Hidden Champions as a central element for the stabilization of rural areas in times of digitalization

Von der Naturwissenschaftlichen Fakultät der

Gottfried Wilhelm Leibniz Universität Hannover

zur Erlangung des Grades

Doktor der Naturwissenschaften

(Dr. rer. nat.)

genehmigte Dissertation

von

Carsten Philipp Rietmann, MASTER OF ARTS

2022

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Tag der Promotion: 01.07.2022

Abstract

The nexus of digitalization and rural regions is being examined in this dissertation. It is using the firm type of Hidden Champions (HCs) as a case study for this connection. HCs are little-known small- and medium-sized global or continental market leaders. Due to their long-lasting business success, they have been framed as an integral factor and as representative of the prosperity and resilience of the German *Mittelstand*. Featuring a high innovative capacity, HCs have disproportionately high export ratios and extensive international sales networks. Rural areas are the central spatial context of this dissertation: They host the majority of HCs in Germany and face resource constraints concerning digitalization. The overarching research question of this dissertation is as follows: *How do Hidden Champions in rural Germany deal with digitalization, and what is their role in their home region and its digitalization?* Employing a qualitative research approach to examine these questions, 57 semi-structured interviews with HCs and regional actors from four German regions are analyzed. First, I find that rural HCs differ in their potential and risk assessment, and resource availability regarding digitalization. As a consequence, four novel types of HCs are identified: Digital Hidden Champions, Hidden Champions of Digitalization, Traditional Hidden Champions, and Digitalization-Skeptical Hidden Champions. Second, integration of HCs in regional innovation systems is influenced by several factors, including ownership structure, firm size, organizational status, location economies, and urbanization economies. Third, I show that HCs strategically use measures of corporate local and regional responsibility and exert place leadership to develop digitalization-related assets in their rural regions. Motives for these actions are grounded in a perceived lack of swiftness and capacity of public actors, but also entail emotional attachment to the region, particularly for family businesses.

Keywords: Corporate Local and Regional Responsibility; Digitalization; Innovation; Hidden Champions; Regional Innovation Systems; Rural Areas

Zusammenfassung

Das Spannungsfeld zwischen Digitalisierung und ländlichen Räumen wird in dieser Dissertation untersucht. Der Unternehmenstypus der Hidden Champions (HCs), unbekannter Weltmarktführer, dient hierfür als Fallstudie. HCs sind der Öffentlichkeit wenig bekannte kleine und mittlere Unternehmen, die eine globale oder kontinentale Marktführerschaft innehaben. Aufgrund ihres langfristigen Geschäftserfolgs werden sie als repräsentativ und mitbestimmend für den Wohlstand und die Resilienz des deutschen Mittelstands angesehen. HCs verfügen über große Innovationskraft und ein starkes Internationalisierungsprofil. Ländliche Räume sind der zentrale geographische Kontext dieser Dissertation: Hier ist Mehrheit der HCs in Deutschland verortet. Gleichzeitig stehen diese Regionen vielen digitalisierungsbezogenen Herausforderungen gegenüber. Die übergeordnete Forschungsfrage dieser Arbeit lautet: *Wie gehen Hidden Champions im ländlichen Raum Deutschlands mit der Digitalisierung um, und welche Rolle spielen sie in ihrer Heimatregion und deren Digitalisierung?* Mittels eines qualitativen Forschungsansatzes wurden 57 teilstrukturierte Interviews mit HCs und Umfeldakteuren in vier deutschen Regionen ausgewertet. Die Ergebnisse zeigen erstens auf, dass sich HCs hinsichtlich der Digitalisierung in ihrer Potenzial- und Risikoeinschätzung sowie in der Ressourcenverfügbarkeit unterscheiden. Daher wurde eine Typologie mit vier Typen entwickelt: Digitale HCs, HCs der Digitalisierung, Traditionelle HCs und digitalisierungsskeptische HCs. Zweitens wird die Integration von HCs in regionale Innovationssysteme durch mehrere Faktoren beeinflusst. Dazu gehören unter anderem die Eigentümerstruktur, die Unternehmensgröße, aber auch verschiedene regionale Variablen. Drittens zeigt sich, dass HCs im Rahmen ihrer regionalen Verantwortung die Digitalisierung ihrer ländlichen Heimatregionen vorantreiben und bei diesen Maßnahmen oft Ortsführung übernehmen. Handlungsmotive hierfür liegen in wahrgenommener mangelnder Schnelligkeit und Kompetenz öffentlichen Akteure begründet. Ergänzend hierzu ist auch die emotionale Bindung an die Region bedeutsam, insbesondere bei Familienunternehmen.

Schlagwörter: Lokale und regionale Verantwortung von Unternehmen; Digitalisierung; Innovation; Hidden Champions; Regionale Innovationssysteme; Ländliche Räume

Acknowledgements

First and foremost, I would like to express my gratitude to all interview partners for their time and openness. Their statements and insights are the foundation of this dissertation.

I would further like to thank my supervisor Ingo Liefner for his excellent guidance throughout this doctoral project. I appreciate our productive discussions, his openness to my research interests, and his swift reactions and feedback. Additionally, a special thanks goes out to Stefan Hennemann for agreeing to serve as co-examiner and for closely collaborating throughout the *HiDi* project. Thank you to Peter Dirksmeier for chairing the examination board.

Moreover, I particularly wish to thank Lisa Zirbes as my research counterpart in our joint project for our ongoing exchange of ideas and feedback, which made the entire project much more interactive and fruitful. I am thankful to Leon Worbs for his exceptional support as research assistant and to Gabriele Herok and Yvonne Waßrodt for the administrative support during the HiDi project. Words of thanks also go to Lech Suwala, Jan-Philipp Ahrens, Matthias Liedtke, and Felix Carl Schultz for critically reviewing and discussing articles of this thesis. I further would like to thank my colleagues at the Institute of Economic and Cultural Geography for the pleasant working atmosphere, particularly in these occasionally isolating times of an ongoing pandemic, and even when working from Berlin. I am grateful for the financial support of the German Federal Ministry of Food and Agriculture, which was essential for conducting research and writing this dissertation.

Lastly, I sincerely thank my family and friends for their long-lasting and unconditional support. In particular, I cannot thank Julia enough for all her love, patience, and for taking care of our beloved daughter while I was writing.

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Chapter 1: Introduction

1.1 Motivation

The debate on equivalent living conditions (g*leichwertige Lebensverhältnisse)* between rural and urban regions in Germany has been ongoing since reunification (Weingarten & Steinführer, 2020). A new dimension to this discussion has been digitalization – in particular, the unequal access to digital infrastructure and the uneven distribution of digital skills (Malecki, 2003; Williger & Wojtech, 2018). A large share of obstacles for rural regions in Germany is of great meaning for digitalization, including resource constraints in these realms (Salemink et al., 2017). In addition, organizational, institutional, and demographic thinness of rural areas (Tödtling & Trippl, 2005) hinder the diffusion of digitalization. At the same time, digitalization is understood as having the potential to facilitate equivalent living conditions, e.g. in health care, education, or transportation (Bundesinstitut für Bau-, Stadt- und Raumforschung [BBSR], 2017) – leading to the notion of a "smart countryside" (Bosworth et al., 2020).

Only recently, the implications of these digitalization-related spatial inequalities have been investigated for companies in rural areas (Norris, 2020). For firms, the availability of such digital resources is also linked to their ability to be integrated into the global knowledge economy (Malecki, 2010). The firm type of Hidden Champions (HCs) is particularly important in this debate. HCs are little-known small- and medium-sized global or continental market leaders, mainly active in specialized business-to-business niche markets (Simon, 2009). They have been extensively studied because of their consistently strong firm performance, and have been shown to represent the success of the German export-oriented *Mittelstand* (Pahnke & Welter, 2019). Endowed with abundant internal resources and high innovative capacity, HCs possess market leadership and have disproportionately high export ratios and extensive international sales networks (Rammer & Spielkamp, 2015). Next to this international

orientation, rural areas with their digitalization-related challenges outlined above are another important spatial pattern of this firm type: These regions host over two-thirds of all HCs in Germany (Schenkenhofer, 2022).

Due to these characteristics, this dissertation examines a firm type characterized by two types of niches: A market niche of specialized business-to-business markets and a geographical niche of rural areas outside of agglomerations. This thesis focuses on HCs in rural areas to highlight the specific circumstances of this spatial context, which is decisively relevant for HCs. This concentration serves to discuss broader questions about the development of rural economies in Germany. Moreover, it allows delimiting these regions from agglomeration areas, which deviate in their conditions for innovation and digitalization (Eder, 2019).

For HCs as firms with international sales footprints and technological leadership, digitalization is particularly relevant (Wittenstein, 2020). For enterprises in general, digitalization has numerous innovation-related dimensions, such as innovation of novel products, processes, and business models (Geissdoerfer et al., 2018). Moreover, it presents firms with both significant potential (e.g. upside revenue, cost reduction) and risks (e.g., new competitors or required skills) (Schneider, 2018). This is particularly valid for manufacturing firms, whose production processes are subject to several implications of digitalization (Parida et al., 2019), and hence for HCs, as 98 percent of HCs are associated with this sector (BBSR, 2019). One could assume that both the international sales focus of HCs and their generally high innovative capacities induce an affirmative stance toward digitalization, resulting in advanced digital innovation through abundant internal resources, high requirements for digital infrastructure and capabilities, and lower integration in regional innovation systems (RIS).

Regarding the latter, digitalization is often portrayed in contradiction with the regional embeddedness and integration of enterprises through its transaction cost-reducing and networking effects, especially in innovation processes (Baronian, 2020). It enables individuals

and organizations to collaborate across greater distances, offering a “more connected way to work” (Slack, 2021, p.1). Recently, the consequences of the COVID-19 pandemic have both demonstrated and popularized these features. However, the persistence of localized innovation systems attests to the continuing importance of the regional (Fernandes et al., 2021). Weaving both perspectives together, the literature on strategic coupling has emphasized the need to complement intra-regional corporate processes with trans-regional knowledge sourcing (MacKinnon, 2012).

While management research has been interested in HCs for a long time, the firm type has only recently received prominence in economic geography (Graffenberger & Görmar, 2020). In the past decades, business scholars have examined manifold management-related questions of HCs at the organizational level, particularly regarding internationalization, R&D, and innovation strategies (Schenkenhofer, 2022). However, economic geographical analyses of HCs were thus far limited to international distributions of this firm type (Simon, 2018) and selected aspects of regional embeddedness, such as contributions by HCs to urban development in small towns (BBSR, 2019).

Regarding regional development, the economic geography literature has increasingly embraced endogenous development models (Pike et al., 2006). Consequently, it has shifted from conceiving regional resource endowment as an external factor, solely influenced by the natural environment or political measures (Lengauer & Tödtling, 2010). In shifting perspectives, scholars have recognized the importance of private actors for regional development, especially of firms (Sotarauta et al., 2012). Regional deficiencies have been shown as resulting in a more intensive corporate involvement in rural development, often labeled as place leadership (Sotarauta et al., 2017). Such initiatives aim to contribute to both regional business and living conditions in the firms’ respective regions (Arato et al., 2016). Digitalization as a significant contemporary challenge for rural areas may be one of these areas of corporate engagement and

responsibility, but has thus far not been investigated in the literature (BBSR, 2019). Such corporate strategies and measures may be particularly relevant for HCs in rural areas as economic actors, which are frequently regionally dominant – for instance, in terms of business tax, employment, or human capital. In addition, HCs are recurrently employed for regional economic marketing purposes due to their international business success and innovativeness (Lehning, 2021; Simon, 2021b).

To summarize, this dissertation focuses on an under-researched situation of innovative firms with abundant internal resources in a regional environment linked to challenges and resource constraints concerning digitalization. Consequently, it examines HCs from two perspectives: As agents of digitalization – firm-internally and firm-externally – and as experiencing the consequences of digitalization, on both a managerial and regional level. Thus far, the literature has focused on managerial features of HCs, such as internationalization and market leadership (Schenkenhofer, 2022). This thesis adds insights on additional aspects of HCs not extensively discussed in the literature: Corporate approaches towards digitalization and the firm's role in the region, expressed through integration in (rural) regional innovation systems and corporate local and regional responsibility.

1.2 Theoretical background

This dissertation is embedded in the research field of economic geography and integrates interdisciplinary perspectives, particularly from the digitalization, family business, management, and rural studies literature. The theoretical framework is built on two pillars being connected throughout this dissertation and will be described in this section: 1) Digitalization in SMEs and rural areas, and 2) Contributions by firms to regional innovation and development: Regional integration and engagement. The specific firm type of HCs, being at the center of this thesis, will be introduced in the subsequent section 1.3.

1.2.1 Digitalization in SMEs and rural areas

Digitalization has several related terms and has been the subject of intensive debate and popularization (Becker et al., 2017). Relevant related terminologies include the Fourth Industrial Revolution, computer-integrated manufacturing, cyber-physical production systems, digital factory, digital transformation, Industry 4.0, Internet of Things, smart factory, and smart manufacturing (Hozdić, 2015). To narrow down the complexity, I focus on the intersection of two dimensions of digitalization, which are most relevant for this dissertation – one organizational (digitalization in SMEs) and one spatial (digitalization in rural areas). Both pertain to the firm type of HCs as the research center of this thesis, due to its organizational categorization as SMEs and the predominantly rural location of HCs.

In terms of digitalization in SMEs, I follow Clerck (2017, p.1) in defining it as "the use of digital technologies and of data to create revenue, improve business, replace/transform business processes and create an environment for digital business, whereby digital information is at the core". In this view, digitalization has enormous potential to transform products, business models, and processes, and has significant implications for firms' value propositions and value demonstrations (Ritter & Pedersen, 2020). Besides these innovation outcomes, digitalization also facilitates and alters trans-local knowledge flows (Grabher & Ibert, 2014). Theoretical perspectives on the effects of digitalization on enterprises have been developed in the literature on resource-based views and dynamic capabilities, transition theory, entrepreneurship, transaction cost theory and platform theory capabilities (Lenka et al., 2017; Parida et al., 2019). Moreover, scholars have created a variety of digitalization frameworks, such as Appelfeller and Feldmann's (2018) reference model for a digitized enterprise and Ciffolilli and Muscio's (2018) taxonomy of Industry 4.0-enabling technologies (i.e., advanced manufacturing solutions, additive manufacturing, augmented reality, simulation, horizontal and vertical integration, industrial internet & cloud, cyber-security, big data analytics).

Applications of these technological components differ not only along the value chain, but also imply changes of the respective value added (Eurofound, 2018): Processes in pre-production (including R&D, design, and inbound logistics) and post-production (including outbound logistics, marketing, sales and customer service) experience increases in their contribution to product value creation. Meanwhile, the actual production process lessens its contribution to value creation through the use of efficiency-enhancing industry 4.0-related technologies. As described throughout this dissertation, these shifts are mainly concentrated in the manufacturing sector and hence particularly relevant for HCs.

For SMEs, significant research has been targeted towards investigating the specificity of digitalization for this firm type, deviating from the implications for larger corporations (Demary et al., 2016). For instance, regarding potential and challenges, identified obstacles of SME digitalization are high fixed costs, data protection and IT security, stakeholder acceptance, new competitors and difficulties of implementation. At the same time, opportunities are related to higher production and resource efficiency, new digital business models, flexibility, individualized production, and process optimization (Amorim et al., 2021). Further, the organizational ambidexterity to exploit long-standing innovation routines and explore digitalization-related innovation represents a specific challenge for manufacturing SMEs (Kraus et al., 2022).

There have been few studies on digitalization and digital transformation specifically limited to HCs (Müller-Seitz & Weiss, 2018; Wittenstein, 2020). To preempt, empirical evidence is scarce, although several studies focus on SMEs without identifying the firm size, market position, or public awareness levels. A large share of such research on SME digitalization is limited to employing standardized questionnaires, often including instruments such as opinion polling or digitalization maturity assessments (Appelfeller & Feldmann, 2018; Becker et al., 2017; Freimark et al., 2018; Mertens et al., 2017).

Next to investigating digitalization of a certain firm type (SMEs), the spatial dimension of digitalization in terms of its implications for rural areas is a focal area of theory for this dissertation. Digitalization affects this regional type in many ways and profoundly changes the conditions for companies located therein (Salemink et al., 2017). As rural regions have yet to comprehensively benefit from the digital revolution, the concept of a digital divide has been repeatedly employed (Malecki, 2003). Related obstacles of rural areas are linked to weak organizational support functions, sparsely developed regional innovation systems, and the lack of clusters (Isaksen & Trippl, 2017). The literature thus far has only insufficiently examined the specific influence of businesses, particularly SMEs and therefore HCs, on the digitalization of rural areas and vice versa (Salemink et al., 2017). This is especially noteworthy given the importance of these firm types in rural areas (Colombo et al., 2013) and hints at the firms' potential to contribute to regional development, as will be outlined in the subsequent section.

For firms, digitalization may help to bypass local resource constraints due to increased accessibility of distant resources through lower transaction costs (Currie, 2004). Hence, in terms of innovation, it may contribute to an uncoupling of firms' innovative capacities and activities from their regional context and its resources, and to strengthen the importance of non-interactive forms of learning (Shearmur & Doloreux, 2016; Vonnahme, 2021). Additionally, companies in rural areas face generally more limited local demand, which makes market entry strategies imperative to access extra-regional markets (McAdam et al., 2004).

These research findings show how closely innovation and digitalization are interlinked. In general, the literature on innovation in rural or peripheral areas can be divided into three narratives: *No innovation in the periphery*, *Innovation despite the periphery*, and *Innovation because of the periphery* (Glückler et al., 2022). While research generally emphasizes the challenges for firms in rural areas in terms of digitalization, rural isolation can also be understood as a conscious choice and strategy by companies to protect valuable knowledge and

facilitate secrecy (Shearmur, 2011, 2016). In a related way, a rural location can also be perceived as a protected testing ground for experimental search for innovations – despite other challenges linked to these firm locations (Glückler, 2014). However, studies on the deliberate selection of locations in rural areas based on this rationale have so far been limited (Mayer & Baumgartner, 2014). In general, case studies on innovation in peripheral areas are rare. Some exceptions include analyses of rural Norway (Fitjar & Rodríguez-Pose, 2011), northern Canada (Petrov, 2011), and the manufacturing industry in Finland (Virkkala, 2007).

While rural areas are disadvantaged regarding digitalization, companies respond to their location in rural areas with compensation and exploitation strategies, thus understanding their location as both a deficit and an advantage (Eder, 2019). These may feature compensation by building internal competencies, cross-regional cooperation, utilizing temporary and virtual buzz, and additional company locations in agglomeration areas, and exploitation by making use of the protective environment in rural areas, by relying on the local institutional context, and by using locally available financial incentives (Eder & Trippl, 2019). A larger company in a rural area can often represent the sole or largest employer in a region - either in a specific industry or overall. This reduces the chance of employees changing jobs, and can therefore increase company loyalty (Isaksen & Karlsen, 2016) and reduce the risk of knowledge leakage to competitors (Grillitsch & Nilsson, 2017). Here, the literature also highlights increased risks associated with such conditions: e.g., poaching of labor, knowledge leakage besides positive spillovers, and substantial regional dependency on the business success of one firm (Flammer & Kacperczyk, 2019).

As a further facet of the spatial implications of digitalization, especially with respect to Industry 4.0 in the manufacturing sector, it has the potential to change the geography of innovation and knowledge as much as the previous industrial revolutions (Balland et al., 2019; Winter, 2020). Numerous studies are investigating how clusters and the characteristics of their agglomeration

effects are changing because of digitalization and Industry 4.0, since their supra-regional networking effect can conflict with classical mechanisms of knowledge flows (Delgado et al., 2014; Götz & Jankowska, 2017).

To summarize, digitalization is important for this dissertation in three main theoretical dimensions. First, novel processes, products, and business models, related to digitalization, have a potential effect on firms' profits through greater revenue or lower costs. Second, geographical dynamics of knowledge creation and innovation are potentially altered through digitalization. Third, a rural location confronts firms with specific challenges and conditions concerning digitalization, leading to both compensation and exploitation strategies.

