily fulfil an end in themselves: expanding the actors' network within their industry, establishing themselves locally, exchanging knowledge, strengthening their project in the region and receiving funding or concrete support in individual project phases. In both examples, players such as the DIHK, business development agencies, co-working spaces, universities and the local start-up centre play an important role (interview\_2\_13-09-21, interview\_13\_06-10-21). The relevance of local and regional alteri arises from the fact that, as some egos stated, new contacts, who are also active in the region and want to develop something locally/regionally, were found for their network in this way. Accordingly, they had the same motivation as the egos. The alteri also acted as multipliers for the egos, as they had their networks and made them available to the egos. During the COVID-19 restrictions, ICT was also constitutive for local/regional networks, as it enabled communication using digital tools to reduce face-to-face communication.

### **4.3. Alteri as users in the network**

The second phenomenon that we highlight in this paper is the importance of alteri as a source for knowledge transfer. As observed in eight networks, these alteri transfer knowledge to the DPs as part of their network. The two decisive advantages cited in this context are, firstly, the particularly valuable feedback from this group, which can be used to improve the products and processes in the DPs' projects from the user's perspective, and secondly, the contact that enables the acquisition of potential users.

#### **4.3.1. Territoriality**

How are the alteri as users characterised in terms of their territorial boundaries? Networking with alteri in value production networks is an important aspect, whereby the alteri, who are also the target group of the

projects, tend to be located at the local level. This is particularly relevant as the products of the DPs could also be offered over greater distances. However, it should be noted that maintaining contact informally, for example, with the church community (interview\_21\_15-10-21), is important to the egos to a certain extent. The church community tested a mobility offer based on a pioneer project. The ego explained at this point that the proximity to the church community allows for a close dialogue and thus contributes to the continuous optimisation of the mobility offer. Concerning the spatial level, it can be stated that the value production networks that are located in BW are characterised as spatially clustered with major alteri at the local level and fewer regional contacts. This is, by the case region, described as a ‘hidden champions’ region with small and medium enterprises that act successfully in a niche at a global level (Rietmann, 2024). The territoriality category is represented by local alteri that share their knowledge to improve the quality of the social innovation.

#### **4.3.2. Stability**

How does the communication vary according to the different stages of the innovation process? Alteri as users play a role for the ego in the various phases and usually join the network in the conception phase (interview\_8\_27-09-21, interview\_40\_02-12-21, interview\_42\_15-12-21) or at the latest in the implementation phase (interview\_6\_16-09-21, interview\_21\_15-10-21, interview\_26\_28-10-21, interview\_31\_08-11-21, interview\_32\_09-11-21). A certain regularity in contact with this alteri group can be observed, although this can vary greatly, as the exchange takes place almost daily (interview\_40\_02-12-21) or only monthly (interview\_32\_09-11-21) to several times a year (interview\_8\_27-09-21). Nevertheless, the users are an essential and stable component of these networks. The method of contact varies widely but is often in person, by telephone or by email. Close personal and/or telephone contact was preferred, particularly when testing products. This was relevant in various fields, such as health, education and entrepreneurship. For example, this involved cooperating with local schools or universities. This enabled the DPs to receive direct feedback on their products. Additionally, the alteri group was already embedded in several networks before the introduction of digital components. There is no clear preferred channel of contact, and although the DPs may have chosen the digital channel based on their knowledge, face-to-face contact is repeatedly perceived as the most important channel. However, this is not unique to this phenomenon but can be seen across the different networks in our sample. To contextualise this observation, as the data collection took place in 2021 and 2022, the pandemic restrictions could have had an impact on the common evaluation of face-to-face contacts as very important. In the interviews and the network analysis, however, we pointed out that pre-COVID-19 behaviour was relevant for us.

#### **4.3.3. Connectivity**

The third category examines adherence to the local context, taking alteri as a source for knowledge transfer. Users and customers are located in close proximity to the ego, although DPs’ products could be sold anywhere. For example, regional farmers (interview\_26\_28-10-21), clinics (interview\_8\_27-09-21) or the church community (interview\_21\_15-10-21) can be mentioned as potential users who were involved in the process in this way. One example is in the medical field. The pioneer was in close contact with a local clinic and a charitable organisation. The DP explains this as follows: ‘[...] I believe it is important to develop and reflect on research findings with users and not to lose this practical perspective. But on the other hand, it is also important to work scientifically, to bring these two sides, practice and theory, together again and again’ (interview\_8\_27-09-21).

#### **4.4. Alteri as family members**

In three networks of value production, family members were explicitly mentioned as important network contacts. This phenomenon can be found in both case regions and is therefore of interest. The family members take on very different roles in the network as alteri. They are also not the only alteri but are explicitly emphasised by the respective pioneers.

#### 4.4.1. Territoriality

How can the territorial dimension of the alteri as family members be described? Several DPs feel connected to the region through their personal and informal networks and their strong ties to the region. It shows that the DPs were all returnees who had moved back to their original homeland. The egos emphasised that the criterion of family ties and roots in the regions in question was of crucial importance to them. Due to the importance of family in their networks, they emphasise informal relationships in addition to formal contacts. These contacts are geographically close and linked to the digital project. In addition, two of the three networks also have more formal contacts with the institutional alteri already mentioned several times (interview\_32\_09-11-21, interview\_35\_24-11-21). One network in BW stands out here in particular, as it is one of the very few networks in the sample in which the ego has no contacts with institutional alteri, but the alteri are exclusively companies. Moreover, these companies are not SMEs, but large corporations that also operate internationally (interview\_36\_24-11-21).

#### 4.4.2. Stability

However, the difference is whether the project involves direct cooperation with family members, as in the case of two networks, or whether the family serves as an important source of mental support and informal advice, as in the case of one network. In all three networks, family members are involved in the project, and it can be considered a family business in the sense that partners, parents, children and even siblings are involved. How frequently does the communication process occur? There is a very stable relationship between ego and alteri through the daily exchange across all project phases. This daily exchange is possible because they work together with the family members on-site (interview\_32\_09-11-21, interview\_36\_24-11-21, interview\_35\_24-11-21). The family also plays an important role in one network across all project phases. It is mentioned in particular as providing mental support and looking after the ego's children (interview\_35\_24-11-21).

#### 4.4.3. Connectivity

How does the local context matter? The DPs all grew up in the region in which they are now implementing their digital projects. Two of them are so-called returnees and are anchored in the region once more. They have strong ties to the region and harboured the desire to develop something there (interview\_35\_24-11-21). The personal contacts within the family are strengthened by direct cooperation and locality. The more formal alteri are contacted in very different ways, whereby it can be seen that personal contacts are also maintained when there is geographical proximity. In addition, contact is also maintained by telephone and e-mail (interview\_32\_09-11-21, interview\_35\_24-11-21). A comparison of the non-familial and familial alteri reveals that the communication channels differ. While non-familial alteri are primarily contacted via telephone, familial alteri are predominantly contacted in person (interview\_36\_24-11-21).

### 5. Discussion

Our empirical data shows that DPs benefit from network contacts in various role relationships. As multipliers, alteri serve as bridge-building social capital that opens up access to broader networks of actors and their resources. As users of pioneer products or services, most alteri are also geographically close within a local or at least regional radius. The local/regional alteri as users are considered particularly valuable, enabling the product or process to be continually improved. Alteri relevant in their role as members of pioneers' families are territorially concentrated in the local and nearby regional surroundings, as some of the DPs returned to their places of origin. We now return to the first subordinated question: What mechanisms constitute bridging and bonding ties? In answering the first research question, we highlight that spatiality plays out differently in access to different sorts of bridging and bonding ties. From the perspective of using networks as a method, with the categories of *connectivity* and *stability*, we zoom into the quality of networks, differentiating with respect to bridging and bonding ties. In the first phenomenon, alteri as multipliers represent weak bridging ties, as they allude to functional relationships that are characterised through greater social distance. As stated in DeLanda (2006, p. 35), 'networks, with more numerous weak links, are for this reason capable of providing their component members with novel information about fleeting opportunities'. These networks are described as 'Low-density networks' (DeLanda, 2006, p. 35). The alteri