1.2.2 Contribution by firms to regional innovation and development: Regional integration and engagement

This section examines contributions by firms to regional innovation and development, which are at the heart of this dissertation. I especially seek to investigate the contributions made by the special firm type of HCs to the rural areas they are located in. Moreover, the thesis aims to intertwine these influences with the realm of digitalization, being the other relevant theoretical pillar.

The concept of endogenous development serves as the underlying connecting mechanism of (a) the integration in RIS and (b) corporate engagement of HCs in rural areas. In comparison with other approaches, it incorporates additional mechanisms to induce regional development, e.g. in contrast with export base theory. The latter had been employed in the past to explain demand-induced regional development. It is based on income effects through exports of a local firm or sector with tradable goods (basic sector) and the related multiplying effect through the local (non-basic) sector with non-tradable goods (Maier et al., 2006). More recently, the extensive R&D capabilities and high innovation output of HCs can be related to theory on knowledge-based and innovation-based regional development (Liefner & Schätzl, 2017).

Classically, endogenous development is understood as inducing regional development through the support of "*local enterprise, small-firm growth, and technological innovation*" (Martin & Sunley, 1998, p. 219). It is crucial to differentiate it from endogenous growth theory as a holistic theoretical model, founded in macroeconomics (Romer, 1990). The latter theory conceptualizes main factors of growth endogenous to the production function, not endogenous in a spatial sense (Margarian, 2013). To link these overarching considerations to the research fields of this thesis, the endogenous development approaches underline the relevance of broader knowledge-based regional development through integrating innovative firms in RIS. Additionally, companies contribute to regional development through corporate engagement and hence may impact the stabilizing development of rural regions, which face unique challenges – for example, concerning digitalization.

First, integration in RIS is vital for firms through the relevance of localized complex, tacit, and codified knowledge for innovation (Boschma & Frenken, 2010), of the ever-growing importance of the open innovation model (Chesborough, 2003), and for entering and accessing regional markets (Cooke et al., 2007). The RIS approach has been widely employed over the past decades to examine the relevance and quality of regional aspects of innovation (Asheim & Isaksen, 1997). It is founded in emphasizing the importance of geographical/spatial proximity, which influences and facilitates the emergence of other proximity dimensions, such as the social realm (Boschma, 2005). However, RIS perspectives focusing on single firms are scant and have mainly analyzed firms in agglomerations or the primary sector of the economy (Doloreux, 2003). The majority of RIS research focuses on other types of businesses that require less specialized knowledge and resources (Greenberg et al., 2018). Further, there is little research on rural RIS compared to agglomerations with a plethora of studies. Especially, the integration of highly innovative enterprises in rural areas' innovation systems has received less attention. Here, RIS frameworks are integral to considering the implications of these theoretical

approaches for regional development and will be employed in Chapter 3 (Article Two) of this dissertation.

HCs are highly internationalized export-driven firms, active in niche markets. These characteristics lead to the proposition that this firm type is expected to be less embedded in its respective home region's innovation system due to two factors. First, its global orientation could imply that the main link of HCs to their regions is through the labor market (Isaksen, 2001). Second, their technological specialization could prioritize cognitive proximity and the technological fit of R&D cooperation over spatial proximity. With its transaction cost-reducing and networking effects, digitalization has the potential to impact the regional integration and embeddedness of HCs as firms with high requirements for specialized knowledge (Wittenstein, 2020). Here, relevant components include distant knowledge sourcing, different knowledge transfer channels, and shifting modes of knowledge creation (Ehret & Wirtz, 2017; Liefner & Schätzl, 2017; Trippl et al., 2009). In particular, the global subsidiary network typical for HCs may be affected by digitalization through easing and facilitating distant intra-firm linkages, including R&D collaboration between firm locations. The predominantly rural location of HC headquarters (Schenkenhofer, 2022) and the specificity of rural regional innovation systems (RIS) (Tödtling & Trippl, 2005) are adding regional characteristics to this question.

By connecting the realms of RIS integration and globalization (with its close relation to digitalization), the literature on strategic coupling can further inform these perspectives – particularly for transnational firms (Yeung, 2016). In this realm, the co-evolution of regional (and occasionally, domestic) and international linkages of firms has been analyzed by the global production network (GPN) and global value chain (GVC) research streams (Gereffi et al., 2005; Yeung, 2009). This co-evolution applies to inter-firm and intra-firm linkages (Ernst & Kim, 2002). These concurrent global and local links are especially important for firms in peripheral regions with limited resources and thin RIS (Asheim & Isaksen, 2002).

Investigating influencing factors of RIS integration of firms is an avenue to consider the specificity of HCs in rural areas. Research has accumulated findings that RIS integration is influenced by both firm-internal and firm-external variables (Kalantaridis & Bika, 2006). These influencing factors will be described in greater depth in this dissertation's Chapter 3 (Article Two). To provide an overview, firm-internally, ownership structure, firm size and age, organizational status (e.g., single-establishment firms, location of headquarters and other corporate functions), market position and industry, innovative capacity and technological focus, and firm leadership and management characteristics have all been found to influence RIS integration on a firm-wide level (Bird & Wennberg, 2014; Branstetter, 2006). For instance, regarding ownership structure, most HCs are classified as family firms (Rammer & Spielkamp, 2015). Concerning the regional embeddedness of this ownership type, scholars have highlighted the home-region focus and sense of local stewardship (Banalieva & Eddleston, 2011), and increased localized social capital as characteristic of family firms (Chrisman et al., 2014).

Firm-external regional variables such as location (or milieu) economies, urbanization economies, the degree of peripherality of corporate locations, and technology and innovation policy are all major influencing elements for RIS integration (Doloreux, 2003). The availability of regional resources differs between urban and rural areas (Eder & Trippl, 2019) and is of particular importance for HCs, which are mainly located in rural areas. Rural places present unique and often difficult conditions for innovation, necessitating a unique RIS structure (Virkkala, 2007). I consider the specificity of RIS in rural areas throughout this dissertation: Resource constraints, institutionally thin RIS, limited knowledge externalities and spillovers, weakly developed or missing clusters, SMEs' dominance, low levels of R&D and product innovation, few research institutions and high-profile universities, low to medium level qualifications, and a focus on raw material extraction are all characteristics of rural RIS (Doloreux & Dionne, 2008; Kalantaridis & Bika, 2011; Tödtling & Trippl, 2005; Yin et al.,

2019). Consequently, these aspects could affect the requirements of firms for interaction with external actors in RIS and beyond (Vonnahme, 2021).

Second, besides RIS integration, the contribution by (and capacity of) firms to endogenous regional development through regional engagement has been increasingly acknowledged (Stimson et al., 2009). Corporate local and regional responsibility (CLRR) provides the theoretical model employed in this dissertation for corporate engagement aiming at regional socio-economic development (Kiese & Schiek, 2016). It highlights corporations' perceived responsibility for their region and the activities that follow from it. Related to the concepts of corporate social responsibility (CSR) and corporate citizenship, but also emphasizing the voluntariness and spatial nature of responsibility by firms, its three key mechanisms are corporate giving, corporate volunteering, and corporate support (Hohn et al., 2014).

Socio-economic development in rural areas has only recently been examined (Müller, 2016). Rural areas face particular socio-economic challenges: Organizational and institutional thinness, infrastructural deficiencies, and others (Tödtling & Trippl, 2005). These obstacles potentially result in an increased necessity for CLRR. Such involvement is founded on the rationale that changing the specific regional conditions of current firm locations could be an alternative to relocations (Albers & Suwala, 2018). By examining emerging and transitioning economies, CLRR has also been studied concerning resource constraints in another spatial context (Blowfield & Frynas, 2005) – mainly assessing the impact on poverty alleviation and other development goals. Regional engagement is associated with high degrees of social capital of involved firms (Westlund & Adam, 2010) – a relevant finding for HCs, which predominantly are classified as family firms (Rammer & Spielkamp, 2015).

Digitalization has thus far not been analyzed in connection with CLRR, while research has examined other areas, such as social and cultural infrastructure, housing, town center development, regional networking, and strategic regional development such as master plan

initiatives (Bürcher & Mayer, 2018). This is especially important as digitalization contemporarily represents a major pillar of socio-economic challenges, particularly in rural areas (Salemink et al., 2017). Moreover, CLRR has only rarely been studied for HCs – with the exceptions of BBSR (2019) examining the regional engagement of HCs in small town development and Graffenberger and Görmar (2021) investigating motives and measures of CLRR of three German small town HCs.

Furthermore, the importance of key actors in regional development – being conceptualized as leadership – has recently been restored as critical drivers of subnational growth (Sotarauta et al., 2017). In rural areas, the partial withdrawal of the state (Albers & Suwala, 2020), constrained regional resource endowments (Collinge & Gibney, 2010) and novel technology, such as digitalization, necessitate leadership by actors that possess adequate capacities (David & Foray, 2002). There are a few concepts of leadership with spatial dimensions that are relevant for this dissertation: City and regional leadership (Raagmaa & Keerber, 2016; Sotarauta & Beer, 2021), place-based leadership (Benneworth et al., 2016), and place leadership (Hu & Hassink, 2017; Sotarauta & Beer, 2017). As regional transformation offers particular challenges for rural areas, leadership must branch out to new regional development paths (Horlings & Padt, 2013). Moreover, the term *change agency* has recently been employed to analyze actors' agency in impacting regional development, especially in peripheral regions (Sotarauta et al. 2022). It is based on an interplay of Schumpeterian innovative entrepreneurship, institutional entrepreneurship and place-based leadership (Grillitsch & Sotarauta, 2020).

CLRR and place leadership were only lately brought up in conversation (Albers & Suwala, 2020; Voegtlin et al., 2012), as will be further elaborated on in Chapter 4 (Article Three). When the engagement of particular firms or other actors becomes so intense and ubiquitous, that obligations handled by the government are expected to be taken up by these firms, a link between the two notions emerges and place leadership is exercised in this way (Basco &

Suwala, 2020). HCs with abundant internal resources and a frequently dominant position within their own region are a promising firm type for examining the intersection of place leadership and CLRR, but have not yet been studied.

1.3 Hidden Champions: A special firm type

This dissertation relates all research questions to HCs as a specific firm type. As indicated, HCs are little-known small-sized or medium-sized global or continental market leaders. Throughout this thesis, I employ Simon's (2009) definition of HCs as SMEs that are (a) part of the top three companies with the largest market share in their market segment globally or have the highest market share on their continent, (b) have an annual revenue below EUR 5 billion, and (c) have a low level of firm awareness among the general public and outside the firm's industry. I refer to Simon's foundational efforts (e.g., 1996, 2009, 2018, 2021a) and Schenkenhofer (2020; 2022) for an extensive literature review of research on HCs. A substantial part of the literature is based on German HCs (and those in other German-speaking countries) due to their significant share of all HCs globally (Audretsch et al., 2021; Simon, 2021a). Additional studies were conducted for other countries, e.g., for Greece by Voudouris et al. (2000) and several states in Eastern Europe and Asia by Lalić (2021).

Several characteristics of HCs are particularly relevant for this dissertation and its research question. Most of these further contribute to the distinctiveness of HCs in comparison with other SMEs or family firms – in particular the abundance of internal resources, a high innovative capacity, and an international sales focus (Witt & Carr, 2013).

First, HCs possess niche market leadership, primarily in manufacturing B2B industries (Simon, 2018). Employing Porter's competitive strategies, HCs can be assigned a focus strategy (Audretsch et al., 2018, 2021). Toften & Hammervoll (2009) offer further analyses of firms that operate in niche markets and their specifics, such as prioritizing markets based on their capacities and strengths and using differentiation and specialization strategies regarding

customers and products. As a research finding in the nexus of strategy and performance, HCs have significantly higher profitability (return on assets) than other Mittelstand firms (Johann et al., 2021). The market position of a global niche business model is frequently attributed to considerable endowment with internal resources (Simon, 2009). However, the literature on resource availability has mostly ignored digitalization-specific resources (Wittenstein, 2020), opening up research gaps for this dissertation.

Second, HCs have extensive R&D capabilities and expenditures and utilize them to preserve their market position through innovation as a long-term business success strategy, backed by strong research collaboration with universities (Schlepphorst et al., 2016; Venohr & Meyer, 2007). Innovation is mostly conducted in small steps, focusing on continuous improvement procedures in close collaboration with customers (Rammer & Spielkamp, 2019). However, there is a research gap in digitalization-related R&D of HCs: It is still unclear whether manufacturing R&D capabilities are equally appropriate for digitalization-related innovation. This question has significant ramifications for the future business success of this firm type (Simon, 2021a). The innovation footprint of HCs represents the German *Mittelstand* in terms of understanding its technologies as *deep tech*: Veiled and embedded in processes and physical products of other firms (Gärtner, 2016). This stands in contrast to consumer-oriented innovation foci from Silicon Valley-based technology firms, for instance (Pahnke & Welter, 2019).

Third, HCs are mostly owner-managed and in cross-generational family ownership (Rammer & Spielkamp, 2015), emphasizing the proximity to the family business literature (Basco & Suwala, 2020). Moreover, low attrition and long tenure of employees – commonly across generations – is characteristic of HCs (Lehrer & Schmid, 2015). Here, HCs frequently act as stable long-term and, occasionally, major employers within a region (Lehmann et al., 2019; Pahnke & Welter, 2019).

Fourth, HCs have a global orientation because of deliberate globalization (Kaudela-Baum et al., 2014). They feature a global network of sales offices and have an average export share of 64 percent, compared to 39 percent for all German enterprises (Rammer & Spielkamp, 2015; Statistisches Landesamt Baden-Württemberg, 2020). As a result, the corporate network of HCs comprises actors who are globally distributed.

Fifth, because HC headquarters are typically located outside agglomeration centers, rural regions are an essential geographical category. Around two-thirds of HCs in Germany, which hosts the bulk of HCs globally (Schenkenhofer, 2022; Simon, 2018), are in rural areas, compared to 39 percent of all enterprises in Germany (Stiftung Familienunternehmen, 2020). Acknowledging the high innovative capacities of HCs, expressed through technological leadership, despite their predominantly rural location calls the significance of agglomeration advantages into question, such as higher likelihoods of knowledge spillovers (Fitjar & Rodriguez-Pose, 2020; Fritsch & Wyrwich, 2021a). This geographical footprint of HCs is surprising, reflecting on the state of the literature that agglomeration areas offer distinct advantages for knowledge-intensive and highly specialized firms.

Regarding the dissertation's research questions, which will be presented in section 1.5, there is scant research on HCs. First, concerning corporate digitalization, very few studies have analyzed this dimension for HCs, despite being a critical factor for HCs to maintain their international networks and engage in digitalization-related innovation (Wittenstein, 2020). Moreover, for HCs, conditions of digitalization such as the spatial (e.g., rural areas) and managerial (e.g., ownership structure) context have yet to be considered in research. The survey of digital transformation activities conducted by Freimark et al. (2018) focuses on differentiating HCs from other SMEs and large companies. Müller-Seitz and Weiss's (2018) case study of a German HC active in artificial intelligence and its digitalization pursuits is limited to a software company whose digital goods differ from most manufacturing-focused

HCs. Kamp's (2018) study of HCs' smart service offerings focuses on a specific sort of business model innovation. The dynamic capabilities approach by Wittenstein (2020) emphasizes HC resources but does not consider digitalization-related innovation because of exploiting these resources. Simon's (2020) analysis of digitalization success criteria is selective in its approach to marketing, but hence opens up research avenues for other business functions. Most recently, an edited volume examined Industry 4.0 implementation of HCs through a collection of case studies (Breyer-Mayländer, 2022).

Second, research on regional integration and embeddedness of HCs is scarce. While RIS integration of firm types such as family businesses (Basco et al., 2021) and multinational enterprises (MNE) (Meyer et al., 2011) has been studied, there is a gap for HCs – possibly due to the firm's hiddenness. Due to these deliberations, I propose that the HC's own location is less important than for other SMEs that rely more heavily on local value chains and marketplaces.

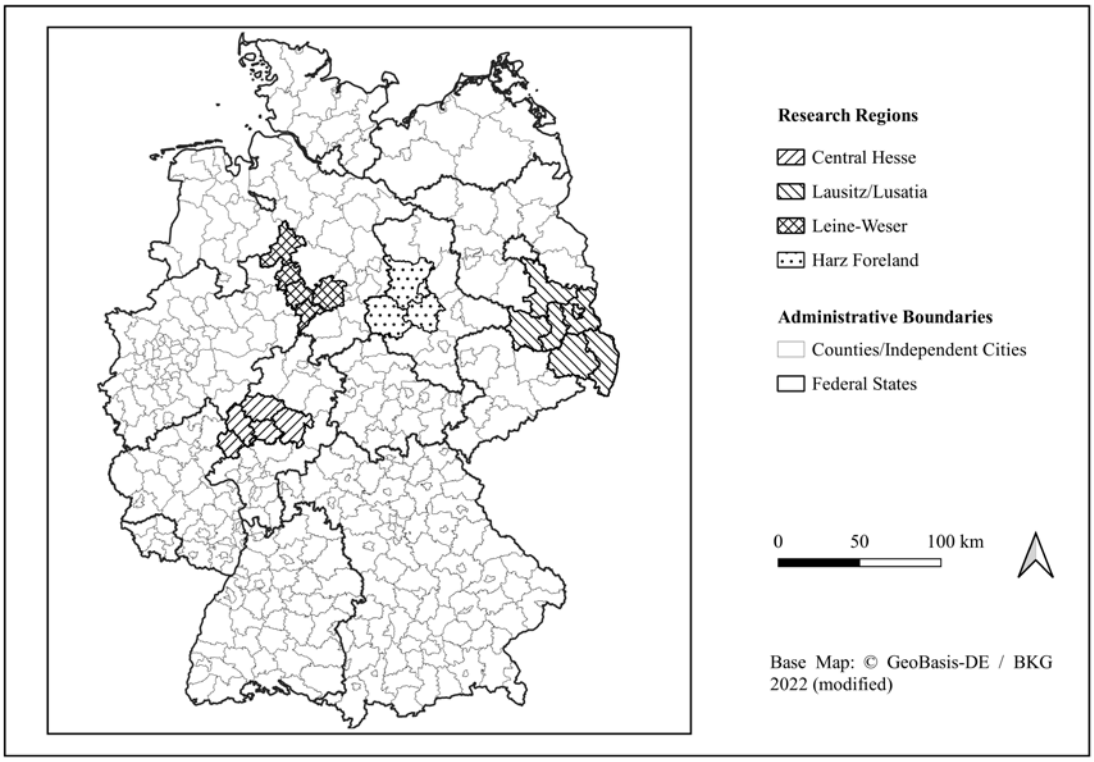
Third, on CLRR and place leadership, there is scant research for HCs with few known exceptions. BBSR (2019) investigates HCs' regional engagement in German small towns in urban development projects. Graffenberger and Görmar (2021) analyze the causes and measurements of CLRR for three HCs in small-sized municipalities using the same data. The findings confirm that family firms – which make up the majority of HCs – are more dedicated to CLRR than non-family enterprises, as stated concerning the influence of firm-internal factors. This indicates a higher likelihood of deepened engagement as most HCs are family businesses. In addition, the regional density of HCs in various German regions has been analyzed as a determinant of regional development (Benz et al., 2021). Moreover, a recent edited volume has investigated the connection between Corporate Social Responsibility (CSR) and HCs (Genders & Seynstahl, 2021).

1.4 Data and methodology

The research questions of this dissertation, which will be formulated in the following, are explorative. Therefore, a qualitative methodology was deliberately chosen to investigate the complexities of the nexus of digitalization, rural areas, and HCs. In addition, this method seemed appropriate for this firm type due to its distinct emphasis on secrecy (Rammer & Spielkamp, 2015). Overall, I employ an actor-centric and firm-centric perspective (Kalantaridis & Bika, 2011) in all three articles of this dissertation, examining the corporate behavior and linkages of individual firms.

To better understand regional characteristics in this firm-centric setting, I selected four rural regions with a large spectrum of demographic, economic and infrastructural indicators, based on the empirical results for German regions by Küpper (2016) and Oberst et al. (2019). I used the Eurostat (2020) definition of rural regions in this context. The regions selected were Central Hesse (Hesse), Leine-Weser (Lower Saxony), Lausitz/Lusatia (Brandenburg and Saxony), and Harz foreland (Saxony-Anhalt). Figure 1 provides an overview of the four regions, while Table 1 lists their NUTS3 components.