as multipliers act in order to enable access to resources of interconnected networks. These functional relationships are referred to in the literature as ‘specialised networks’ that compensate for the lack of proximity and poor accessibility in peripheral areas (Galliano et al., 2019, p. 276). They could mitigate challenges of limited institutional support, as they were identified regarding rural small- and medium-sized enterprises (Fanelli, 2018). In the second phenomenon, in which alteri are involved as users, the categories of bridging and bonding relationships become blurred. For example, the relationship between the church community and the ego can be described as a bridging relationship: They test the mobility offering and provide feedback for improving the DP’s product. In accordance with territorial innovation models that highlight the context and location specificity (Broekel et al., 2021), actors of the church community perform as part of the interactive innovation chain (Gust-Bardon, 2012). In the third phenomenon, alteri as family members represent strong bonding ties, as the resource exchange takes place between members of a close group, such as the family. It is interesting to note that our research data support Granovetter’s assumption of ‘strength of weak ties’ (1973), as the number of alteri as multipliers in both regions ( $n = 18$ ) is higher than the number of family networks ( $n = 3$ ). This can be linked to the research of Galliano et al. (2019) on actors in peripheral regions that utilise place-based resources.

How can we describe the characteristics of these rural networks, as explored in the second subordinated research question? Concerning our categories of *territoriality*, *stability* and *connectivity*, we argue for a relational perspective. In assemblage thinking, these regions are built with ‘assemblages against essences’ (DeLanda, 2006). With the help of the network data, the spatial reference dimension is highlighted. Our categories of *stability* and *connectivity* allude to the dynamic properties of rural networks, characterised by the ‘fuzzy boundaries’ (Allen & Cochrane, 2007). These bridging ties do not refer to regions as ‘organic totalitie[s]’ (DeLanda, 2006), but as assemblages. As network characteristics, territorial attachment to place and region still matter in times of ICT usage. Preferences for nearby contacts can be explained by pioneers’ place attachment and feelings of regional responsibility, characterised by the idea that they want to work together to develop the region. We can even state a preference for alteri at the regional level, even if the same or better resource is available elsewhere. Regarding the group of entrepreneurs, our findings support the assumption that long-term working or living experiences in a region are shaping the ways in which social capital is put to use (Habersetzer et al., 2021).

According to the presented data, we describe the characteristics of the networks as rural network assemblages. Thus, rural network assemblages refer to the understanding of the region as a process, rejecting the perspective that ‘the relation between successive spatial scales is a simple one’ (DeLanda, 2006, p. 33). ‘The part-to-whole relation is rarely this simple’, as stated about a Russian doll (DeLanda, 2006, p. 33). Indeed, the rural network assemblages show different spatial scales that relate to ‘the strength of weak ties’, pointing to the emergent position of informal contacts in providing resource access, thus named as alteri in the role of multipliers. But, ‘dispersed networks are less capable of supplying other resources that define the strength of strong links’ (2006, p. 35), and the role of alteri as family members in both regions relates to the importance of bonding ties. In contrast to the deficit approach of the territorial perspective, resources can be observed at different spatial levels in the DPs’ rural peripheries. The lack of resources in rural regions due to sparse institutional density is compensated for not only by network contacts in agglomerated areas and territorial dynamic processes (Pecqueur, 2014), but also by problem-solving, functionally specialised networks at the local and regional level. To sum up, our paper is embedded in the current debates on rural development and regional governance, reflecting their key themes and challenges. The following important insights emerge from our egocentric network perspective: First, our findings confirm the shortcomings of concepts that view regions predominantly from a territorial perspective. This constrains individuals and their capacity to act within a fixed framework of a region as a container. Secondly, a relational and multidimensional perspective that focuses on social networks as a crucial constitutional element enables a holistic view of regions. Viewing regions as a process helps to understand dimensions of stability and connectivity, and thus the link between social relations and their spatial contexts. Thirdly, our micro-perspective shows how the agency of key actors and egocentric networks gives rise to multiple constructions of regions, territoriality and place attachment that depend on the spatial embeddedness of concrete social phenomena. Fourthly, our analysis can highlight the influences of institutional definitions of regions and their inherent territorial logic as they emerge through administrative demarcations and the design of funding programmes.