Figure 1: Overview of research regions



Source: Map design by Leon Worbs; data from GeoBasis-DE/BKG.

Table 1: NUTS3 components of the four research regions

Central Hesse	Leine-Weser	Lausitz/Lusatia	Harz foreland
Giessen	Hamelin-Pyrmont	Bautzen	Börde
Lahn-Dill	Hildesheim	Cottbus	Harz
Limburg-Weilburg	Holzminden	Dahme-Spreewald	Magdeburg
Marburg-Biedenkopf	Nienburg	Elbe-Elster	Salzland
Vogelsberg	Schaumburg	Görlitz	
		Oberspreewald-Lausitz	
		Spree-Neisse	

Source: Own elaboration.

Central Hesse in the state of Hesse is constituted of the counties Giessen, Lahn-Dill, Limburg-Weilburg, Marburg-Biedenkopf, and Vogelsberg. Located around Gießen as its largest agglomeration, Central Hesse features clusters of optics, electronics, mechanics, wood processing, and environmental technology (Regionalmanagement Mittelhessen, 2021). Three tertiary educational institutions are in Mittelhessen: Justus Liebig University Giessen, Philipps University of Marburg, and University of Applied Sciences Mittelhessen.

Leine-Weser comprises the counties Hamelin-Pyrmont, Hildesheim, Holzminden, Nienburg, and Schaumburg in the south of Lower Saxony. Containing major parts of the Weser Uplands, Leine-Weser is characterized by very rural regions and areas more proximate to the state capital Hannover and the other significant cities Göttingen and Hildesheim. While mainly associated with tourism, historical clusters prevail in various parts of this study area: Glass, furniture, mechanical engineering, electronics, and food technology (Amt für regionale Landesentwicklung Leine-Weser, 2017).

Lausitz/Lusatia spans across parts of the East German federal states of Brandenburg (Lower Lusatia) and Saxony (Upper Lusatia). A rural historical area in the center of Europe, it unites German and Polish regions while bordering on the major German cities Berlin and Dresden. The economic base of Lusatia has a strong mining footprint, especially in lignite. In addition, international corporations maintain predominantly production-focused plants in Lusatia, such as BASF, Siemens, Bombardier, Globalfoundries, and recently Bosch (Wirtschaftsregion Lausitz, 2018).

The Harz foreland in the East German state of Saxony-Anhalt is nestled between the city of Magdeburg and the Harz mountain range. It consists of the counties Börde, Harz, Magdeburg, and Salzland. The Harz University of Applied Studies with its two campuses is the main tertiary institution in the rural parts of the region, while the Otto von Guericke University Magdeburg also has a strong regional influence beyond the city (Regionale Planungsgemeinschaft Magdeburg, 2021). As in the Harz itself, mining is a central pillar of the economic base of the eastern Harz foreland – besides logistics due to its centrality and proximity to major highways and waterways. Table 2 lists indicators of these four research regions.

Table 2: Relevant indicators of research regions

	Central Hesse	Leine-Weser	Lausitz/ Lusatia	Harz foreland	Germany - Average	Germany - Minimum	Germany - Maximum
Internet coverage 100 Mbit/s[3]	86.4%	79.5%	78.9%	78.8%	85.7%	36.8%	99.7%
Internet coverage 1.000 Mbit/s[3]	29.1%	52.5%	23.9%	10.5%	51.1%	0.1%	99.7%
Car density / 1.000 pop.[2]	605	608	586	548	594	330	1109
Average age of population (years)[2]	43.7	36.4	44.0	47.2	44.7	39.9	50.5
Unemploy-ment rate[2]	4.3%	5.6%	6.3%	6.7%	4.7%	1.4%	12.8%
Employment share: Secondary sector[2]	34.0%	34.0%	30.6%	28.8%	31.5%	7.6%	63.1%
GDP per capita (EUR)[2]	35,319	25,112	27,581	29,617	38,543	16,610	188,290
Municipal tax capacity per inhabitant (EUR)[2]	961	636	710	660	947	495	2,819

Source: Bundesministerium für Digitales und Verkehr [BMVI] (2022) and BBSR (2022). Own calculations (NUTS3 aggregates. weighted by area and population size). Data from 2018[1], 2019[2] and 2020[3].

To identify potentially relevant HCs, the Global Market Leader Index by Müller (2018) was used and enriched by interviews with Chambers of Industry and Commerce representatives. All firms were evaluated concerning their fit with Simon's (2009) definition of HCs[1].

Between September 2020 and March 2021, 57 interviews were conducted with two actor types: HC representatives and regional actors. First, representatives of HCs consisted exclusively of members of the management. I focused on those leadership positions as they are acquainted with the firm's history and regional context due to their HC-typical long tenure (Venohr & Meyer, 2007), and have the authority to disclose details. One representative per firm has been

[1] (1) Part of the top three companies in their market segment globally or are number 1 on their continent, (2) annual turnover below EUR 5 billion, (3) low level of firm familiarity among the general public or outside their industry (Simon, 2009).

interviewed. In the sample of 28 HCs, the share of firms active in manufacturing is 89%, the remainder being HCs that exclusively produces software. This distribution is proportionate to the general population of German HCs. The average revenue of EUR 195 million per year is lesser than of all HCs, with EUR 325 million (Simon, 2018). The average share of exports of interviewed firms is 52% (compared with 64% for all HCs, Rammer & Spielkamp, 2015) and the share of family-owned firms 54% (compared with 66% for all HCs, ibid.). Second, 29 actors in the regional vicinity of HCs were interviewed to add insights and validate the perspectives of HCs. The regional distribution was equivalent for both interviewed groups. Actor types included mayors, representatives of regional development agencies, Chambers of Commerce and Industry (CCI), and research transfer managers at universities.

The interviews were structured with interview guides, which are further described in the three articles of this dissertation and are also part of the attached Appendix. The interview material was coded and evaluated in the following way. For Chapter 2 (Article One), the interviews were coded to develop a data structure with first-order concepts, second-order themes and aggregate dimensions, based on Gioia et al. (2013). Thereinafter, a cross-case analysis revealed commonalities and differences between the interviewed HCs (Yin, 2011). Based on this analysis, empirically grounded firm types were constructed, based on Kluge (2000). In Chapter 3 (Article Two), the interview transcripts were coded along the structure of RIS subsystems and were refined with sub-dimensions of these subsystems for deeper coding levels. Subsequently, influencing factors for RIS integration were identified inductively and grouped as (a) firm-internal and (b) firm-external regional factors. In Chapter 4 (Article Three), the interviews were coded and evaluated using qualitative content analysis methods, based on Mayring (2014). For all articles, the interviewees' statements were selectively triangulated and validated with secondary data sources, such as annual reports and firm websites (Graebner et al., 2012). The

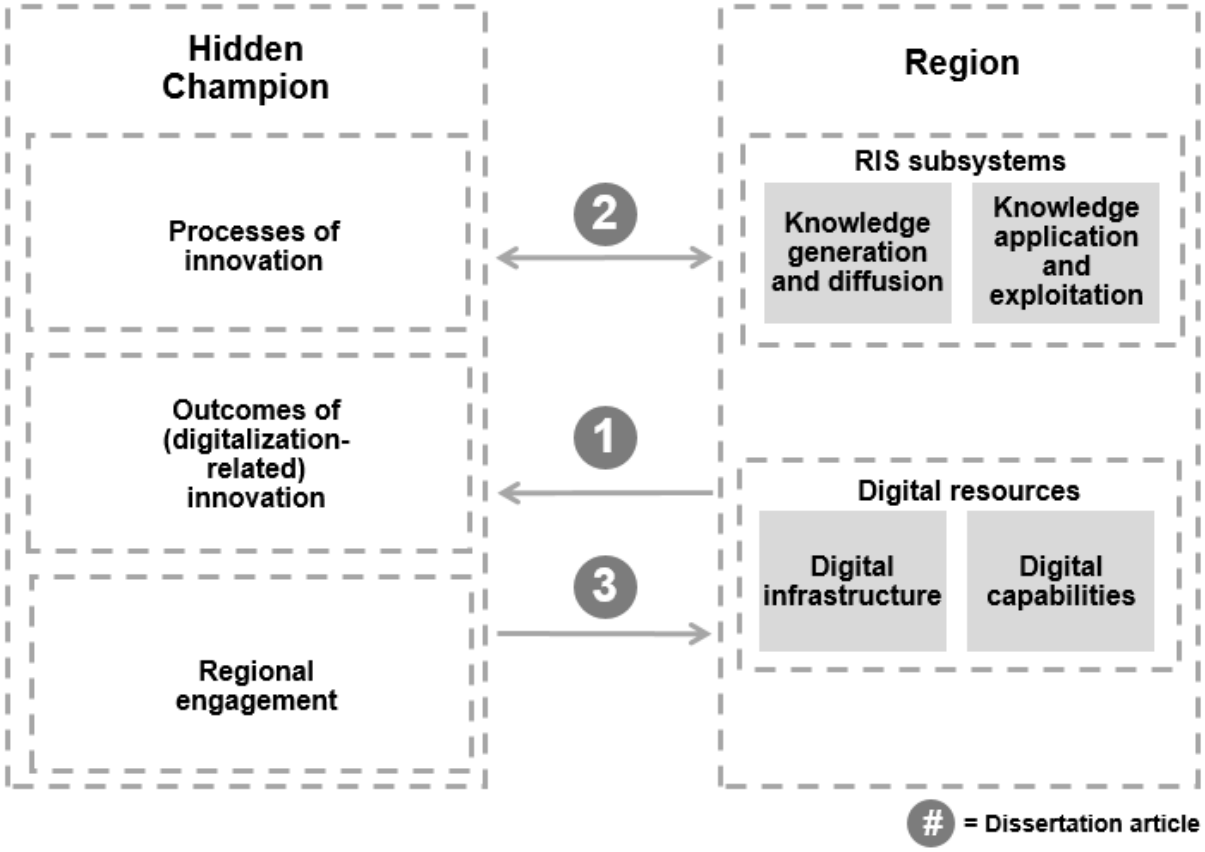
software *f4 (f4transkript/f4analyse)* was used to transcribe, code, and analyze the interview material.

1.5 Research context and thesis structure

This dissertation emerged in the research project "*Hidden Champions as a central element for the stabilization of rural areas in times of digitalization*" (HiDi). It has been funded by the German Federal Ministry of Food and Agriculture under the framework *Bundesprogramm Ländliche Entwicklung* (BULE). A joint project between Leibniz University Hannover and Justus Liebig University Gießen, it has been supervised by Prof. Dr. Ingo Liefner and Prof. Dr. Stefan Hennemann. The project consisted of two subprojects. While this dissertation presents the findings of one subproject with a qualitative methodology, my doctoral counterpart Lisa Zirbes worked on the other subproject, employing quantitative methods. She focused on identifying HCs in Germany through web-based data and text mining, and the structural analysis of locational conditions and regional typologies.

In light of the dissertation's project context, and its theoretical background and methodology described above, the following overarching and guiding research question is being approached in this dissertation: ***How do Hidden Champions in rural Germany deal with digitalization, and what is their role in their home region and its digitalization?*** The research framework of this dissertation is displayed in Figure 2.

Figure 2: Dissertation research framework



Source: Own elaboration.

This main research question is being broken down into separate research questions, which the three articles of this cumulative dissertation investigate.

Chapter 2 (Article One): *What are the dimensions and conditions of digitalization for HCs in rural areas? How do these dimensions and conditions shape outcomes of digitalization for these firms?*

Chapter 3 (Article Two): *What influences the integration of HCs in rural regional innovation systems?*

Chapter 4 (Article Three): *How and why do HCs engage in digitalization-related corporate local and regional responsibility and place leadership*?

Table 3 summarizes this dissertation's research articles as of 29 March 2022. All three articles were conceptualized and written by the author of this dissertation.

Table 3: Overview of dissertation articles

Title	Author	Research question	Status
Digital pioneers in the periphery? Toward a typology of rural Hidden Champions in times of digitalization	Carsten Rietmann	What are the dimensions and conditions of digitalization for HCs in rural areas? How do these dimensions and conditions shape outcomes of digitalization for these firms?	*Journal of Small Business & Entrepreneurship* Published DOI: 10.1080/08276331.2021.1979909
Hidden Champions and their integration in rural regional innovation systems: Insights from Germany	Carsten Rietmann	What influences the integration of Hidden Champions in rural regional innovation systems?	*Zeitschrift für Wirtschaftsgeographie / ZFW – Advances in Economic Geography* Published DOI: 10.1515/zfw-2021-0024
Corporate responsibility and place leadership in rural digitalization: The case of Hidden Champions	Carsten Rietmann	How and why do HCs engage in digitalization-related corporate local and regional responsibility and place leadership?	*European Planning Studies* Published DOI: 10.1080/09654313.2022.2059345

Source: Own elaboration.

In terms of the dissertation's structure, these three articles are embedded between the introduction (Chapter 1) and the conclusion (Chapter 5). The introduction has thus far described the motivation, theoretical background and research gaps, data and methodology, and the research context and thesis structure. Chapter 5 concludes this dissertation and discusses the main findings, as well as theoretical, managerial, and policy implications.

Regarding limitations of this dissertation's research, Section 5.4 develops an extensive critical review of the findings (that is, the potential for direct comparison with other firm types in rural

areas, difficulties to generalize from case study regions, and the importance of intra-firm linkages for knowledge creation of HCs, among others). To guide the reader and preempt this reflection, I would like to highlight a selection of limitations upfront that pertain to the firm type of HCs. As the literature review above has been indicated, other firm types – such as SMEs, MNEs, and family firms – have been analyzed regarding digitalization, RIS integration, and corporate engagement. While HCs represent subsets of some of these firm types or display overlaps, the crucial distinction is functional. The defining features of HCs (i.e., niche market leadership) differ from SMEs overall and family businesses, which are typically investigated concerning their ownership structure (Benz et al., 2021; Witt & Carr, 2013).

Chapter 2 | Article One: Digital pioneers in the periphery?

Digital pioneers in the periphery? Toward a typology of rural Hidden Champions in times of digitalization

Author: Carsten Rietmann

Journal: Journal of Small Business & Entrepreneurship

Status: Published (DOI: 10.1080/08276331.2021.1979909)

Abstract

We unravel dimensions, conditions, and outcomes of digitalization for Hidden Champions (HCs) in rural areas in Germany. As highly innovative small- and medium-sized market leaders, HCs are challenged to maintain their niche dominance but are endowed with significant resources. However, firms in rural areas face resource constraints related to digitalization and innovation. Based on qualitative interviews with 28 companies, we develop a typology of HCs with four firm types differing in their handling of digitalization: Digital Hidden Champions, Hidden Champions of Digitalization, Traditional Hidden Champions, and Digitalization-Skeptical Hidden Champions. Their digitalization-related potential and risk assessment, resource availability, strategy, and innovation types are portrayed. We provide evidence that innovative market leaders in rural areas are not necessarily also digitalization front-runners. We contribute to a deeper understanding of the nexus of digitalization, SMEs, and rural areas. Our findings have managerial and policy implications. Less innovative SME can emulate HCs' handling of digitalization. Regional policymakers should expand firm type-specific digitalization policy formulation.

Keywords: Hidden Champions; Digitalization; SME; Rural areas; Qualitative analysis

2.1 Introduction

Digitalization involves fundamental changes to products and business models and processes, both internally and with external stakeholders. Following Clerck (2017, p.1), we understand digitalization as 'the use of digital technologies and of data to create revenue, improve business, replace/transform business processes and create an environment for digital business, whereby digital information is at the core'. Digitalization also affects HCs as highly innovative but little-known small- and medium-sized companies possessing market or technology leadership for specialized products. HCs have significant export shares in their niche segments and are required to cooperate with customers globally (Rammer & Spielkamp, 2019). HCs are mainly active in manufacturing industries and have concentrated their innovation activities on incremental continuous process improvement, which deviates from digital modes of innovation (Simon, 2009, 2020). Hosting a vast majority of HCs in Germany, rural areas face special conditions and external resource constraints, both concerning digitalization and innovation (Eder & Trippl, 2019). HCs are understood as the backbone of the German *Mittelstand* of export-oriented small- and medium-sized enterprises (SME). So, their continued business success in times of digitalization is crucial for the prosperity of the larger economy (Wittenstein, 2020). This situation is even amplified for rural areas, facing substantial challenges related to digitalization.

We contribute to the literature by addressing a research gap in the nexus of digitalization, SMEs, and rural areas, which will be further described in Section 2. Facing scant research, this study adds additional analytical depth and differentiation in understanding HCs' digitalization behavior by considering contextual factors and focusing on key conditions and outcomes of digitalization. Most of the HC literature neglects the spatial context by not distinguishing between rural and agglomeration areas and not considering differences in location conditions and requirements. The geographical focus of this study on rural areas shines a light on a regional

context associated with increased challenges and resource constraints concerning digitalization (Eder & Trippl, 2019). Moreover, managerial context such as ownership structure (and hence managerial agency) is largely ignored in the HC literature, and thus, for example, private equity-owned firms and family businesses are not analyzed in distinct ways. Research frequently does not distinguish between HCs and other SMEs (Schenkenhofer, 2022). This article provides a perspective on a segment of SMEs that systematically deviates from other SMEs due to market and technology leadership and abundant internal resources, and different managerial context (Witt & Carr, 2013). Further, in academic and political discourses and beyond, digitalization has suffered from a lack of analytical precision (Bloomberg, 2018). Using semi-structured interviews has so far not been employed in research on the digitalization of HCs.

These identified voids have recently motivated scholars to ask for a more differentiated understanding of digitalization (Attaran & Woods, 2019) and for building bridges from management research to related disciplines (Beckmann et al., 2021), such as economic geography.

This study hence investigates two key research questions: *What are the dimensions and conditions of digitalization for HCs in rural areas? How do these dimensions and conditions shape outcomes of digitalization for these firms?*

Therefore, we develop a typology of HCs concerning the dimensions, conditions, and outcomes of digitalization. It emphasizes the key role of context to address this interface of digitalization with this special firm type, which is highly relevant for the overall economy, and a distinct spatial situation, facing increased challenges globally. The typology helps to better understand important dimensions of digitalization, key characteristics of HCs, and the combination thereof.

This study is structured as follows. Section 2 presents the state of research about HCs in rural areas in times of digitalization and develops relevant research questions. Section 3 describes

the qualitative methodology employed for this study. Section 4 introduces a typology of HCs and portrays the identified types. Section 5 concludes with a discussion and summary.

2.2 Literature review

Several streams of literature relate to this study sitting at the nexus of digitalization, HCs, and rural areas. These include research on digitalization in SMEs, HC-related digitalization, and conditions of digitalization in terms of spatial and managerial context. These micro- and meso-level perspectives are being coalesced into research questions, which this article investigates.

2.2.1 Digitalization in SMEs

Digitalization has an enormous potential to transform products, business models, and processes, both internally and with external stakeholders (Geissdoerfer et al., 2018). Theoretical perspectives on organizational digitalization can be identified in the literature on resource-based views, dynamic capabilities, transition theory, transaction cost theory, and platform theory (Parida et al., 2019).

The understanding of digitalization in SMEs is heterogeneous. Over the past decades, substantial research on business-related digitalization, digital transformation, and Industry 4.0 has been published, mainly focusing on its necessary resources and capabilities, enablers, and processes (Li et al., 2018). We follow Clerck (2017, p.1) in understanding digitalization as “the use of digital technologies and of data in order to create revenue, improve business, replace/transform business processes and create an environment for digital business, whereby digital information is at the core”. Regarding components and dimensions of digitalization, scholars have developed various frameworks of digitalization in the economy. Examples include Mayer’s (2018) main technologies of digitized manufacturing processes and Ciffolilli and Muscio’s (2018) taxonomy of Industry 4.0-enabling technologies based on the European Union’s Seventh Framework Programme key enabling technologies. As an example, the latter include advanced manufacturing solutions, additive manufacturing, augmented reality,

simulation, horizontal and vertical integration, industrial internet and cloud, cyber-security, big data and analytics. The literature is unanimous in emphasizing the importance of internal and external resources such as digital infrastructure and workforce with digital capabilities (Salemink et al., 2017). Digitalization has additionally been investigated about its potential and risk for SMEs. Frequently mentioned potential includes increased revenue, cost savings, and increased organizational agility, while risks and challenges highlight technological complexity, uncertain benefits and business cases, and lack of adequate resources (Matt et al., 2020). However, there is no differentiation of firms occurring in virtually all research, except for a few industry- and firm size-specific studies (Peillon & Dubruc, 2019).

The vast majority of studies on digitalization in SME in Germany was designed with standardized questionnaires and then analyzed quantitatively (e.g., Freimark et al., 2018). Further, many studies have anchored opinion polling as a central method. These are often guided by interests – e.g., by private sector firms – and contain suggestive questions and operationalize key concepts insufficiently. A sizeable share of these surveys focuses on measuring digitalization in SME (e.g., Schuh et al., 2017). Becker et al. (2017) attest such studies a lack of depth in the analysis of digitalization components or Industry 4.0 - especially about the strategic dimension and adjustments and extensions of existing business models. Only a few studies employ a qualitative research design to better understand the complexity of digitalization's dimensions and conditions (e.g., Müller-Seitz & Weiss, 2018).

2.2.2 Digitalization of Hidden Champions

HCs are little-known small- and medium-sized global or continental market leaders. Due to their incessant strong firm performance, they have been examined widely and have been shown as significantly contributing to the strength of the German *Mittelstand* and its export orientation. With a substantial part of the research literature coming from Germany due to the global HC

concentration there, we refer to Simon's foundational efforts (e.g., 2009) and to Schenkenhofer (2020) for an extensive literature review of research on HCs.

Three key features of HCs are especially relevant for this study, and most serve as differentiators from other SMEs. First, HCs possess market or technology leadership, or both, mainly in manufacturing-related business-to-business niche markets, enabled by abundant internal and external resources (Simon, 2009). However, literature on resource availability has so far neglected digitalization-specific resources. Second, HCs have significant R&D capacity and activity to maintain this market position and use innovation as a long-term business success strategy, supported by strong research cooperation with universities (Venohr & Meyer, 2007). Third, innovation is mainly conducted incrementally, emphasizing continuous improvement processes in close interaction with customers (Rammer & Spielkamp, 2019). However, there is a research gap on digitalization-related R&D activity and innovation of HCs. In particular, it remains open whether capabilities in manufacturing R&D are equally suited for digitalization-related innovation. This question has important implications for the prospective business success of HCs.

Very few studies have so far examined the digitalization of HCs, although several analyses focus on SMEs without specifying company size, market position, and levels of public awareness. Further, conditions of digitalization such as spatial (e.g., rural areas) and managerial (e.g., ownership structure) context have not yet been acknowledged concerning HCs. Freimark et al.'s (2018) survey of digital transformation initiatives are focused on distinguishing HCs from other SMEs and large corporations. Müller-Seitz and Weiss's (2018) case study of digitalization efforts of a German artificial intelligence HC is limited to a software firm whose digital products deviate from the vast majority of manufacturing-focused HCs. Kamp's (2018) analysis of offerings for smart services of manufacturing HCs is focused on a particular type of business model innovation. Wittenstein's (2020) dynamic capabilities approach emphasizes the

resources of HCs but does not consider digitalization-related innovation as an outcome of the utilization of these resources. Simon's (2020) assessment of digitalization success factors is selective about marketing and opens up research avenues for other corporate functions.

2.2.3 Conditions of digitalization: Spatial and managerial context

The conditions of spatial and managerial context play an increasingly important role in management research, particularly concerning innovation and decision making (Autio et al., 2014) and are hence also relevant for digitalization.

Regarding spatial context, rural regions are an important spatial category for HCs as their headquarters are frequently located outside agglomeration centers (Vonnahme, 2021). In Germany, which hosts most HCs globally, about two-thirds of HCs are in rural areas (Schenkenhofer, 2020; Simon, 2009), compared to 39% of all companies in Germany (Stiftung Familienunternehmen, 2020). In this study, we define rural areas according to the Eurostat (2020) NUTS3-based definition as regions with a density of fewer than 300 inhabitants per km². Rural areas face various challenges and could not fully reap the benefits of the digital revolution, underlining a digital divide (Malecki, 2003). The reasons are manifold and lie in complex interactions between infrastructural, supply-related and usage-/demand-based factors (Salemink et al., 2017). The literature on digitalization in rural areas often neglects the conditions of digitalization for enterprises and the specific impact of enterprises on the digitalization of these regions in terms of externalities (Colombo et al., 2013). In rural areas, the conditions for innovation are different from urban areas, and innovation capacities and types should be interpreted in a regional context: There is a broad consensus in the research literature that peripheral spaces offer comparably difficult conditions for innovative activities (Eder & Trippl, 2019).

Besides spatial conditions, managerial context such as ownership structure plays an important role in decision-making and innovation (Cucculelli et al., 2021). Mostly, HCs are owner-

managed and in cross-generational family ownership (Venohr & Meyer, 2007). Family firms are distinct in their long-term orientation (Lumpkin & Brigham, 2011), home-region focus and secrecy (Banalieva & Eddleston, 2011), and relevance of noneconomic goals and bounded rationality (Chrisman et al., 2014). These have significant implications for the digitalization of family businesses, such as more conservative approaches to new technologies, and the threats to home-region orientation through the transaction-cost reducing effect of digitalization and to secrecy due to digital traces and data interfaces with other actors (Cravotta & Grottke, 2019).

2.2.4 Research questions and objectives

Addressing the context and research gap outlined above, the following research questions are approached in this paper: *What are the dimensions and conditions of digitalization for HCs in rural areas? How do these dimensions and conditions shape outcomes of digitalization for these firms?*

2.3 Methods

2.3.1 Data collection and sampling

To better understand the dimensions, conditions and outcomes of digitalization for HCs in rural areas, we designed and implemented a qualitative research approach. The method was deliberately chosen to address the research gap outlined above. Therefore, we decided on conducting semi-structured interviews with HCs in rural areas in Germany. The method of interview guide-led semi-structured interviews has been chosen deliberately to cater to the explorative nature of this study (Gioia et al., 2013). Hence, this study differs from the questionnaire-based approach pursued by most studies on digitalization in SMEs. This method seemed appropriate for a widely discussed topic such as digitalization.

We limit the sample to Germany, hosting more than half of all HCs (Simon 2018), to standardize macro-conditions. To better understand regional characteristics, we selected four rural regions to cover a large spectrum of demographic, economic and infrastructural indicators,

based on Oberst et al. (2019): Two regions with a strong and two with a weak profile of indicators, and of each group one in West and one in East Germany. The regions selected were Central Hesse and Leine-Weser in West Germany, and Lower and Upper Lausitz, and northeastern Harz foreland in East Germany. We based the definition of rural regions on the Eurostat (2020) NUTS3-based definition. For firm sampling, the Global Market Leader Index by Müller (2018) and interviews with Chambers of Commerce and Industry representatives in the respective regions were used to identify potentially relevant firms. All firms were afterwards evaluated regarding their fit with Simon's (2018) definition of HCs[2]. Only firms that matched this definition and were located in these four regions were contacted with interview requests.

Based on the theoretical and empirical starting situation described above, an interview guide was developed and used in the interview. This semi-structured approach supported orientation during the interview and ensured comparability in the evaluation. We distributed the interview guide with open questions in advance, and personal focal points were encouraged. Between September and December 2020, 28 interviews were conducted with representatives of the HCs. The interview partners were exclusively members of the management, in particular CEO/CIO/CTO/CDO. We focused on those roles as they are knowledgeable about the respective company's digitalization strategy and pursuits and have the authority to disclose details. Further, they are acquainted with the firm's history and regional context due to the long tenure typical for leadership of HCs (Venohr & Meyer, 2007). One representative per firm has been interviewed.

In our sample, the share of HCs mainly active in manufacturing is 89%, the remainder being HCs that exclusively produce software. This distribution is proportionate to the proportions among all German HCs. The average turnover of EUR 195 million per year is lower than the

[2] (1) Part of the top three companies in their market segment globally or are number 1 on their continent, (2) annual turnover below EUR 5 billion, (3) low level of firm familiarity among the general public or outside their industry.

overall average of all HCs with EUR 325 million (Simon, 2018). The average share of exports was 52%, and the share of family-owned firms was 54%. Details of the sample are provided in Table 4. Due to the ongoing COVID-19 pandemic, all interviews were conducted remotely: Most via video-conferencing and the remainder via telephone. The interviews on average lasted 57 min, were audio-recorded after permission was granted, and then transcribed. All relevant statements by interviewees used in this article were translated into English. Considering that digitalization strategies and innovation activities are sensitive matters, we guaranteed confidentiality and anonymity to the interviewees to ensure openness and to increase the response rate.

Table 4: Description of interview sample

ID	Industry	Firm foundation	Revenue (EUR m.)	Employees (#)	Interview duration (min.)
HC1	Extension spindles and poles	1990s	~5	~50	85
HC2	Wireless controls	1990s	~50	~180	64
HC3	Lithium-ion batteries	2000s	~90	~1600	51
HC4	Water ultrafiltration	2000s	n/a	~140	59
HC5	Ladder systems	1940s	~150	~500	59
HC6	Slicing systems	1980s	~250	~1400	56
HC7	Bowden cables	2000s	n/a	n/a	30
HC8	Steel construction	1990s	~30	~200	35
HC9	Extraction and filtration	1990s	~30	~130	55
HC10	Electrical safety	1940s	~150	~900	50
HC11	Buffet solutions	1980s	~5	~20	51
HC12	Festive decoration	1890s	~10	~150	45
HC13	Fine chemistry and fragrance components	1990s	~15	~50	44
HC14	Marine gearboxes	1870s	~80	~500	63
HC15	Digital radio systems	1980s	~90	~50	92
HC16	Specialized textiles	1990s	~40	~150	40
HC17	Confectionery process lines	1920s	~50	~250	49
HC18	Foundry technology	1990s	n/a	~30	54
HC19	Welding machines	1910s	~120	~500	57
HC20	Office furniture	1900s	~80	~600	57
HC21	Spark extinguishers	1910s	~90	~650	74
HC22	Central heating products	1920s	~600	~3700	60
HC23	Welding torches	1940s	~300	~2200	62
HC24	Powertrain technology	1940s	~800	~4000	63
HC25	Software engineering	1990s	~10	~80	69
HC26	Switchgear	1990s	~60	~200	46
HC27	Seed production	1850s	~1700	~5700	50
HC28	Float glass	2000s	~300	~250	65
Average:			**195**	**890**	**57**

Source for firm data: Bureau van Dijk (2020) and desk research; latest data available for revenue and employees.

2.3.2 Data analysis and evaluation

The interviews were subsequently coded to develop a data structure with first-order concepts, second-order themes and aggregate dimensions, based on Gioia et al. (2013). The software *f4* was used for this purpose. One researcher coded the interviews, while research assistants transcribed the interviews. First, we coded the HC interview material into 323 first-order concepts derived from the data and proximate to the interviewees' terminology. Examples are statements on 'data standardization', 'bandwidth requirements', and 'step-fixed costs'. Investigating the similarities and differentiations between these concepts, we aggregated them into 27 second-order themes such as 'infrastructure' and 'process innovation'. Four aggregate dimensions of digitalization were derived from the further aggregation of second-order themes: 'potential and risk assessment', 'resource availability', 'digitalization strategy', and 'innovation types'. Additionally, the interviewees' statements were selectively triangulated and validated with secondary data sources such as annual reports, firm websites and magazine articles (Graebner et al., 2012).

A cross-case analysis revealed commonalities and differences between the interviewed HCs (Yin, 2011). Based on this coding scheme, we identified two key type dimensions, which are outlined below. Thus, empirically grounded firm types were constructed, based on Kluge (2000). The interviewed firms were clustered and assessed regarding regularities of responses. The subsequent construction of types was based on meaningful relationships between responses, focusing on heterogeneity between and homogeneity within types. The identified types were then characterized and further illustrated; they represented homogeneous characteristics as responses to one or more dimensions. However, the types described in the next section should be understood as generalized. Although individual firm cases may differ from these types in one or more characteristics, they are useful in understanding and explaining the dimensions and conditions of digitalization of HCs in rural areas.

2.4. Results

2.4.1 A typology with two key dimensions

Conducting a cross-case analysis, it became evident that the responses of HCs toward the dimensions and conditions of digitalization were too heterogeneous to treat them as uniform for all HCs. Based on the methodology described above, we developed a typology of two independent type dimensions – first, potential and risk assessment of digitalization and, second, availability of digitalization-relevant resources, both internally and externally. In the following, the typology serves as a basis to portray the dimensions, conditions, and outcomes of digitalization for HCs.

The first type dimension, potential and risk assessment of digitalization, is represented on a spectrum from affirmative, balanced, and skeptical. An affirmative assessment emphasizes the potential related to digitalization for the business success of the HC, and weighs it significantly higher than related obstacles and challenges. Potential includes revenue growth through new products, business models, or sales channels and cost reduction, product quality and customer satisfaction.

'The potential is large and very significant, but some of these opportunities are imperative to take as they would turn into risks, if not taken. […] If we do not move fast, large corporations such as Bosch or Continental develop more sophisticated technologies and we will suddenly trail.' (HC2)

A balanced assessment highlights the necessity to consider potential and challenges equally, and calls for taking the company tradition and the nature of the product into account.

'How can I develop a digital business model, a digital product on the basis of our company history, its tradition? I think it is very important for me that we do not try throwing away our

entire history and tradition and then do something completely new, but to harmonize them in this way. It is my strong belief that mastering this tightrope walk will distinguish us.' (HC20)

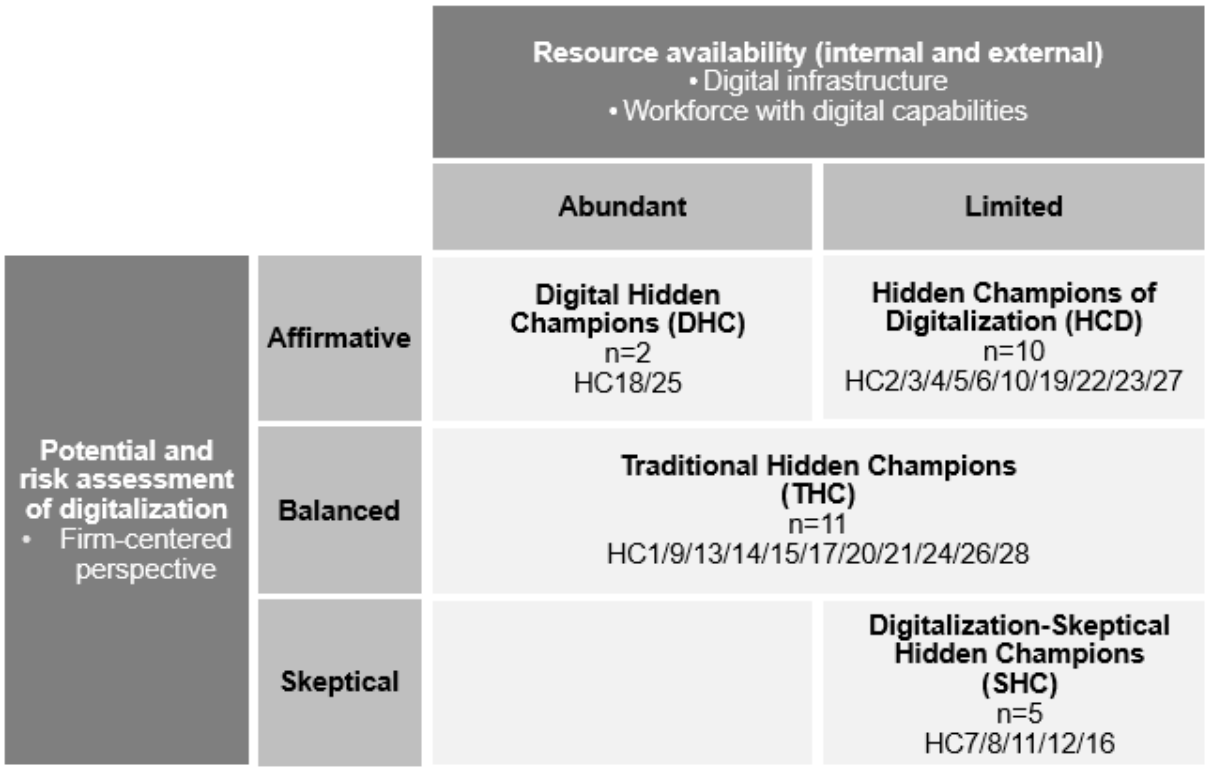
A skeptical assessment significantly focuses on perceived risks of digitalization that outweigh any benefits, and hence displays a decreased risk preference. This perspective may be centered on the company itself or may be broader to include existing business networks or the rural region, in terms of loss of workforce through automation or relocation of firms.

'I am absolutely convinced that fine chemicals, as we make them, will not live on generating data, but that our core business will continue to be to manufacture products, tangible products.' (HC13)

The second type dimension, availability of digitalization-relevant internal and external resources, may range from limited to abundant. Internal resources entail factors such as firm IT infrastructure and qualification of HC employees. External resources include existing networks and cooperation with suppliers, universities, and other institutions with digitalization-relevant resources relevant to a firm's digital transformation and locational factors such as digital infrastructure such as fiber, broadband, 5G, and mobile networks and digital capabilities of the regional workforce. To some extent, a deficit in internal or external resources can be compensated by the abundance of others, relocating or contracting. HCs that would rate both their digitalization-relevant internal and external resources as abundant face no resource constraints, while the scarcity of resources limits a firm's ability to realize its assessment of digitalization, and consequently, its strategy.

'So, if you want to continue walking in this direction about digitalization, and it definitely makes sense to do that, we must address the infrastructure. Digitalization by itself is without purpose if the required infrastructure is not available.' (HC4)

Figure 3: Typology of HCs regarding digitalization

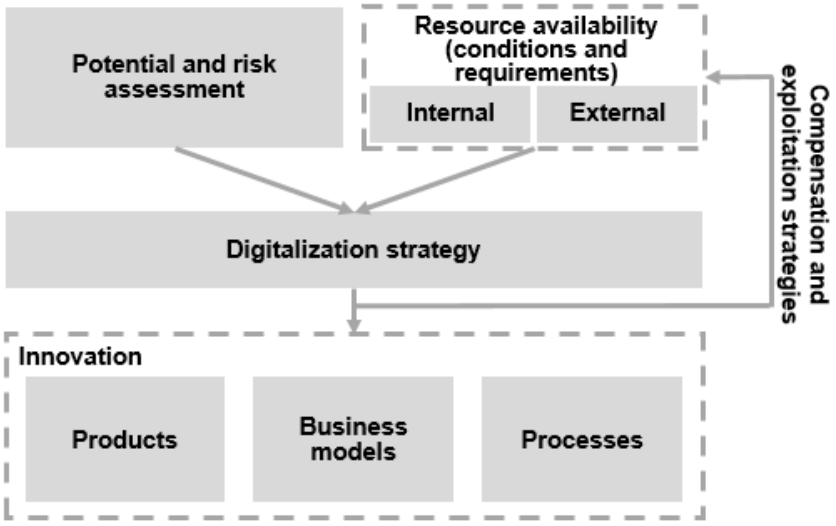


Source: Own elaboration, based on interviews with n = 28 interviewed HCs.

2.4.2 Description of types

Our interview data allow for the identification of four types of HCs in rural areas regarding their approach toward digitalization: (1) Digital Hidden Champions (DHC), (2) Hidden Champions of Digitalization (HCD), (3) Traditional Hidden Champions (THC), and (4) Digitalization-Skeptical Hidden Champions (SHC). Figure 3 above positions them in relation to the developed type dimensions. The type dimensions of potential and risk assessment and resource availability – expressed both as condition and requirement – and the outcomes in terms of digitalization strategy and innovation types will be used to portray the identified types. Figure 4 presents a framework of these aggregate dimensions, while Table 5 summarizes the portrayal of these identified types.

Figure 4: Dimensions of HC digitalization



Source: Own elaboration.