## 6. Conclusion

Our analysis shows that digital pioneers' networks vary highly regarding their territorial radius and often reach far beyond regional borders. Digital ICT facilitate functional relationships over larger distances, thereby 'bridging across spatial contexts' (Müller & Korsgaard, 2018). However, intensive bonding and highly analogue social ties within the nearer regional surroundings, as family relationships or multiplier structures, remain important in many cases, mirroring a deep 'resource embeddedness' (Müller & Korsgaard, 2018) of the pioneers and their project.

We highlighted the roles of DPs as important actors in rural regional governance settings and in innovative entrepreneurship outside urban agglomerations. Looking at actors and their access to issue-related resources from a functional perspective, which includes egocentric networks, sheds new light on currently undiscussed governance structures. It shifts the focus from alteri in regional formal partnerships to those who can bring in helpful resources in the concrete situations of different project stages. In our case study, the DPs' networks, alongside the formal regional governance arrangements, can be important for rural development. A large number of actors from the public, private and civil sectors were relevant to the success of the projects. Relating back to entrepreneurship literature, that findings underline the relevance of a 'systems of innovation approach' (Tödtling & Trippel, 2005). This highlights the critical debates on the responsibility of non-public actors in the context of rural development. Networks have an impact on policies, though they are not politically legitimised (Fürst, 2005). As argued by Fürst, networks establish linkages and collective problem-solving approaches. This diffusion of responsibility, the transfer of responsibilities to a wide range of actors, could lead to confusion and a lack of public knowledge or even an 'organised lack of responsibility' (Fürst, 2005, p. 712). Against the backdrop of the very rural spatial conditions, questions of distribution and power (Allen, 2009) are of great interest and should be discussed in further research.

When analysing the construction of spatiality in egocentric networks, our study focused on the agency of individual and group actors in rural peripheral regions. The sample was selected, among other aspects, according to digital literacy. Therefore, the impact of the use of ICT on the innovation process was of special interest. Our network analysis data showed that weak tie networks in supra-regional contexts and strong tie networks in local contexts both shape the process of constructing spatiality. Rural network assemblages are territorially based and stabilised through varied communication channels, as well as being locally embedded.

Thus, our paper contributes to the debate of social rural innovation with empirical data from two German rural regions. As highlighted by Galliano et al. (2019, p. 282), who state that their study 'tends to confirm the existence of a peripheral pattern of innovation characterized by a strong reliance on local resources and on the personal networks of a few individual leaders', the disadvantage of rural areas is compensated for through specific local and regional resources. However, the empirical data from the qualitative ego-network analysis demonstrate that such structures based on a high degree of embeddedness (Habersetzer et al., 2021) are complemented by problem-solving, functionally specialised networks that extend the territorial boundaries. That in turn supports Galliano et al.'s broader argument that a lack of agglomeration does not imply a lack of actor networks and social capital (Galliano et al., 2019).

Several limitations of our study relate to the selected research design. The concept of the ego DP is fraught with inconsistencies and contradictions. One challenge is that it is difficult to draw a clear line as to when someone is considered a DP: at what point is something pioneering (Mettenberger et al., 2024)? How 'digital' does a project have to be for it to be considered a DP project (Binder & Sept, 2022)? Concerning the limitations of the methodological approach, there was the challenge of how alteri were understood. Naming key people who could be important in the different phases of the innovation project was highly dependent on how the DPs remembered and self-assessed the people and their relevance in the project. Although we tried to provide a clear definition in advance, the egos specified the alteri very differently. Sometimes names or people were mentioned, others just said 'several companies', for example, or gave a general functional description such as 'school' or 'bank'.

In both regions of our case study, we also found that the ego was not an individual but a group actor, such as a company, an interest group or a loose network. As a result, it could happen that the individual interviewee only described the network from his or her perspective, and the distinction between ego and alteri

was sometimes difficult in the case of group actors. This was because it was not always clear which contacts were inside and which were outside the organisation.

Finally, we would like to take a brief look at other possible perspectives and questions. One question could be, how do the DPs position themselves in regional governance constellations? To clarify this, we would need to conduct a blanket survey of a regional network, respectively the analysis of an overall network instead of an egocentric approach. Another question is what impact the new normality after the COVID-19 pandemic will have on the DP projects. Due to our limited case study, we were only able to focus on one specific group, the DPs. We are aware that other relevant groups are important for the development of rural regions: from the public, the private and the civil sector. Hence, this study is a first explorative step.