Table 5: Dimensions and outcomes of digitalization for HC types

	DHC	HCD	THC	SHC
Industry / nature of product	Niche digital products and services	Mainly analog products in manufacturing and other industrial segments	Manufacturing of analog products, mostly in classic mechanical engineering	Solely analog products with company origins in manufacturing
Firm ownership	Predominantly owner-managed or start-ups	Publicly-traded or private equity-owned firms; family businesses, often with junior management	Overwhelmingly family businesses, often with a long tradition	Family businesses with an extensive tradition
Firm size	Small- to medium-sized firms	Medium-sized to large HCs with a few thousand employees with ample internal resources	Small- to medium-sized firms	Mainly small-sized firms
Digitalization potential and risk assessment	Potential significantly higher than challenges and obstacles, including new business models, product innovations and digital sales channels, cost reductions	Digitalization considered necessary and imperative to maintain leadership position; potential (revenue gains , cost savings in production, sales, logistics and administration)	Balanced assessment between being affirmative and being skeptical; viewed as tightrope act to seize advantages and preserve tradition and identity; emphasis on limited flexibility of business model and significant risks associated with digital transformation	Risks by far outweigh potential benefits; such as high investment requirement, uncertain business cases, lack of necessity to maintain market leadership, loyalty with existing business networks, potential loss of employment for loyal employees
Resource availability	Abundant internal and external resources; strong emphasis on the availability of digital infrastructure (high bandwidth and latency, 5G) and highly qualified employees	Emphasized need for digital infrastructure and highly qualified professionals; varying availability of both internal and external resources, especially concerning digital skills	Both in combination with abundant and limited resources; skill compensation through contracting; digitalization seen as incentive for employees to make traditional manufacturers more attractive	Significant internal and external resource constraints, but assessed as less relevant as for other HC types
Digitalization strategy	Integral part of their overall firm strategy; detailed to a great extent	Dedicated digitalization strategies to signal adequate importance; in family businesses strongly dependent on management agency	Formalized digitalization strategies, but selective and adjustable in nature, particularly in the medium and long term	Reluctance to develop a dedicated strategy
Innovation types	Inherently strong focus on digital innovations; mainly adjusted digital business models and overwhelmingly digitized corporate processes	Focus on process digitalization, mainly in production and administration; rapidly emerging digitalization of products and business models (data, value chain extension, platform)	Digitized sizeable processes in corporate support functions; however, often isolated and not integrated; more conservative approach for product and business model innovation	At most, select few projects, mainly to digitize administrative processes; skepticism towards digital business models; product innovations limited to considerations of use-based data gathering

Source: Own elaboration.

Digital Hidden Champions (DHC)

Firm profile: Digital Hidden Champions (DHC) exclusively produce niche digital products and services. They are small- to medium-sized firms, predominantly owner-managed or start-ups.

Potential and risk assessment: Owing to the purely digital nature of their products, DHCs rate digitalization-related potential significantly higher than challenges and obstacles. Commonly highlighted potential includes both revenue increases through new business models, product innovations and digital sales channels, cost reductions through additional digitalization and automation of processes. Moreover, a regionally-specific argument includes the remote market access potential for these firms being located in rural areas. Mentioned challenges focus on technological complexity, the difficulty in attracting labor with digital capabilities to rural areas, the lack of political support for digital infrastructure and internal digitalization, and the difficulty in establishing cooperation with public research institutions.

Resource availability: DHCs put a strong emphasis on the availability of digital infrastructure and highly qualified employees. Besides high bandwidth and latency demands, DHCs have stressed the importance of redundancy in Internet connections. In extreme cases of initial resource scarcity, some firms report having undertaken significant efforts to ensure sufficient connectivity, including local political involvement and pressuring regional grid operators to accelerate construction and dedicated lines with costly contracts with telecommunications providers or even own construction.

'It took us seven years of application, and then we finally got it here. However, we drilled it ourselves: We drilled the 2 km to the distributor ourselves with a deep drilling machine. Otherwise, it would have taken another two years, […] and there we said "enough is enough".' (HC18)

The interviewed HCs occasionally emphasized the importance of 5G, but to an extent smaller than broadband and fiber internet. It has exclusively been cited as a future locational requirement by DHCs and HCDs.

A commonly mentioned instrument to attract local labor and to retain employees is corporate social/regional responsibility. DHCs have also emphasized the need for urban amenities, traffic connectivity, and other initiatives to cater for the lifestyle preferences of the young, digitally-qualified workforce.

Digitalization strategy: Due to the overwhelmingly optimistic attitude toward digitalization and the abundant availability of resources, DHCs have detailed their relevant strategies to a large extent. Due to their product, DHCs perceive digitalization as an integral part of their overall firm strategy. Further, the agency of management plays an important role here as an impetus for these strategies.

'Well, we do not have a strategy in itself. Our strategy is to digitize and automate everything possible. First, because you have no employees, and second, because the machines, if they run around the clock, are much cheaper than if people are used.' (HC18)

Innovation types: DHCs have strongly advanced and implemented digitalization-related innovation, including adjusted digital business models. They further report having digitized the vast majority of corporate processes. This naturally includes production due to purely digital products.

Hidden Champions of Digitalization (HCD)

Firm profile: Hidden Champions of Digitalization (HCD) mainly produce analog products and have emerged mainly in manufacturing and other industrial segments. HCDs are the largest firms among HC types. They include large HCs with a few thousand employees with ample internal resources, publicly traded or private equity-owned firms with shareholder influence on

corporate strategies, and family businesses with junior management. The latter are frequently the successors of company founders and tend to be more affirmative toward digitalization.

Potential and risk assessment: HCDs assess digitalization potential higher than challenges and risks, and consider it necessary to maintain and strengthen their market and technology leadership position. Cost-saving through digital and automated processes, predominantly in production, sales, logistics and administrative processes, as well as revenue gains through enhanced products, new business models related to servitization and disintermediation are frequently emphasized. Additional potential includes mastering technological complexity, using data analysis for various purposes, increasing customer satisfaction, stabilizing rural areas, and relieving COVID-19 pandemic obstacles. Digitalization considered imperative, with the risk of competitors taking over market shares being frequently emphasized.

Resource availability: HCDs strongly emphasize the need for digital infrastructure and highly qualified professionals. Many interviewees report having undertaken significant efforts to ensure sufficient connectivity, including local political involvement. Firm size is a differentiating factor in terms of political support for the accelerated provision of high-speed internet connections: HCs with more than a few thousand employees, predominantly classified as HCDs, have commended the swift political response. 5G was occasionally emphasized by the interviewed HCDs, with 5G campus and factory networks as relevant applications.

A frequently highlighted characteristic of HC is long tenure and low attrition of employees (Venohr and Meyer 2007). According to interviewed HCD leadership, this may prove to be an additional challenge under digitalization. In the past, HCs have succeeded due to continuous process improvement in mechanical engineering. The digital transformation constitutes a disruptive factor that may serve as an obstacle for potential inertia and lock-in. The long tenure and its consequential identification with the firm are still seen as a success factor for business, though increasingly threatened:

'[…], which brings with it completely different challenges: How do I nevertheless establish a bond with the company? How do I get identification? We still need people identifying with the company, not just mercenaries who move from A to B.' (HC6)

HCDs consistently emphasize that it is harder to attract qualified labor with more education and work experience due to increased competition by firms perceived as more attractive, such as software firms or large corporations in urban areas. As a consequence, many firms pursue strategies to attract potential employees as early as possible.

'And since people are in high demand by the big companies, the competition is intense and as a small company you must get the people early on.' (HC22)

An important advantage of digitalization frequently mentioned as a cause for substantial optimism and that proliferated in the pandemic conditions of 2020 is work from home, enabling HCDs in rural areas to expand their geographic reach in recruiting, without exacerbating the burden of commuting. Another compensatory strategy for resource constraints, both infrastructure- and workforce-related, is firm relocation or opening new firm locations in other regions. The launching of satellite offices, mostly for R&D, in agglomeration areas is an effective instrument. Larger HCs with a few thousand employees pursue a strategy of *tier 2* cities such as Bremen. These offer urban amenities and strong university and firm networks but are perceived as less 'overcrowded' with new R&D offices of large corporations such as Berlin. This pattern corresponds to the image of 'hiddenness' even in their locational choices. Relocation to other countries was mentioned less frequently.

Digitalization strategy: HCDs have developed dedicated digitalization strategies to endow it with adequate importance. Further, the agency of management plays an important role here as an impetus for these strategies.

'We have separated digitalization into different areas: production, processes, sales and service. In these areas, we have numerous projects underway that we coordinate. […] We have been doing this as a company since 2015.' (HC22)

Innovation types: HCDs have digitized many processes in all firm units, including production and R&D, and state the ambition of digitizing additional processes.

'Yes, it is definitely not easy for small companies, but we have the advantage that our investor insisted on [digitalizing most processes] and provided the necessary budget for the investment.' (HC4)

For production, Mayer's (2018) key technologies industrial robots, additive manufacturing, big data and cloud computing, computer-aided manufacturing, artificial intelligence, and machine learning were all mentioned as already established digital processes. Most firms were realizing a manufacturing execution system, occasionally including digital twins of production. On a related note, a connected manufacturing environment related to Industry 4.0., frequently even with multiple plants involved, is a crucial goal of HCDs.

Generation and analysis of data are dominant motivations for digital product and business model innovation. Various purposes are stated: benchmarking to calibrate machines, better information about product lifecycles and wear out patterns, and predictive maintenance. Connectivity is also frequently mentioned concerning both inter-connectedness of product components and their connection to other machines and cloud connectivity. Connected devices have their main benefit in condition monitoring, remote control, and remote maintenance, often assisted by virtual and augmented reality technologies.

Some HCDs also state to be considering extending their value chain position and to transform toward platform providers. Various dimensions of a service business are motivations for HCDs

that emerge from digitalization. These pertain to after-sales, particularly spare parts, to better understand the product's condition and increase replacement speed.

Traditional Hidden Champions (THC)

Firm profile: THCs manufacture analog products, mainly in classic mechanical engineering. They are overwhelmingly small- to medium-sized family businesses, often with a long tradition.

Potential and risk assessment: Traditional Hidden Champions (THC) pursue a balanced assessment of digitalization between being affirmative and being skeptical. THCs view the task to seize digitalization advantages and conserve their tradition and identity as a tightrope walk. They embrace digitalization's potential and emphasize the limited flexibility of their business model and the significant risks associated with digital transformation. In contrast with HCDs, they have a more clouded perspective on the relevance of new business models. Additional challenges entail revenue loss through new competitors, the fast pace of digital transformation, the difficulty implementing digital innovation due to technological complexity, and data analysis, standardization, and security issues. The firm's size is frequently judged as too small to effectively engage in the digital transformation, partially due to the specific cost nature of many digitalization-related investments. Employees are an integral element in risk considerations, applying to the lack of acceptance for digitalization and digital skills. Moreover, a significant risk is seen in the chance of job losses – clashing with the perceived responsibility of THCs for their employees with long tenure and low attrition (Venohr & Meyer, 2007).

Resource availability: THCs were identified both along with abundant and limited resources. For instance, the availability and reactions to limitedly available internet varied significantly. All cases of scarce internet availability can be attributed to THCs and SHCs.

'Our company is located in the middle of the forest, a bit far away from any village and of course you don't necessarily have a broadband connection for a single user here.' (HC1)

To compensate for internal resource constraints by lack of expertise and to remain focused on their own technological specialization, HCs in rural areas report being contracting with external service providers such as software and consulting firms. Digitalization is further seen as an incentive for existing and potential employees to make traditional companies such as manufacturing HCs more attractive.

'We can offer the young people something they like, something they are interested in. If I had remained solely a steel firm, things might have been different.' (HC1)

From another perspective, digitalization and particularly automation and hence a decreased need for labor is perceived as an instrument to reduce recruiting difficulties in rural areas.

'For me, that is a critical driving force to push and advance digitalization […]: I do not know how it will be possible to find young talent here in five to six years. I want to have digital options to keep the business running smoothly with fewer people.' (HC13)

Digitalization strategy: THCs report having formalized a digitalization strategy but aim at keeping it selective and adjustable, particularly in the medium and long term.

'We have set ourselves a digital agenda: […] Digitizing processes has top priority, simply to keep up with the costs. Digitized products are currently subject to a follow-up strategy. […] That's simply not in our DNA, and we do not have people who can think and act like that. Our sector, by its very nature, is always behind. And you do not have to take a leading role here, you have to get used to it and saddle up a bit.' (HC9)

The availability of policy programs to support the development of digitalization strategies is relevant. Additionally, agency of management in owner-managed firms plays an important role here:

'There is no [digitalization] strategy written on paper. The strategy originates from my being. So I know what I want, where I want to develop the company and where I want to develop the employees, and I follow through on that.' (HC1)

Innovation types: THCs have digitized sizeable process segments in corporate support functions such as finance, HR and logistics. However, these frequently remain isolated and are not integrated into a connected IT infrastructure.

'Oh, and we have also digitized the HR management: Now we are digitizing our payroll system, fuel voucher and other fringe benefits.' (HC9)

Additionally, THCs have only taken limited steps in digitizing production-related processes and often stated that a traditional continuous improvement process would yield the best results in optimizing production. THCs have consciously decided for a more conservative approach concerning digital product innovations compared to their advances in process innovations. They mainly focus on high-speed wireless sensors and actuators. Real-time analysis of sensor data is used to adjust the product operation, e.g. to change the heating system temperature, or to trigger the actual function of a product, e.g. to eliminate sparks. Further, resource efficiency is frequently quoted as an additional benefit, such as optimizing gas input for welding machines. One interviewed HC, a manufacturer of specialized pipe components, uses sensors to locate grid leakages.

Digitalization-Skeptical Hidden Champions (SHC)

Firm profile: Digitalization-Skeptical Hidden Champions (SHC) solely produce analog products and have their company origins in manufacturing. They are mainly small-sized firms and are – equally to THCs – family businesses with an extensive tradition.

Potential and risk assessment: In the perspective of SHCs, risks and challenges of digitalization by far outweigh potential benefits. The obstacles include all the abovementioned aspects and

additionally stress the high investment necessary, uncertain business cases, the lack of necessity to maintain one's market leadership position, particularly in manufacturing, the overwhelming speed of transformation, the loyalty with existing business networks that could erode through digitalization, the potential loss of employment for loyal employees, and negative social consequences of digitalization such as human isolation. Further, SHCs perceive no threat from digitalization to their market position due to the niche nature of their products.

Resource availability: SHCs face significant internal and external resource constraints relevant for digitalization. All cases of scarce internet availability can be attributed to THCs and SHCs. The requirement for infrastructure and labor with digital capabilities is limited, and the status quo is rated as sufficient. SHCs were the only group with strong reservations against working from home, citing the risk of inefficient collaboration, the physical distance to production sites, as well as individual effects such as the psychological consequences of isolation.

Digitalization strategy: SHC express their skepticism toward digitalization also in their reluctance to develop a dedicated strategy.

'It is available only rudimentarily. We have a list of points that we want to modernize, digitize in the future. That is more of a bullet point list. […] In the end, we can't work through this list systematically and with a time schedule. Furthermore, we always have to look at what our current possibilities are to improve something.' (HC15)

Some SHCs also link their reluctance to regional resource constraints and scarce infrastructure. Moreover, the risk for existing sales networks is being related to developing a digitalization strategy.

'We have not yet laid down a strategy for saying exactly how we want to do it. […] Because every digital provider that we support makes things more difficult for our traditional specialist retailers.' (HC11)

Innovation types: At most, SHCs pursue select few projects, mainly to digitize administrative processes such as document or leave management. SHCs refrain from digital business models and limit their product innovations to initial considerations of gathering data from product use. However, these have not yet been realized in the surveyed firms.

'But actually we are not extremely innovative [concerning digitalization]. We employ product development to update user manuals and so on.' (HC5)

2.5 Conclusion, discussion, and future work

Conclusion

This article examined dimensions, conditions, and outcomes of digitalization for HCs in rural areas in Germany. As highly innovative market and technology leaders, this segment of SME firms is fighting to maintain their niche dominance. Being in rural areas, the availability of digital infrastructure and a workforce with digital capabilities is frequently more onerous than in metropolitan areas.

We have identified four novel types of HCs that differ in their dimensions, conditions, and outcomes of digitalization: Digital Hidden Champions (DHC), Hidden Champions of Digitalization (HCD), Traditional Hidden Champions (THC), and Digitalization-Skeptical Hidden Champions (SHC). These types have distinct potential and risk assessments of digitalization – ranging from affirmative to skeptical – and availability of digitalization-relevant resources, ranging from abundant to scarce, differ in their digitalization strategies and outcomes of innovation.

Through these findings, the study contributes to the management, digitalization and economic geography literature. We close the research gap to a deeper and more differentiated understanding of the digitalization behavior of HCs, and have highlighted influencing contextual factors such as spatial and managerial. To comprehend the dimensions, conditions, and outcomes of digitalization, differentiation must account for the specific firm HC and its

variations. Taking crucial dimensions such as the potential and risk assessment, resource availability, strategy, and innovation into account in a structured way allows for the explanation of diverging responses and occasional counterintuitive findings. This paper provides evidence to the proposition that highly innovative market and technology leaders in rural areas are not necessarily also front-runners in digitalization, but vary widely in their advances. This article focused on an under-researched situation of innovative firms with abundant internal resources in a regional environment linked to challenges and resource constraints concerning digitalization.

Discussion and future work

This study addresses a specific firm type. It needs to be discussed whether the digitalization typology also applies to other relevant firm types such as SMEs, or whether the distinctiveness of HCs in terms of niche position and market leadership is relevant for differences in digitalization-related corporate behavior. Hence, the transferability of results to other SMEs may be limited by fewer available internal resources and technological sophistication.

Key managerial implications of this research are threefold. First, the insights into digitalization of HCs can inform the leadership of other, less innovative firms and serve as orientation, depending on the specific contextual conditions of these firms. Second, firm leadership should pay increased attention to incorporate internal and external resource availability in their potential and risk assessment of digitalization, and subsequently in their digitalization strategies. Third, compensation and exploitation strategies for resource availability – particularly considering the regional context – should be actively pursued to realize the envisioned innovation outcomes of digitalization.

The findings are of relevance for policymakers at various spatial scales, too. A focused and differentiated regional policy approach to specific firm types can be more effective in answering the distinct and specific requirements of these firms. A deeper understanding of the particular

digitalization approaches of HCs provides an impetus for the formulation of differentiated policies for the four HC types, ranging from providing digital infrastructure to education programs for specialized digital capabilities and skills. Further, a better understanding of HC innovation systems and their institutional and spatial patterns helps incentivizing the development of adequate structures.

As an outlook for further research, quantitative statistical identification of digitalization types for more HCs relates to validating this qualitative study's findings. A comparative analysis with HCs in agglomeration areas, other SMEs, and family firms that do not fit the definition of HCs could add additional value. Regarding policies, more detail on digitalization type-specific support programs for HC may be beneficial. Last, it seems counterintuitive that HCs are highly innovative firms with technology leadership are frequently in rural areas. Research on enabling factors and regional embeddedness of HCs can contribute to a better understanding of spatial and managerial contexts and their impact.

Chapter 3 | Article Two: Integration in rural regional innovation systems

Hidden Champions and their integration in rural regional innovation systems: Insights from Germany

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Journal: Zeitschrift für Wirtschaftsgeographie / ZFW – Advances in Economic Geography

Status: Published (DOI: 10.1515/zfw-2021-0024)

Abstract

This article studies the integration of Hidden Champions – little-known highly innovative global market leaders – in rural regional innovation systems (RIS) in Germany. These firms are analyzed in relation to their integration into a RIS framework, which differentiates two subsystems: Knowledge generation and diffusion, and knowledge application and exploitation. The relevance of firm-internal and firm-external regional influencing factors on rural RIS integration is examined. The article proposes that Hidden Champions are weakly integrated in RIS due to their international sales focus and high technological specialization. To test this premise, 57 expert interviews with Hidden Champions and regional actors were conducted. It was found that key influences for RIS integration of this firm type are ownership structure, firm size, organizational status, location economies, and urbanization economies. Family businesses are on average more integrated than other firm types, but vary significantly in their integration.

Keywords: Family-owned firms; Hidden Champions; Qualitative analysis; Regional innovation systems; Rural areas

3.1 Introduction

Globalization and digitalization are frequently contrasted with the local integration of firms, particularly for innovation processes. These forces enable enterprises to source knowledge and engage in innovation across greater distances, ‘replacing spatial proximity with cloud-based connectivity’ (The Atlantic, 2021). Simultaneously, research also emphasizes the importance of localized innovation systems, whose institutionally-embedded complex innovation processes highlight the ongoing importance of the regional aspect (Gertler et al., 2000).

These phenomena are highly relevant for HCs. These little-known small and medium-sized firms are highly innovative and possess global or continental market leadership in their product niches (Simon, 2018). On the one hand, they are highly relevant for their home regions through economic effects, such as business taxes, employment, human capital development, corporate regional engagement, and additional intangible effects. On the other hand, these firms have disproportionately high export ratios and extensive international sales networks. In addition, HCs produce highly specialized products and hence require very specific fields of knowledge in their R&D activities (Rammer & Spielkamp, 2019). Furthermore, their headquarters are frequently located outside of industrial agglomerations: In Germany, two-thirds of HCs are located in rural areas (Schenkenhofer, 2020). Rural regions and firms located in this geographical context face special conditions, such as external resource constraints (Eder & Trippl, 2019). These special conditions manifest themselves in thin RIS and the absence of clusters (Tödtling & Trippl 2005). As a consequence of these aspects, this paper proposes that the integration of HCs in rural regional innovation systems (RIS) can be assumed to be relatively low.

This article examines the integration of HCs in rural RIS in Germany and its firm-internal and firm-external regional influencing factors. Firm-internal and firm-external characteristics are considered important dimensions in economic geography for investigating RIS integration and

the regional embeddedness of firms (Autio et al., 2014). The provision of additional insight into both perspectives is a main contribution of this paper to this debate. Firstly, firm-internal characteristics such as ownership structure and organizational status are major determinants of integration in RIS. Two-thirds of these firms in Germany are family-owned firms (Venohr & Meyer, 2007) – a firm type linked to long-term orientation and distinct forms of *spatial familiness* (Basco & Suwala, 2020). Family-owned firms in general are crucial for the prosperity and strength of local and regional economies, among other factors, due to significant contributions to regional employment, the tax base, and vocational training (Baù et al., 2019, Lenz & Glückler, 2021). Nevertheless, RIS integration of family-owned firms has rarely been examined – in defiance of the firm type's capacity to alter regional institutions (Basco, 2015).

Secondly, in terms of firm-external regional characteristics, rural regions are an important spatial category for HCs, as stated above. Most research, however, focuses on innovation in agglomeration areas (Isaksen & Karlsen, 2016), emphasizing the notion of metropolitan innovation systems (Bathelt & Henn, 2017). As a consequence, there is scant research concerning the integration of firms in rural RIS. Recent contributions have attempted to close this research gap (Eder, 2019; Fritsch & Wyrwich, 2021b). In such rare instances, studies are overwhelmingly concentrated on small-scale entrepreneurship, examining firms catering to local markets (Greenberg et al., 2018), other niches of entrepreneurship, or local linkages related to FDI-induced plants of multi-national enterprises (MNE) (Meyer et al., 2011) – in the latter case focusing on firm locations solely with production capacities and no other corporate functions.

As a consequence, the following research question is posed: *What influences the integration of HCs in rural regional innovation systems?* As indicated above, the proposition here is that these firms are not strongly integrated in RIS due to their international sales focus, specialized technology, and rural location. The article contributes to the literature on RIS by providing

evidence (a) for a firm type thus far not analyzed in terms of RIS integration and (b) for a regional type (rural areas) thus far not strongly associated with highly innovative firms and under-researched regarding RIS. Moreover, this paper responds to the call for an increased cross-fertilization between economic geography and family business studies (Basco & Suwala, 2020; Basco et al., 2021).

A qualitative research design with semi-structured expert interviews is employed (Meuser & Nagel, 2009). In total, 57 interviews in four rural German regions with management representatives of HCs and other regional actors were conducted. The study is structured as follows. Section 2 outlines the current state of research concerning the RIS integration of HCs and family-owned firms and develops the research question. Section 3 describes the qualitative methodology employed for this study. Section 4 presents the results in terms of a framework of RIS integration of HCs and its influencing factors. Section 5 concludes with a summary and discussion.

3.2 State of research and theoretical framework

Multiple streams of literature with relevance for this study were identified: **Integration in RIS, firm-internal and firm-external regional influences on integration in RIS, and RIS integration of HCs.** Based on an overview of these streams, the research question for this article will be subsequently developed.

3.2.1 Integration in regional innovation systems (RIS)

The RIS approach is a useful analytical device for considering the spatial aspects of innovation and for highlighting the importance of local networks (Asheim & Isaksen, 1997). In combination with other territorial innovation models (TIM) such as learning regions or clusters, RIS have attracted increasing attention and popularity (Bathelt & Henn, 2017; Moulaert & Sekia, 2003). The concept is based on the understanding of innovation as a systemic process that thrives on concentrated economic activity in an area that is spatially confined (Doloreux &

Porto Gomez, 2017). In this regard, the underlying reasoning is that innovative activity of organizations not only depends on the knowledge embedded in the organization itself, but additionally on the interaction and knowledge exchange of various regional organizations and their institutional environment (Cooke et al., 2004).

Following Autio (1998), a RIS entails two subsystems: Knowledge generation and diffusion, and knowledge application and exploitation. While the subsystem of knowledge generation and diffusion mainly consists of public organizations (e.g. research institutions, universities, regional development agencies) and the subsystem of knowledge application and exploitation of firms (e.g. suppliers, customers, competitors), several overlaps of these organizational types in both subsystems can be observed (Cooke, 2002). For instance, these overlaps apply to knowledge application and exploitation activities of universities of applied science. This paper employs a firm-centric perspective on RIS, examining the integration of a single firm at its main location in these RIS subsystems (Kalantaridis & Bika, 2011). It follows a line of research on RIS integration of specific firms and organizations such as large local R&D-intensive firms (Agrawal & Cockburn, 2003). While most research on RIS has focused on the ways in which regions foster favorable conditions for innovation (Doloreux & Porto Gomez, 2017), this firm-centric approach is particularly applicable for the research question of this study. In terms of regional characteristics, research has mainly focused on agglomeration areas and particularly on disproportionately successful examples, implying problematic generalization (Bathelt & Henn, 2017). Notable exceptions are Tödtling & Trippl's (2005) portrayal of thin rural RIS and Doloreux' (2003) case study of peripheral Québec.

Integration in RIS is important for firms due to its relevance for business performance (Davidsson et al., 2006), regional sales levels (Cooke et al., 2007), international competitiveness and international R&D alliances (Al-Laham & Souitaris, 2008), effective innovation through network capital (Huggins & Thompson, 2015), and its contribution to

regional development (Bürcher, 2017). RIS integration further prioritizes linkages with regional contractors and customers, and eases local accessibility of both tangible and intangible assets (Baù et al., 2019). In particular, RIS integration can be particularly beneficial for firms in their early stages of development (Keeble et al., 1998). A key rationale for RIS integration is based on the availability, accessibility, and spillover of localized complex, tacit, and codified knowledge (Gertler, 2003). Here, geographical, relational, and cognitive proximity are intertwined and condition each other (Capello, 2014). Social capital and mutual trust has been shown as underlying several of these rationales and outcomes (Cooke et al., 2005). However, it needs to be noted that evidence on the relationship of business and innovation performance and RIS integration is ambiguous and varies according to sector. For Swedish machinery producers, for instance, "*there is a negative correlation between localized technological relations and firm performance*" (Larsson & Malmberg, 1999, p. 16).

Moreover, another branch of the RIS literature has focused on the interplay of RIS integration and globalization for transnational corporations. It uses the notion of strategic coupling to emphasize the need to complement intra-regional corporate processes (MacKinnon, 2012). Research on global production networks has highlighted the globalization of regional development, viewing the region as porous in terms of trans-regional network connections of economic actors (Coe et al., 2004). These parallel global and local linkages (Asheim & Isaksen, 2002) are of specific relevance for regions with thin RIS and resource constraints, such as rural areas, implying the need for compensation strategies such as trans-regional knowledge sourcing (Eder & Trippl, 2019; Herb & Neiberger, 2021). This interplay could prove to be particularly important for HCs, considering their internationalized sales networks and requirements for specialized knowledge.

Some of the studies portrayed explicitly focus on integration in terms of RIS, but occasionally employ related approaches – predominantly associated with Granovetter's (1973)

understanding of embeddedness or by attempting to measure the degree of local integration and embeddedness of firms through firms' shares of local sales and sourcing (e.g., Halaszovich & Lundan, 2016). The next section will further outline and describe firm-internal and firm-external regional influences on firm integration in RIS.

3.2.2 Firm-internal and firm-external regional influences on firm integration in RIS

Research has shown that RIS integration of firms is influenced by firm-internal and firm-external dimensions (Kalantaridis & Bika, 2006). Table 6 below provides an overview of relevant influencing dimensions.

Firm-internally, ownership structure, firm size, organizational status, market position and industry, innovative capacity and technological focus, and firm leadership/management characteristics have been shown to be influential for RIS integration. Regarding ownership structure, family-owned firms are distinct in their long-term orientation (Lumpkin & Brigham, 2011), home-region focus and regional identity, secrecy and a sense of local stewardship (Banalieva & Eddleston, 2011), spatial loyalty (Pallares-Barbera et al., 2004), and relevance of non-economic goals and bounded rationality (Chrisman et al., 2014). Family-owned firms are more embedded in their home regions than non-family-owned firms (Bird & Wennberg, 2014), which is frequently attributed to increased local social capital (Arregle et al., 2007). The latter enables family-owned firm leadership to utilize localized resources, contributing to business growth and performance. As a consequence, localized social capital is understood as a compensation strategy against resource constraints in rural areas. However, family-owned firms are particularly heterogeneous regarding their strategic and innovative actions due to stronger relevance of managerial agency (Miller & Le Breton-Miller, 2020).

Firm-external regional dimensions are further important influencing factors for RIS integration and include location (or milieu) economies, urbanization economies, the degree of peripherality of firm location, and technology and innovation policy. Regional resource availability plays a

significant role and varies between urban and rural regions (Eder & Trippl, 2019). Here, the extent of RIS integration can be understood as either an exploitation or a compensation strategy (Eder & Trippl, 2019). Rural areas offer distinct and frequently challenging conditions for innovation (Virkkala, 2007). Scholars have recognized the specificity of RIS in rural areas (Doloreux, 2003; Doloreux & Dionne, 2008; Kalantaridis & Bika, 2011; Yin et al., 2019). The characteristics of rural RIS are related to resource constraints, institutionally-thin RIS, limited knowledge externalities and spillovers, weakly developed or missing clusters, dominance of SMEs, low levels of R&D and product innovation, few research institutions and high-profile universities, low to medium-level qualifications, and a focus on the extraction of raw materials (Tödtling & Trippl, 2005). In a case study of SMEs in rural Québec, Doloreux (2003) identifies the availability of skilled labor, trust between regional actors, and supplier proximity as the most important firm-external factors determining RIS integration.

Table 6: Selection of firm-internal and firm-external regional influences on RIS integration

Influencing factors	State of the literature: Implications and mechanisms
Firm-internal characteristics	
Ownership structure	RIS integration is influenced by ownership structure, with family businesses being particularly integrated (Baù et al., 2019; Bird & Wennberg, 2014), induced by high regional social capital in comparison with other ownership and leadership types (Arregle et al., 2007)
Firm size	Through abundant internal resources, larger firms have the capacity to act as focal or anchor firms in RIS or are alternatively able to remain isolated due to self-sufficiency, vertical integration or greater ability to maintain extra-regional linkages (Christopherson & Clark, 2007; Munari et al., 2012)
Organizational status (e.g. single-location firm, headquarters, branch, subsidiary, location of R&D)	Headquarters location is related to regionally embedded management (Doloreux & Dionne, 2008); co-location of R&D functions increases local RIS integration through linkages to educational and research institutions and to collaborators (Branstetter, 2006); FDI-linked production plants of MNEs/TNCs lack RIS integration due to reduced necessity for plant-based knowledge generation and diffusion (Meyer et al., 2011)
Market position and industry	RIS integration differs according to industry and market (Watts et al., 2006); firms catering to local markets are strongly integrated in RIS due to the regional location of customers, and frequently suppliers and contractors as well (Greenberg et al., 2018), while manufacturing firms with high export shares are least integrated due to extra-regional customer bases and specialized supplier requirements (Arndt & Sternberg, 2001)
Innovative capacity and technological focus	High innovative capacity is associated with limited spillovers due to lacking cognitive proximity to regional knowledge base and the absorptive capacity of RIS actors (Asheim & Coenen, 2005, Capello, 2014; Reidolf, 2016); also shown for FDI in transition economies (Suwala & Micek, 2018)
Firm leadership/management	Owner-managed firms utilize local social capital more effectively due to overlaps of personal and corporate social capital (Arregle et al., 2007); personal origin and current residential location of ownership and leadership are additional influencing dimensions for RIS
Firm-external regional characteristics	
Location (or milieu) economies	Geographical proximity to customers, suppliers, contractors, competitors, and R&D collaborators positively influences RIS integration (Capello, 2020; Doloreux, 2003)
Urbanization economies	Availability of relevant regional resources for firms, such as a qualified labor force, physical infrastructure, and research institutions induces and conditions compensation and exploitation strategies for RIS integration (Doloreux, 2003; Eder & Trippl, 2019); rural areas offer a specific RIS constitution with organizational and institutional thinness, hence necessitating extra-regional innovation linkages or internalization of capacities (Tödtling & Trippl, 2005; Virkkala, 2007)
Degree of peripherality of firm location	The degree of peripherality of a firm location is linked to the distance to agglomerations and to regional density and thickness of RIS, with greater peripherality complicating and aggravating knowledge transmission across distances, regional resource availability, and physical proximity between regional actors (Eder, 2019; Polèse & Shearmur, 2006)
Technology and innovation policy	Existing structures, processes, and incentives for intra-regional R&D cooperation facilitate and strengthen RIS integration, particularly in rural areas (Sternberg & Arndt, 2001)

Source: Own elaboration.

While the RIS integration of firm types such as family-owned firms (Basco et al., 2021) and multi-national enterprises (MNE) (Meyer et al., 2011) has been investigated, there is a void for HCs, potentially due to the firm characteristic of hiddenness. Most related research focuses on other firm types requiring less specialized knowledge and related resources such as firms with largely local markets (Greenberg et al., 2018). However, related research on RIS integration of SMEs and family businesses is relevant, as these firm types have many overlapping features with HCs and hence serve as a basis for approximation with regard to the research question. Moreover, scholars have analyzed the impact of family-owned firms in innovative industries on regional innovation activity (Block & Spiegel, 2011). Here, an assessment of the actual innovation output of these firms and of their fit with the definition of HCs (i.e. status of market leadership, etc.) has not been conducted before. Substantial research has investigated the local integration of MNE plants, focusing on foreign direct investment (FDI) in transition and emerging economies (Meyer et al., 2011, Suwala & Micek, 2018).

Additionally, there is scant research on rural RIS in contrast to the existence of ample studies on agglomerations. Furthermore, the integration of highly innovative firms in rural RIS has rarely been examined. In particular, RIS integration of innovative firms that are regionally dominant has not yet been studied in rural areas, but only in agglomerations and industrial districts, opening relevant research avenues for dominant firms in regions with a thin economic base (Munari et al., 2012).

3.2.3 Hidden Champions and integration in RIS

Research on rural RIS integration of HCs is rare, while this dimension of the firm-territory nexus has already been examined for other firm types such as family-owned firms (Basco & Suwala, 2020). The firm type has been studied widely, particularly in Germany and the broader German-speaking world (Simon, 2018), with additional case studies for other countries (e.g. Lalić (2021) for several Eastern European and Asian countries and Voudouris et al. (2000) for

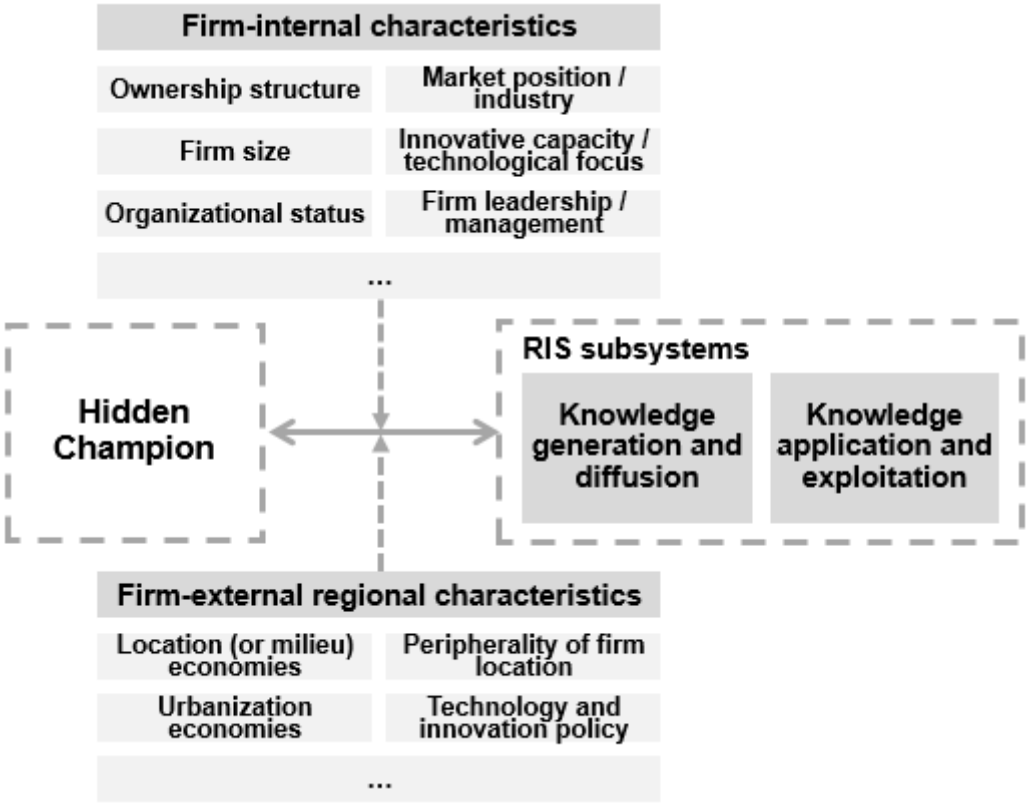
Greece). HCs are considered the backbone of the German Mittelstand, which consists of export-oriented SMEs as an essential element for the competitiveness of the German economy (Simon, 2009; Streeck, 2009). As a result, their sustained corporate success in the digital age is regarded as essential for the overall economy's prosperity and especially for the structurally weak regions in which they are frequently located (Wittenstein, 2020).

Through deliberate internationalization, HCs have a global focus (Simon, 2009). On average, they possess an export share of 64% (compared to 39% for all German firms, Statistisches Landesamt Baden-Württemberg, 2020) and feature a global network of sales offices (Rammer & Spielkamp, 2015). The corporate network of these firms hence consists of actors which are by definition international. Consequently, this paper proposes that firms of this type are not strongly integrated in rural RIS due to their international sales focus, high technological specialization, and rural location. Regarding the latter, the importance of the firm's location in determining fundamental conditions for corporate success, e.g. through the regional labor pool, available infrastructure, or regional policy, has been at the heart of economic geographical debates. Here, rural regions are an important spatial category for HCs being mostly located outside of industrial agglomerations. As indicated, the headquarters of two-thirds of them are located in rural areas (Schenkenhofer, 2020), compared to 39% of all firms in Germany (Stiftung Familienunternehmen, 2020). These firms have significant R&D capacity and activity and employ innovation as a long-term business success strategy (Venohr & Meyer, 2007). They are typically mainly active in manufacturing sectors and focus their R&D on incremental continuous process improvement (Rammer & Spielkamp, 2019). HCs further differ in their ownership structures, with two-thirds being family businesses, frequently in cross-generational family ownership (Rammer & Spielkamp, 2015; Venohr & Meyer, 2007).