## Notes

1. The most important contact channels between ego and alteri were surveyed here.
2. A few pioneers asked whether they should think about the contact channels during or before the time of COVID-19. For us, however, the time before COVID-19 was relevant, as we saw the contact restrictions as an exceptional situation.

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## Data availability statement

For reasons of confidentiality, the data is not publicly available. The survey reports on the individual case studies are available on request from the authors.


## Research ethics and consent (interview partners)

Before the interviews began, a data management plan, together with an information letter and a consent form for respondents, was approved by the Brandenburg University of Technology. Participants were assured, among other things, that interview quotes would only be published in pseudonymised form.

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## References

- Albornoz, C., Panitz, R., & Glückler, J. (2024). Legitimate network governance in small-scale fisheries in northern Chile. *Area Development and Policy*, 9(2), 204–227. <https://doi.org/10.1080/23792949.2023.2289368>
- Allen, J. (2009). Three spaces of power: Territory, networks, plus a topological twist in the tale of domination and authority. *Journal of Power*, 2(2), 197–212. <https://doi.org/10.1080/17540290903064267>
- Allen, J., & Cochrane, A. (2007). Beyond the territorial fix: Regional assemblages, politics and power. *Regional Studies*, 41(9), 1161–1175. <https://doi.org/10.1080/00343400701543348>