Addressing the state of the literature and the research gap outlined above, the following research question is posed in this paper: *What influences the integration of HCs in rural regional*

innovation systems? To answer this question, a RIS framework of two subsystems (knowledge generation and diffusion, and knowledge application and exploitation) is applied to systematically investigate the influences on the rural RIS integration of this firm type (Autio, 1998; Cooke, 2002). The framework and its dimensions are presented in Figure 5. The following section presents the findings along these identified factors for both subsystems.

Figure 5: Influencing factors for rural RIS integration of Hidden Champions



Source: Own elaboration; RIS subsystems based on Autio (1998) and Cooke (2002).

3. Methods: Data collection and analysis

This study adopts a qualitative research approach to better understand how rural RIS integration of HCs is influenced. The method was deliberately chosen to investigate the complexities involved in RIS subsystem integration. Therefore, semi-structured interviews with HCs in rural areas in Germany as well as with actors from their regional context were conducted.

To gain a better understanding of regional characteristics, four rural regions with a large spectrum of demographic, economic and infrastructural indicators were selected, based on the empirical results for German regions by Küpper (2016) and Oberst et al. (2019). The Eurostat (2020) definition of rural regions was used. Two rural regions with a strong and two with a weak economic, demographic and infrastructural base were included. The regions selected were Central Hesse (north of Frankfurt to the northern district of Biedenkopf) and Leine-Weser in southern Lower Saxony in West Germany, as well as Lower and Upper Lusatia/Lausitz (Greater Dresden to the northern rural regions around the district of Oberspreewald-Lausitz) and the northeastern Harz foreland in the state of Saxony-Anhalt in East Germany.

To identify potentially relevant HCs, the Global Market Leader Index by Müller (2018) was used and enriched through interviews with Chambers of Industry and Commerce representatives. All firms were evaluated concerning their fit with Simon's (2009) definition of this firm type.

Between September 2020 and March 2021, 57 interviews were conducted with two actor types: HC representatives and regional actors. The first group, representatives of HCs, consisted exclusively of members of the management. Employees in these leadership positions were targeted, as they are acquainted with the firm's history and regional context due to their long tenure typical for these firms (Venohr & Meyer, 2007) and have the authority to disclose details. One representative per firm was interviewed. In the sample of 28 HCs (response rate of 33%,

84 firms were contacted), the share of firms active in manufacturing is 89%, the remainder being firms that exclusively produce software. This distribution is proportionate to the general population of this firm type. The average turnover of EUR 195 million per year is lower than the overall average of all HCs with EUR 325 million (Simon, 2018). The average share of exports of interviewed firms is 52% (compared with 64% for the general population; Rammer & Spielkamp, 2015) and the share of family-owned firms is 54% (compared with 66% for all HCs; ibid.). For the second group, 29 actors in the regional vicinity of these firms were interviewed to add insights into additional dimensions of RIS integration and to validate the perspectives of HCs (response rate of 83%, 35 organizations were contacted). The regional distribution was equivalent for both interviewed groups. Actor types included mayors and representatives of regional development agencies as well as Chambers of Industry and Commerce. These actor types were targeted as they were both knowledgeable about the firms and their regional linkages, and were not subject to non-disclosure agreements, as potential collaborators from other regional firms or universities would have been. The interviews mainly concentrated on the interviewed firms, but also involved other regional HCs, if applicable. An overview of the regional characteristics of the sample is provided in Table 7 (for further details, see Tables 8 and 9 in the Online Appendix at the end of the paper). Based on the theoretical point of departure described above, an interview guide was used in the interviews covering the RIS integration of these firms and structured by integration in the two subsystems and its elements (e.g. "*How would you describe the relationship and interactions of your firm with regional universities?*"). Due to the ongoing COVID-19 pandemic, all interviews were conducted remotely: Most via video calls and the remainder via telephone. The interviews lasted 57 min on average and were audio-recorded and then transcribed. All statements by interviewees used in this article were translated into English. Confidentiality and anonymity were guaranteed to the interviewees to ensure openness.

Table 7: Regional characteristics of sample

		Hidden Champions (HC)	Regional actors (RA)
Settlement size	Large city (>100k population)	0 (0%)	4 (14%)
	Medium-sized city (20k-100k population)	7 (25%)	18 (62%)
	Small town (5k-20k population)	13 (46%)	6 (21%)
	Village (<5k population)	8 (29%)	1 (3%)
Regional classification	Very rural / weak socio-economic conditions	8 (26%)	7 (24%)
	Very rural / strong socio-economic conditions	3 (12%)	4 (14%)
	Fairly rural / weak socio-economic conditions	3 (12%)	3 (10%)
	Fairly rural / strong socio-economic conditions	14 (50%)	12 (42%)
	Not rural	0 (%)	3 (10%)
Driving distance to closest research university	<30 minutes	8 (29%)	n/a
	>30&<60 minutes	15 (53%)	n/a
	≥ 60 minutes	5 (18%)	n/a
Total		**28**	**29**

Source: Own elaboration; regional classification based on Küpper (2016), based on nine indicators for socio-economic conditions, such as unemployment rates, median income, life expectancy, and housing vacancy rates; settlement size and driving distance to closest research university based on Statistisches Bundesamt (2021).

The interview transcripts were coded deductively along the structure of the RIS subsystems described above. In the following step, sub-dimensions of these subsystems (e.g. types of organizations, such as suppliers, customers, or research institutions) were used for deeper coding levels. The software *f4* was used for this purpose. One researcher coded the interviews after research assistants transcribed them. Subsequently, influencing factors for RIS integration were identified inductively and grouped as (a) firm-internal and (b) firm-external regional factors. This deductive-inductive approach (Gibbs, 2018) offers a combination of advantages: While the inductive elements prevent biases and prejudices from the researchers responsible

for interviewing, the deductive dimension enables an integration of these inductively identified factors based on a theoretical framework.

Additionally, the statements of the interviewees were selectively triangulated and validated with secondary data sources such as annual reports and firm websites (Graebner et al., 2012). These triangulations and validations focused on identifying and validating firm-internal and regional variables (e.g. firm size, existence of regional research institutions) as well as indicated linkages of HCs with other actors that are publicly visible, such as endowed professorships.

3.3 Results

The analysis of the interview material reveals the influence of firm-internal and firm-external dimensions for RIS integration. The effect of the specific influences will be described in the following section, differentiated according to the two RIS subsystems of knowledge generation and diffusion, and knowledge application and exploitation. Table 10 in the Online Appendix displays how the firm-internal and firm-external regional influences on RIS integration of HCs were systematically identified in an inductive way, using the interview transcripts. Firm-internally, this pertains to ownership structure, firm size, and organizational status. Firm-externally, location (or milieu) economies and urbanization economies were identified as important. These factors will be further described in the following section.

3.3.1 Firm-internal influences

Integration in RIS subsystems: Knowledge generation and diffusion

HCs conduct business in specific product niches and are highly innovative, implying the need for specialized knowledge (Venohr & Meyer, 2007). Additionally, firms of this type are strongly internationalized in terms of sales networks (Rammer & Spielkamp, 2015). Hence, this paper hypothesizes that RIS integration concerning knowledge generation and diffusion, e.g. through linkages with higher education and research organizations, occurs based solely on specialization and cognitive proximity, and not necessarily on geographical proximity

(Boschma & Frenken, 2011). However, the interview material reflects an ambiguous picture: All HCs surveyed have some form of connection with regional research and educational institutions, but differ in two important aspects.

Firstly, larger HCs and those that are not family-owned tend to be spatially flexible in their search for suitable cooperation with research institutions, while smaller firms of this type and family-owned firms deliberately search locally for partners and exploit their existing social capital and built-up trust (RA5). In particular, almost all HCs that are classified as family-owned firms are strongly interlinked with regional research institutions. The regional availability of research institutions such as research universities, universities of applied sciences, or other research institutes affects this pattern, as described in the next section on firm-external regional influences in the knowledge generation and diffusion subsystem (Doloreux, 2003). Secondly, virtually all firms analyzed involve regional educational institutions such as universities and vocational schools for human capital-related purposes in the realm of knowledge diffusion. Often, these linkages possess a strategic element to attract, develop and retain qualified local labor and to transform these institutions according to particular corporate requirements (HC28, RA8). Forms of interaction include dual university programs, specialized apprenticeships, curricula customized to the technology foci of individual or groups of HCs, endowed professorships, supervised theses, internships hosted by these firms, and support for and sponsoring of youth IT competitions (HC10/17/20, RA8/12/28). These initiatives are reported as being particularly effective when the rural regional environment does not feature many other innovative or large firms, or both. Agency of Hidden Champion leadership also plays an important role in establishing and deepening relationships with research and educational institutions (Chrisman et al., 2014). In contrast to other firms, they value regional research institutions as very important. In this context, the representative of a regional economic development agency in Lusatia explains:

‘HCs have this strong will to engage in technology transfer. We don't have to organize that. If we were involved, the transfer is by nature artificial. They already know pretty well what the local university can provide them with. […] With micro-enterprises and other SME, it is not the case that they say: "I need a research ecosystem around me”. HCs ask precisely for this, and they ask for it first.’ (RA24)

Interview partners have highlighted how HCs with varying ownership structures and firm sizes differ in the degree of localization of research cooperation. Family-owned/operated firms are described as deliberately trying to engage local universities – if existing – in as many projects as possible and only search beyond the region if necessary. Additionally, alumni networks between research and educational institutions and the employee base of this firm type are relevant in terms of being acquainted with the respective institutions and having developed relationships with its members. The relatively small size and limited public awareness of HCs is pictured as a disadvantage for cooperation with large metropolitan universities and hence fosters regional collaboration with research institutions, since the intra-regional public awareness is considered markedly higher (Simon, 2018). The following example from an economic development agency in Central Hesse illustrates this:

‘When HCs contact the big universities, they are one among many. Here [in our rural region], there is an existing relationship. The universities of applied sciences are more regionally oriented. Meanwhile, even Gießen University [as a research university] is doing the same. It now has a president who said: "Of course, a university has an international reputation. It has to have one. It needs the international connections in research, but we also have a regional responsibility."’ (RA5)

In terms of relationships to policy organizations, HCs with larger firm sizes are reported as having a different spatial focus. They prioritize supra-regional linkages on national or state levels over local ones (HC14, RA9/27). The reasons given for this are strategic foci of regional

economic development agencies that do not match the priorities and requirements of these firms, more adequate support programs at the supra-national level, and a general lack of entrepreneurial necessity to engage with local political stakeholders beyond matters such as building laws and digital infrastructure. The CTO of a powertrain technology Hidden Champion explained:

'We are simply too big for that. […] If we want funding, we have to go to the state or the federal government.' (HC24)

HCs that are subsidiaries of larger corporations, and particularly of international ones, display lower integration with regional policy institutions – similar to findings on MNEs (Kramer & Diez, 2012). This also corresponds to the findings concerning linkages of these firms with regional research and educational institutions described above. The manager of a university-run technology transfer center exemplified this with the following statement:

'Yes, they [subsidiaries of larger corporations] may be HCs, but they are all externally determined. […] We have hardly had any contact with most of the firms in the last five years or so, because headquarters are just far away in Brazil or Mexico.' (RA13)

Integration in RIS subsystems: Knowledge application and exploitation

As this firm type is active in product niches and has a global sales focus with high export ratios, there is no emphasis on regional sales reported in the interviews (cf. Rammer & Spielkamp, 2015). Regarding supplier networks, HCs as subsidiaries of larger corporations are portrayed as being less active in sourcing from regional suppliers. Interview partners frequently attribute this pattern to the influence of corporate purchasing units at the holding level. Particularly for private equity-owned firms and those that are subsidiaries of larger corporations, the notion of "*islands*" has been invoked to describe the lack of RIS integration in this subsystem. Interestingly, cases of ownership change provide insights into influencing factors of RIS integration: Ownership transfer not only implies changes in the allocation of decision-making

power, but also access to corporate R&D resources to substitute external knowledge sourcing (Bodner & Capron, 2018). The manager of the technology transfer center quoted above continues:

‘Cooperation doesn't work anymore, because the headquarters that make the decisions are located far away across some ocean. And the management level with which you can get in touch is no longer on site. Only the production is located here. And that's a bit of a problem.’ (RA13)

The firm size of HCs was negatively associated with integration in the RIS and its knowledge application and exploitation subsystem. A crucial distinction is to be made between the size of the firm’s regional location and the overall firm size for firms with multiple locations. Here, important aspects in influencing RIS integration emphasized by interviewees are which corporate functions are located in the regional location analyzed and whether the site serves as the Hidden Champion’s headquarters (RA13). The regional background of Hidden Champion leadership in terms of biographical origin and current residential location plays an important role as well. A department head of a Chamber of Industry and Commerce in Central Hesse confirmed:

‘The executives no longer move to the region. They prefer to drive those 100 kilometers every day instead of moving to the region. Of course, there is the disadvantage that they are not that connected.’ (RA8)

Integration in the knowledge application and exploitation subsystem has been identified as stronger for family-owned firms than for those HCs with other ownership and management models. Management agency plays a much more pronounced role in family-owned firms compared to other ownership models (Chrisman et al., 2014). Additionally, family-owned firms may be better positioned to build and exploit local social capital (Arregle et al., 2007). In this regard, the interview records demonstrate that the long-lasting regional focus of family-owned

HCs conditions the localization of social capital and trust. This, however, may be different for other ownership types of these firms or in cases in which Hidden Champion leadership has been recruited from other regions (RA18). Regarding more generic supplies by contractors such as craftsmanship, firms that are family-owned firms deliberately engage local suppliers regularly due to a sense of regional responsibility. To demonstrate, a Chamber of Industry and Commerce branch manager explained:

'The local roofer does not cover the roof at [Hidden Champion, subsidiary of a large holding]. [Holding] determines this and puts it out for tender. If a firm from the region happens to submit a favorable bid, then they get it. The local family Hidden Champion could not afford to take a roofer from [larger city]. You can't do that in such a small village. There really are differences of cooperation and regional ties.' (RA4)

Regional networks among family-owned HCs and other family SMEs are pertinent. These networks are manifested through various forms, such as business clubs, associations, Chambers of Industry and Commerce, R&D collaboration, supplier links, and sharing of labor in case of bottlenecks. A regional economic developer from Central Hesse illustrated these networks as follows:

'There is an annual reception here. You notice there how these people flock together. How long they have known each other. You notice the familiarity, the openness with which they deal with each other. It is very nice to experience that. Especially these old business families, they really live for their region.' (RA5)

In the regional economic landscape, HCs are portrayed as occupying a special position of being innovative enough to generate intra-regional spillovers to other firms while still being hidden and valuing secrecy (cf. Eder, 2019). However, among the firms surveyed, there is substantial heterogeneity regarding awareness of potential local R&D collaborators (RA26). Larger firms

with more than a few hundred employees feature local suppliers that have emerged in their regional vicinity to supply required intermediary products – as in the following example from Lower Saxony:

'We now have a large industrial park, where many smaller suppliers for [Hidden Champion] have emerged. The chemical industry is a big matter here, because [Hidden Champion] is there.' (RA16)

3.3.2 Firm-external regional influences

Integration in RIS subsystems: Knowledge generation and diffusion

Regional resource availability in terms of research and educational institutions is repeatedly mentioned as determining RIS integration of HCs, implying that the search for suitable partners is initially conducted locally. However, the lack of awareness of other actors in the knowledge generation and diffusion subsystem is seen as an obstacle. Spatial proximity to larger cities with dense research ecosystems such as Göttingen is emphasized as positively impacting RIS integration (HC27, RA10). Regional research and education institutions are deliberately establishing intra-regional partnerships, also affecting this firm type. In terms of locational requirements and requests for HCs, the availability of regional research institutions – of research universities and beyond – has gained priority and influences locational decisions such as relocation of corporate units. The director from a Lusatian regional development agency was clear about this:

'It used to go "I need space, I need funding and then the rest comes." Now it is "I need people and I need research". Then comes space, then infrastructure, and at some point "If there was a bit of funding, that would be great." That has completely turned around.' (RA24)

Different approaches in research cooperation by local research universities and universities of applied sciences in rural areas versus big research universities in urban regions also drive

patterns of collaboration with HCs. The CTO from a Hessian slicing systems producer explained it as follows:

'More complex universities view themselves differently – as solution providers: "Okay, you have a problem. We'll internally pull together the departments we need to work with to come up with a solution." And that is basically what we need. We do not get that with the local universities, despite repeated requests.' (HC6)

Secrecy-seeking HCs form exceptions to integration in the regional knowledge generation and diffusion subsystem, following a logic of secrecy as an exploitation strategy of rural locations (Eder & Trippl, 2019). As a consequence, this applies to integration in the second subsystem of knowledge application and exploitation as well. For the vast majority of these firms, however, co-location of HCs in related industries is an impetus for new developments in knowledge generation and diffusion subsystems such as co-sponsored professorships (HC19, RA8). As a rationale for these local linkages, the investigated firms frequently cite the necessity of regional visibility to attract qualified labor (HC8/22). HCs also build alliances with other specialized local firms for strategic purposes, such as requirements for a highly-skilled workforce.

In their regions, firms of this type are described as highly relevant in terms of economic effects – i.e. through business tax, employment, human capital, activities in corporate spatial responsibility, and also due to their suitability for regional marketing through their international business success and innovation. This relevance can be leveraged to realize locational requirements of HCs, and also includes the initiatives to develop and attract qualified labor described above. Scholars have used the term place leadership for related phenomena (Albers & Suwala, 2021). The CEO from a switchgear-producing Hidden Champion in the Harz foreland illustrated this:

'The big advantage is: If we really have problems, then we have a short path here either to the city, to our county, or even to our state government.' (HC26)

Regional policies and their institutions, particularly regarding education and training, technology, and innovation, were identified as influencing RIS integration of HCs. Generally, external policy influences take on various forms of interaction, including infrastructural demands, the search for adequate support programs or for skilled labor, and further administrative matters. Still, self-sufficiency and high degrees of organizational excellence of this firm type have frequently been mentioned, resulting in rare requests for support or assistance addressed to regional actors dedicated to economic development (Simon, 2009). Agency of Hidden Champion leadership, especially for family-owned firms, is important in terms of establishing and maintaining relationships with regional policy institutions as well. This is particularly induced by social capital and trust accumulated over extended periods of time, also considering the generally long tenure of employees in regional administrations. In addition to self-sufficiency, contacts to regional public actors are described as limited to specific requests. A representative from a Lusatian Chamber of Industry and Commerce emphasized the character of self-sufficiency:

'There are businesses that need us as a Chamber of Industry and Commerce, and there are firms that need us less. HCs can also manage on their own. But if you are active, if you get involved, if you help build networks with your knowledge, then you are a partner for them.' (RA3)

The municipal level is consistently commended for its swift response to demands of HCs, in contrast to greater bureaucracy perceived on larger administrative scales. A direct interest of municipalities in terms of the relevance of the Hidden Champion's business tax base, which is directly allocated to municipalities in Germany, may also influence this. In addition to RIS integration, interviewees have also stressed increased activity by family-owned firms in

measures of corporate spatial responsibility such as sponsoring (Albers & Suwala, 2021). In a few instances, family-owned HCs were active in founding and developing regional development agencies to foster intra-regional innovation cooperation.