- Bar, R., Hadad, S., Maymoni, L., Ben-Malka, R., & Megidish, R. (2024). Can the periphery survive innovation-led growth? Insights from Israel. *Regional Studies, Regional Science*, 11(1), 453–470. <https://doi.org/10.1080/21681376.2024.2374994>.
- Binder, J., Bembnista, K., Mettenberger, T., Ulrich, P., Witting, A., Zeiig, H., & Zscherneck, J. (2023). *Digitale Pioniere als Schlsselakteure lndlicher Governance. Kommunale Perspektiven auf das Forschungsprojekt 'DigPion'*. Universittsverlag Potsdam (KWI-Schriften, 14). <https://doi.org/10.25932/publishup-61338>
- Binder, J., & Sept, A. (2022). Debordered materiality and digital biographies: Digital transformation in rural-peripheral areas. *Historical Social Research*, 47(3), 291–314. <https://doi.org/10.12759/hsr.47.2022.34>
- Binder, J., & Witting, A. (2022). Digital pioneers in rural regional development: A bibliometric analysis of digitalisation and leadership. *Raumforschung und Raumordnung/Spatial Research and Planning*, 80(3), 266–278. <https://doi.org/10.14512/rur.103>
- Birnbaum, L., Wilhelm, C., Chilla, T., & Krner, S. (2021). Place attachment and digitalisation in rural regions. *Journal of Rural Studies*, 87, 189–198. <https://doi.org/10.1016/j.jrurstud.2021.09.015>
- Bock, B. B. (2016). Rural marginalisation and the role of social innovation; A turn towards nexogenous development and rural reconnection. *Sociologia Ruralis*, 56(4), 552–573. <https://doi.org/10.1111/soru.12119>
- Bonfiglio, A., Camaioni, B., Coderoni, S., Esposti, R., Pagliacci, F., & Sotte, F. (2017). Are rural regions prioritizing knowledge transfer and innovation? Evidence from rural development policy expenditure across the EU space. *Journal of Rural Studies*, 53, 78–87. <https://doi.org/10.1016/j.jrurstud.2017.05.005>
- Bosworth, G., Annibal, I., Carroll, T., Price, L., Sellick, J., & Shepherd, J. (2016). Empowering local action through neo-endogenous development; The case of LEADER in England. *Sociologia Ruralis*, 56(3), 427–449. <https://doi.org/10.1111/soru.12089>
- Broekel, T., Lazzaretti, L., Capone, F., & Hassink, R. (2021). Rethinking the role of local knowledge networks in territorial innovation models. *Industry and Innovation*, 28(7), 805–814. <https://doi.org/10.1080/13662716.2021.1941802>
- Bundesnetzagentur. (2021, 03, 10). *Breitbandatlas*. <https://www.bundesnetzagentur.de/GIGA/DE/Breitbandatlas/Vollbild/start.html?jsessionid=2354D5594F614DE7AAB8A2530ACFAE07>
- Bundesnetzagentur. (2025, 08, 11). *Breitbandatlas*. <https://gigabitgrundbuch.bund.de/GIGA/DE/Breitbandatlas/Vollbild/start.html>
- Calignano, G., & Nilsen, T. (2024). Political leaders as agents in regional development. *Regional Studies, Regional Science*, 11(1), 479–495. <https://doi.org/10.1080/21681376.2024.2378780>
- Clarke, K. (2025). The impact of remote work on mobilities in the UK. *Regional Studies, Regional Science*, 12(1), 472–487. <https://doi.org/10.1080/21681376.2025.2502113>
- Dargan, L., & Shucksmith, M. (2008). LEADER and innovation. *Sociologia Ruralis*, 48(3), 274–291. <https://doi.org/10.1111/j.1467-9523.2008.00463.x>
- DeLanda, M. (2006). *A new philosophy of society. Assemblage theory and social complexity*. Repr. Bloomsbury Academic.
- de Souza, P. (2017). *The rural and peripheral in regional development. An alternative perspective* (1st ed.). Taylor and Francis (Regions and cities, 124). <https://doi.org/10.4324/9781315211183>.
- Durose, C., van Ostaijen, M., van Hulst, M., Escobar, O., & Agger, A. (2022). Working the urban assemblage: A transnational study of transforming practices. *Urban Studies*, 59(10), 2129–2146. <https://doi.org/10.1177/00420980211031431>
- Edwards, B., Goodwin, M., Pemberton, S., & Woods, M. (2001). Partnerships, power, and scale in rural governance. *Environment and Planning. C, Government & Policy*, 19(2), 289–310. <https://doi.org/10.1068/c12m>
- Esparcia, J. (2014). Innovation and networks in rural areas. An analysis from European innovative projects. *Journal of Rural Studies*, 34(2014), 1–14. <https://doi.org/10.1016/j.jrurstud.2013.12.004>
- Fanelli, R. M. (2018). Rural small and medium enterprises development in Molise (Italy). *European Countryside*, 10(4), 566–589. <https://doi.org/10.2478/euco-2018-0032>
- Favre-Bonte, V., Gardet, E., & Thevenard-Puthod, C. (2019). The influence of territory on innovation network design in mountain tourism resorts. *European Planning Studies*, 27(5), 1035–1057. <https://doi.org/10.1080/09654313.2019.1588856>
- Frst, D. (2005). *Netzwerke*. Ed. ARL. Hannover (Handwrterbuch fr Stadt- und Regionalentwicklung).
- Galliano, D., Gonalves, A., & Triboulet, P. (2019). The peripheral systems of eco-innovation: Evidence from eco-innovative agro-food projects in a French rural area. *Journal of Rural Studies*, 72(2019), 273–285. <https://doi.org/10.1016/j.jrurstud.2019.10.009>
- Georgios, C., & Barra, H. (2023). Social innovation in rural governance: A comparative case study across the marginalised rural EU. *Journal of Rural Studies*, 99, 193–203. <https://doi.org/10.1016/j.jrurstud.2021.06.004>
- Granovetter, M. S. (1973). The strength of weak ties. *American Journal of Sociology*, 78(6), 1360–1380. <https://doi.org/10.1086/225469>
- Gust-Bardon, N. I. (2012). *Regional development in the context of an innovation process*. Karlsruhe. = Fraunhofer ISI Working Papers Firms and Region R5/2012.
- Habersetzer, A., Rataj, M., Eriksson, R. H., & Mayer, H. (2021). Entrepreneurship in rural regions: The role of industry experience and home advantage for newly founded firms. *Regional Studies*, 55(5), 936–950. <https://doi.org/10.1080/00343404.2020.1826038>

- Handelsblatt. (2018, 03, 10). *Digitalisierungskompass 2018*. <https://www.handelsblatt.com/politik/deutschland/digitalisierungskompass/>
- Herz, A. (2012). Erhebung und Analyse egozentrierter Netzwerke. In S. Kulin, K. Frank, D. Fickermann, & K. Schwippert (Eds.), *Soziale Netzwerkanalyse. Theorie, Methoden, Praxis* (pp. 133–150). Waxmann (Netzwerke im Bildungsbereich, 5).
- Holl, A., & Rama, R. (2009). The spatial patterns of networks, hierarchies and subsidiaries. *European Planning Studies*, 17(9), 1261–1281. <https://doi.org/10.1080/09654310903053414>
- Holl, A., & Rama, R. (2024). Spatial patterns and drivers of SME digitalisation. *Journal of the Knowledge Economy*, 15(2), 5625–5649. <https://doi.org/10.1007/s13132-023-01257-1>
- Kamalipour, H., & Peimani, N. (2015). Assemblage thinking and the city: Implications for urban studies. *CUS*, 3(4), 402–408. <https://doi.org/10.4236/cus.2015.34031>
- Knieling, J., & Kunzmann, K.-R. (2005). *Netze, räumliche und funktionale*. Ed. ARL. Hannover (Handwörterbuch für Stadt- und Regionalentwicklung).
- Küpfer, P. (2016). *Abgrenzung und Typisierung ländlicher Räume*. Thünen-Institut für ländliche Räume. Braunschweig (Thünen Working Paper, 68).
- Küpfer, P., & Kundolf, S. (2021). Entrepreneurial regions at a dead end: Competition, management by objectives and decentralization less effective, efficient and legitimate. *European Planning Studies*, 29(10), 1925–1950. <https://doi.org/10.1080/09654313.2021.1897529>
- Larsen, L., Harlan, S. L., Bolin, B., Hackett, E. J., Hope, D., Kirby, A., Nelson, A., Rex, T. R., & Wolf, S. (2004). Bonding and bridging. *Journal of Planning Education and Research*, 24(1), 64–77. <https://doi.org/10.1177/0739456X04267181>
- Marmo, L., Rovolis, A., & Avdikos, V. (2025). The role of collaborative workspaces in promoting networking opportunities: A comparison between urban and peripheral contexts. *Regional Studies, Regional Science*, 12(1), 23–42. <https://doi.org/10.1080/21681376.2025.2453572>
- Maruseva, V., & Kroll, H. (2025). Digital business activities in the peripheral regions of Germany: Patterns and key enabling factors. *European Planning Studies*, 33(11), 1893–1913. <https://doi.org/10.1080/09654313.2025.2533937>
- Massey, D. (1994). *Space, place, and gender*. NED – New Edition. University of Minnesota Press.
- McFarlane, C. (2011). The city as assemblage: Dwelling and urban space. *Environment and Planning D: Society and Space*, 29(4), 649–671. <https://doi.org/10.1068/d4710>
- Meador, J. E. (2019). Reaching rural: Identifying implicit social networks in community development programmes. *Journal of Rural Studies*, 68, 285–295. <https://doi.org/10.1016/j.jrurstud.2018.12.006>
- Merrell, I., & Charles, D. (2025). Clustering policy and its effects on rural entrepreneurship over 20 years. In G. Bosworth, P. Chapman, R. T. Newbery, A. Steiner, & D. J. Webber (Eds.), *Rural entrepreneurship. Harvesting ideas and sowing new seeds* (pp. 173–186). Emerald Publishing Leeds (=Contemporary Issues in Entrepreneurship Research Volume 20).
- Mettenberger, T., Binder, J., & Zscherneck, J. (2024). Unveiling the resources of digital pioneers: An agency perspective on digital social innovation in rural Germany. *European Countryside*, 16(3), 412–436. <https://doi.org/10.2478/euco-2024-0022>
- Mollenhorst, G., Völker, B., & Flap, H. (2008). Social contexts and personal relationships: The effect of meeting opportunities on similarity for relationships of different strength. *Social Networks*, 30(1), 60–68. <https://doi.org/10.1016/j.socnet.2007.07.003>
- Müller, S., & Korsgaard, S. (2018). Resources and bridging: The role of spatial context in rural entrepreneurship. *Entrepreneurship & Regional Development*, 30(1–2), 224–255. <https://doi.org/10.1080/08985626.2017.1402092>
- Panitz, R. (2025). Netzwerke in der Innovations- und Wissensmanagementpraxis. In C. Stegbauer und R. Häußling (Eds.), *Handbuch Netzwerkforschung* (pp. 1–18). Springer Fachmedien Wiesbaden; Imprint Springer VS (Netzwerkforschung). <https://doi.org/10.1007/978-3-658-37503-4>.
- Pecqueur, B. (2014). Draft for a territorial economic geography. *L'espace géographique*, 43(3), 179–194.
- Pike, A., Béal, V., Cauchi-Duval, N., Franklin, R., Kinossian, N., Lang, T., Leibert, T., MacKinnon, D., Rousseau, M., Royer, J., Servillo, L., Tomaney, J., & Velthuis, S. (2024). 'Left behind places': A geographical etymology. *Regional Studies*, 58(6), 1167–1179. <https://doi.org/10.1080/00343404.2023.2167972>
- Piša, J. (2023). How individuals become agents of change in old industrial regions. *Regional Studies, Regional Science*, 10(1), 592–602. <https://doi.org/10.1080/21681376.2023.2219723>
- Putnam, R. D. (2016). *Bowling Alone. The collapse and revival of American community*. Simon and Schuster. [https://doi.org/10.1007/978-3-658-13213-2\\_95](https://doi.org/10.1007/978-3-658-13213-2_95)
- Qureshi, I., Pan, S., & Zeng, Y. (2021). Digital social innovation: An overview and research framework. *Information Systems Journal*, 31(5), 647–671. <https://doi.org/10.1111/isj.12362>
- Ray, C. (1999). Towards a meta-framework of endogenous development: Repertoires, paths, democracy and rights. *Sociologia Ruralis*, 39(4), 522–537. <https://doi.org/10.1111/1467-9523.00122>
- Richter, R. (2019). Rural social enterprises as embedded intermediaries: The innovative power of connecting rural communities with supra-regional networks. *Journal of Rural Studies*, 70, 179–187. <https://doi.org/10.1016/j.jrurstud.2017.12.005>
- Rietmann, C. (2024). Digital pioneers in the periphery? Toward a typology of rural hidden champions in times of digitalization. *Journal of Small Business & Entrepreneurship*, 36(2), 281–301. <https://doi.org/10.1080/08276331.2021.1979909>

- Rogers, E. (1962). *Diffusion of innovations*. Simon and Schuster.
- Saleminik, K., Chapan, P., & Townsend, L. (2025). Digital rural entrepreneurship: Two decades of research into the interaction between entrepreneurship and policy. In G. Bosworth, P. Chapman, R. Newbery, A. Steiner & D. J. Webber (Eds.), *Rural entrepreneurship. Harvesting ideas and sowing new seeds* (pp. 157–172). Emerald Publishing Leeds (=Contemporary Issues in Entrepreneurship Research Volume 20). <https://doi.org/10.1108/S2040-7246202520>
- 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. <https://doi.org/10.1016/j.jrurstud.2015.09.001>
- Steiner, A., & Atterton, J. (2015). Exploring the contribution of rural enterprises to local resilience. *Journal of Rural Studies*, 40, 30–45. <https://doi.org/10.1016/j.jrurstud.2015.05.004>
- Tödting, F., & Trippel, M. (2005). One size fits all? Towards a differentiated regional innovation policy approach. *Research Policy*, 34(2005), 1203–1219. <https://doi.org/10.1016/j.respol.2005.01.018>
- Vilaclara Fatjo, S. (2016). *Regionale Bindung von Familienunternehmen* [Doctoral dissertation, University of Bamberg Press]. University of Bamberg Press. <https://fis.uni-bamberg.de/server/api/core/bitstreams/853315a3-92c9-49ab-846d-e4cbad8b850e/content>.
- Viry, G., van Dülmen, C., Maisonobe, M., & Klärner, A. (2022). On the role of space, place, and social networks in social participation. *Social Inclusion*, 10(3), 217–220. <https://doi.org/10.17645/si.v10i3.6186>
- Zürn, M. (2000). Democratic governance beyond the nation-state. *European Journal of International Relations*, 6(2), 183–221. <https://doi.org/10.1177/1354066100006002002>