Integration in RIS subsystems: Knowledge application and exploitation

The representatives interviewed generally evaluate regional knowledge application and exploitation linkages of rural HCs as thin, implying limited localized relations to suppliers, contractors, customers, and other related actors. Often, this is due to geographical proximity to both existing and potential partners (Schäfer & Meyer, 2019). The CTO from a Lower Saxony-based Hidden Champion concluded:

'An ecosystem around me helps to move forward faster. That is the part where we have the hardest time in rural areas. My closest partners are all quite some distance away.' (HC24)

Regional clusters of HCs in these rural areas form an exception, and particularly those in related industries, e.g. furniture and glass in Leine-Weser or optics, welding, and packaging in Central Hesse (Moßig, 2000). Here, the local transfer of employees through attrition and hence of specialized, tacit knowledge constitutes an additional dimension of spillovers. In addition, a history of spin-offs – similar to the corporate evolution of Fairchild Semiconductors in Silicon Valley (Storper et al., 2015) – has been frequently described with regard to these structures. The small town of Haiger in Central Hesse is an example of this, as the CEO of a welding machine Hidden Champion illustrated:

'Our small town is already a special industrial location. Look at all those firms that have emerged, grown, and become large in this small place! […] That motivates everybody, and so there are some smaller mechanical engineering firms that are unknown and very successful.' (HC19)

These particular regions feature a high density of this firm type and other manufacturing SMEs in specific industries despite being classified as rural, leading to regionalized supplier networks. Factors such as regional culture and the promotion of an atmosphere of networking and exchange amplify this. If they exist, HCs are reported to deliberately support local startups, for instance through engaging them as suppliers or R&D collaborators. Still, they are described as having high requirements for their suppliers and as valuing good-quality products more highly than regionally sourced intermediate products that do not completely fulfill requirements (Venohr & Meyer, 2007). To compensate for resource constraints and to remain focused on their own technological specialization, HCs in rural areas report contracting with external (and predominantly extra-regional) service providers such as software and consulting firms as suppliers. Additionally, many have mentioned the potential for rural areas due to the transforming nature of R&D collaboration through digitalization. The CFO of a large seed production Hidden Champion assessed the opportunities induced by digitalization in the following way:

'How do I get knowledge into rural areas? How do I get resources and talent into rural areas? How can I exchange expertise remotely? Of course, digitalization quickly opens up completely different possibilities and completely different exchanges and workflows.' (HC27)

3.4 Summary and discussion

This article has examined the integration of HCs in rural RIS in Germany and the influence of firm-internal and firm-external regional characteristics on rural RIS integration. The paper has developed the proposition that firms of this type are not strongly integrated in rural RIS due to their international sales focus and technological specialization, and posed the following research question: *What influences the integration of HCs in rural regional innovation systems*? A RIS framework of two subsystems (knowledge generation and diffusion, and knowledge application and exploitation) was applied to approximate rural RIS integration.

It was found that integration in rural RIS is heterogeneous for HCs in Germany. The important firm-internal influences identified are ownership structure, firm size, and the organizational status. Regarding ownership, HCs that are family businesses are on average more integrated in rural RIS than other ownership and leadership types, but vary significantly – potentially due to the increased importance of managerial agency and differences in regional social capital. Firms of this type that are subsidiaries of larger corporations, and particularly international ones, display lower integration in RIS – similar to findings on MNEs (Kramer & Diez, 2012). The size of these firms was negatively associated with integration in RIS. There is a crucial distinction to be made between the size of the firm's regional location and the overall firm size in cases of HCs with multiple locations.

For firm-external regional influences, location and urbanization economies are important dimensions. Greater resource availability in terms of qualified labor and relevant institutions for knowledge generation and application was positively associated with RIS integration for HCs. A regional knowledge base that is cognitively proximate to the Hidden Champion's technological focus, such as for optics, welding, and packaging in Central Hesse, as well as long-established industrial traditions and an appropriately trained workforce increase rural RIS integration of these firms. Industry, technological focus, degree of peripherality, and characteristics of technology and innovation policy do not play an important role in rural RIS integration of HCs, according to the actors interviewed.

Additional insight into firm-internal and firm-external dimensions contributes to the debate on influences on rural RIS integration of HCs. This special firm type has not yet been examined regarding their RIS integration. Here, existing insights into other firm types such as SMEs, MNEs, and family businesses are thus enriched. As rural areas offer challenging conditions for innovation, this paper provides a valuable analysis of highly innovative firms with global market leadership located in this regional context. It could be shown that – depending on

influencing factors – a significant share of these firms are integrated in rural RIS, contradicting dichotomies between "*rural entrepreneurship and entrepreneurship in the rural*" (Korsgaard et al., 2015, p. 5). Furthermore, this study answers the call for cross-fertilization between economic geography and family business studies (Basco & Suwala, 2020). Here, the existing research focus on the comparative performance of family vs. non-family leadership concerning their home-region focus has been extended (Banalieva & Eddleston, 2011). This has been achieved by limiting the sample to firms with a consistently low home-region focus due to their disproportionately high export shares.

The present findings offer several implications for regional policymakers in rural areas. Facing the relatively low regional integration of this firm type in defiance of their general preference for intra-regional collaboration, attempts to support these rural RIS in enhancing localized learning can be fruitful. Actor-based policies should be at the center of such approaches. Large HCs have the capacity to be additionally relevant in fostering cluster development in rural areas through their role as anchor firms. Reinforcing and amplifying spillovers and other externalities from them as highly innovative firms to their regional context can strengthen the region at large, countering the metaphor of an *anchor tenant without a mall*, to paraphrase Agrawal and Cockburn (2003). In light of increased interest in place-based innovation policies (Grillitsch & Asheim, 2018) and acknowledging the recent launch of the German funding system for structurally weak regions (*Gesamtdeutsches Fördersystem*), a stronger integration in rural RIS of HCs as highly innovative firms has potential to contribute to these goals. From a regional development perspective, strengthening family-owned firm structures – particularly concerning firm successions – can contribute to the continued regional integration of this firm type and other businesses. Additionally, the lack of awareness of many HCs concerning potential regional innovation partners can be improved through better dissemination of information.

Some limitations of the study need to be discussed. It remains unclear how RIS integration of HCs compares with other SMEs in rural areas. This, however, is beyond the scope of this study due to the research design focusing on this firm type. Limiting the study to four rural regions and their specific economic base of these firms could hinder the generalization of findings in a broader context (Bathelt & Li, 2020). The emphasis of regional characteristics could then underestimate the agency and impact of individual actors, such as HCs and their management in this context (Bathelt & Glückler, 2018). The research field of management geography could provide a platform to further analyze the impact of managerial decision-making in the realm of RIS integration (Suwala & Schlunze, 2019). Additionally, the segmentation in subsystems can obliterate recent insights into boundary-spanning activities within RIS (Kerry & Danson, 2016).

The results provide a fruitful base for extended research. Firstly, rural RIS integration of HCs should be compared with other firm types. Existing research examining the integration of specific types such as family-owned firms does not distinguish the regional context. Secondly, additional research on the relationship of digitalization-related behavior and regional integration of these firms can be insightful in exploring this connection. Thirdly, further studies on the effect of family business successions as well as mergers and acquisitions on regional integration of HCs may prove relevant in establishing the influence of firm-internal factors such as ownership structure (Lenz & Glückler, 2021). Fourthly, while this paper has focused on the integration of this firm type in rural RIS and their subsystems, additional insights on relations between these firms and civil society and on various regional contributions of HCs and their importance for their home region, such as economic and intangible effects, may enrich the understanding of the relevance of this firm type for rural areas.

Online Appendix

Table 8: Description of interview sample of Hidden Champions

ID	Industry	Firm foundation	Firm revenue (EUR m.)	Employees (#)	Ownership structure	Interview duration (min.)
HC1	Extension spindles and poles	1990s	~5	~50	Family	85
HC2	Wireless controls	1990s	~50	~180	Family	64
HC3	Lithium-ion batteries	2000s	~90	~1600	Subsidiary	51
HC4	Water ultrafiltration	2000s	n/a	~140	Subsidiary	59
HC5	Ladder systems	1940s	~150	~500	Subsidiary	59
HC6	Slicing systems	1980s	~250	~1400	Family	56
HC7	Bowden cables	2000s	n/a	n/a	Family	30
HC8	Steel construction	1990s	~30	~200	Family	35
HC9	Extraction and filtration	1990s	~30	~130	Family	55
HC10	Electrical safety	1940s	~150	~900	Family	50
HC11	Buffet solutions	1980s	~5	~20	Subsidiary	51
HC12	Festive decoration	1890s	~10	~150	Family	45
HC13	Fine chemistry and fragrance components	1990s	~15	~50	Family	44
HC14	Marine gearboxes	1870s	~80	~500	Foundation	63
HC15	Digital radio systems	1980s	~90	~50	Subsidiary	92
HC16	Specialized textiles	1990s	~40	~150	Family	40
HC17	Confectionery process lines	1920s	~50	~250	Subsidiary	49
HC18	Foundry technology	1990s	n/a	~30	Family	54
HC19	Welding machines	1910s	~120	~500	Subsidiary	57
HC20	Office furniture	1900s	~80	~600	Family	57
HC21	Spark extinguishers	1910s	~90	~650	Family	74
HC22	Central heating products	1920s	~600	~3700	Foundation	60
HC23	Welding torches	1940s	~300	~2200	Private equity	62
HC24	Powertrain technology	1940s	~800	~4000	Foundation	63
HC25	Software engineering	1990s	~10	~80	Family	69
HC26	Switchgear	1990s	~60	~200	Subsidiary	46
HC27	Seed production	1850s	~1700	~5700	Public	50
HC28	Float glass	2000s	~300	~250	Subsidiary	65
Average:			**195**	**890**	**n/a**	**57**

Source for firm data: Bureau van Dijk (2020) and desk research; latest data available for revenue and employees.

Table 9: Description of interview sample of regional actors

ID	Type of regional actor	Region	Interview duration (min.)
RA1	Regional economic development agency	Leine-Weser	56
RA2	Regional economic development agency	Harz foreland	40
RA3	Chamber of Industry and Commerce	Lausitz/Lusatia	60
RA4	Chamber of Industry and Commerce	Lausitz/Lusatia	60
RA5	Regional economic development agency	Central Hesse	63
RA6	Chamber of Industry and Commerce	Harz foreland	60
RA7	Regional economic development agency	Lausitz/Lusatia	60
RA8	Chamber of Industry and Commerce	Central Hesse	63
RA9	Regional economic development agency	Leine-Weser	50
RA10	Regional innovation agency	Leine-Weser	65
RA11	Regional economic development agency	Central Hesse	45
RA12	Employers association	Lausitz/Lusatia	75
RA13	Technology transfer agency	Harz foreland	60
RA14	Regional economic development agency	Central Hesse	60
RA15	Chamber of Industry and Commerce	Lausitz/Lusatia	60
RA16	Regional innovation agency	Leine-Weser	64
RA17	Employers association	Central Hesse	65
RA18	Mayor	Central Hesse	50
RA19	Mayor	Leine-Weser	48
RA20	Regional economic development agency	Harz foreland	30
RA21	State economic development agency	Central Hesse	75
RA22	Regional economic development agency	Leine-Weser	60
RA23	Regional economic development agency	Central Hesse	50
RA24	Regional economic development agency	Lausitz/Lusatia	70
RA25	Regional economic development agency	Lausitz/Lusatia	60
RA26	Chamber of Industry and Commerce	Leine-Weser	50
RA27	Regional location marketing agency	Harz foreland	25
RA28	Chamber of Industry and Commerce	Lausitz/Lusatia	60
RA29	Chamber of Industry and Commerce	Harz foreland	60
Average:			**57**

Source: Own elaboration.

Table 10: Identified influencing factors of RIS integration of Hidden Champions

Influencing factors	Number of cases	Selected interview quotes
Firm-internal characteristics		
Ownership structure	39	• 'Yes, they [subsidiaries of larger corporations] may be Hidden Champions, but they are all externally determined. […] We have hardly had any contact with most of the firms in the last five years or so, because headquarters are just far away in Brazil or Mexico.' (RA13) • 'The innovative firms, the Hidden Champions, most of them feel a regional connection. But they are also family-run. You can say: All those that are not family-run and were not founded in the region have little connection to the region.' (RA29) • 'The local roofer does not cover the roof at [Hidden Champion, subsidiary of a large holding]. [Holding] determines this and puts it out for tender, and if a firm from the region happens to submit a favorable bid, then they get it. The local family Hidden Champion could not afford to take a roofer from [larger city]. You can't do that in such a small village. There really are differences of cooperation and regional ties.' (RA4) • 'There is an annual reception here. You notice there how these people flock together. How long they have known each other. You notice the familiarity, the openness with which they deal with each other. It is very nice to experience that. Especially these old business families, they really live for their region.' (RA5) • 'We have had the experience that when firms are sold, this culture is quickly lost. If the managing directors no longer sit locally, but somewhere in Hamburg… We have a window manufacturer which was taken over by a Hamburg firm. Within two years, almost the entire workforce had resigned and left.' (RA18) • 'Strategic cooperation on such a long-term basis is still a rarity. We once had a company that conducted [regional strategic cooperation] very strongly. But the firm has now been sold to the Bosch Group because the owner was childless. […] Bosch is a large corporation. It has its own dynamics. None of us can get in touch with them.' (RA5)
Firm size	34	• 'We are simply too big for that. […] If we want funding, we have to go to the state or the federal government.' (HC14) • 'The larger Hidden Champions, they have isolated themselves from the region quite a bit.' (RA13) • 'We now have a larger industrial park, where many smaller suppliers for [Hidden Champion] have emerged. This whole chemical industry is a big matter here, because [Hidden Champion] is there.' (RA16) • 'The bigger the firms are – they are now part of the [holding] as they have been bought – the less they are anchored in the region.' (RA13) • '[Hidden Champions], that's a very small firm. I didn't even know the firm before I became mayor, honestly. […] They do not radiate that strongly into our town and region.' (RA18) • 'Of course, the firms also have relationships beyond the state borders. Especially the very large Hidden Champions are then probably even better networked with ministries that are responsible for any approvals than perhaps our small district itself.' (RA27)
Organizational status	26	• 'And I actually don't even know if they are all still paying their business taxes here locally. The headquarters may not even be here anymore. We have had hardly any contact with most of these firms in the last five, six years.' (RA13) • 'When in Quebec, or wherever, the decision is made to close a plant, it's emotionless. If they are based here, if the enterprise has been part of the municipality for decades, it is not as simple to close down, it is a more emotional process.' (RA24)

		• ‘The large Hidden Champions usually have a central purchasing department at another headquarters. […] If you have small Hidden Champions, many of course buy in the region.’ (RA27) • ‘It was also a way to make ourselves known locally again. Of course, the people in Mexico don't even know that there is a university in Wernigerode. That's just the way it is, yes. […] The bigger the firms become and the more they emerge as world market leaders, they become more interesting for foreign firms, for large corporations. Be it Bohai from China or Nemak from Mexico. And then they get bought out and are a bit lost in the decision-making structure for us. The impact in the region is sometimes lost as well, because the people who make the decisions are sitting far away.’ (RA13) • ‘These firms mainly operate externally at their headquarters’ location.’ (RA6)
Firm-external regional characteristics		
Location (or milieu) economies	31	• ‘An ecosystem around me helps to move forward faster. That is the part where we have the hardest time in rural areas. My closest partners are all quite some distance away.’ (HC24) • ‘The region in which we are located, I'll just say that now, doesn't really matter. We don't have our customers here in the region, we have them somewhere else, because the hotels we supply are not in the rural areas.’ (HC11) • ‘The customers are supra-regional, and we only have a connection to [town] directly, because the firm location is here, not to the place per se.’ (HC8) • ‘Our small town is already a special industrial location. Look at all those firms that have emerged, grown, and become large in this small place! […] That motivates everybody, and so there are some smaller mechanical engineering firms that are unknown and very successful.’ (HC19) • ‘It is for reasons of specialization that Hidden Champions look for research cooperation in other regions if they really need a highly specialized university. For instance, a Fraunhofer Institute is being established here – an institute for insect biotechnology.’ (RA5) • ‘If I needed a supplier who can deliver this part to me in time and quality for the price, then of course digitization is great. So if it's worldwide, someone with whom I wouldn't necessarily have to meet, with whom I don't necessarily have to sit at a table, but with whom I simply negotiate the terms and conditions and he has to assure me of timely delivery, then everything is good. I think that these are different relationship levels.’ (RA4) • ‘They have actually built up very good relationships with local firms in this area and don't always look at whether it's cheaper to have this developed in China, India, or whatever. Instead, if local partners are called, they'll be there in a quarter of an hour and can also fix something on site. So, for the most part, it has remained regional.’ (RA25) • ‘I know that people help each other out when it comes to skilled workers. So I know for example - I also find this quite exciting - that [Hidden Champion] also sends trainees over to its competitor in Eisleben when there's a need.’ (RA27) • ‘There is also the issue of networking among the firms. You have to travel further to find firms that are active in a similar field or with whom you can cooperate [as a Hidden Champion], where you can exchange information, etc. That's a huge problem.’ (RA12) • ‘The Hidden Champions live from the fact that they have a short route, short communication channels to their suppliers in the region, who implement this directly. […] We have a large proportion of metal processors and plastics processors here. The larger Hidden Champions are then Tier 2 or Tier 1 suppliers for the automotive industry. The entire value chain is represented and there is an intensive exchange and an intensive economic cooperation between these firms.’ (RA8)

Urbanization economies	29	• ‘It used to go “I need space, I need funding and then the rest comes.” Now it is “I need people and I need research”. Then comes space, then infrastructure, and at some point “If there was a bit of funding, that would be great.” That has completely turned around.’ (RA24) • ‘More complex universities see themselves differently – as solution providers: "Okay, you have a problem. We'll internally pull together the departments we need to work with to come up with a solution." And that is basically what we need. We do not get that with the local universities despite repeated requests.’ (HC6) • ‘The big advantage is: If we really have problems, then we have a short path here either to the city, to our county, or even to our state government.’ (HC26) • ‘There are businesses that need us as a Chamber of Industry and Commerce. And there are firms that need us less. Hidden Champions can also manage on their own. But if you are active, if you get involved, if you help build networks with your knowledge, then you are a partner for them.’ (RA3) • ‘We also have a technical university. It was two years ago that firms from the optics industry joined forces and created an optics professorship because they needed special experts. And these are mainly local Hidden Champions, because an optics cluster is very present here.’ (RA7) • ‘That type of cooperation is sought after. […] However, it is not that much driven by the desire to enrich the region, but rather by the necessity to attract the attention of young skilled workers.’ (RA6) • ‘We don't have a university in the district. But the proximity to Dresden is a great advantage. So with the TU, with the HTW, with the Fraunhofer Institutes, there are quite a few relationships with Hidden Champions.’ (RA25). • ‘You have to make sure that you try to keep vocational school classes for certain professions in the region, that's always an issue, for training cooperation.’ (RA7)

Source: Own elaboration, based on interview transcripts.

Chapter 4 | Article Three: Corporate responsibility and place leadership in digitalization

Corporate responsibility and place leadership in rural digitalization: The case of Hidden Champions

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Journal: European Planning Studies

Status: Published (DOI: 10.1080/09654313.2022.2059345)

Abstract

We examine the role of Hidden Champions in rural areas in advancing regional digitalization through corporate local and regional responsibility and place leadership. Endowed with abundant internal resources and high innovative capacity, these global niche market leaders face regional resource constraints, concerning digital infrastructure and workforce with digital capabilities. 57 semi-structured interviews with firm representatives and regional actors in rural Germany are analyzed. We show that these enterprises strategically use measures of corporate local and regional responsibility and exert place leadership to develop digitalization-related assets in their rural regions. These initiatives are operated through modes of both inclusive and exclusive agency and benefit. We find that the motives for these actions are grounded in a perceived lack of swiftness and capacity of public actors, but also entail emotional attachment to the region, particularly for family businesses. Our findings have implications for regional policymakers, such as targeting greater alignment of regional and corporate development goals.

Keywords: Corporate local and regional responsibility; Digitalization; Hidden Champions; Place leadership; Qualitative analysis; Rural areas

4.1 Introduction

Rural regions are lagging behind in the digital revolution, highlighting the concept of a digital divide (Malecki, 2003). In terms of digitalization, this geographic setting faces unique challenges and resource constraints (Eder & Trippl, 2019). These include digital infrastructure, such as broadband internet and 5G access, and digital capabilities of the regional workforce. In Germany, significant regional inequalities in digital infrastructure provision exist (Maretzke et al., 2019).

These circumstances also affect Hidden Champions (HCs), which are small- and medium-sized businesses that possess market leadership in specialized products but are relatively unknown to the broader public. HCs have disproportionately high export shares and are supported by a worldwide network of sales offices (Rammer & Spielkamp, 2015). To preserve their link to these international networks and to engage in digitalization-related innovation, digitalization is a crucial dimension (Wittenstein, 2020). Digitalization is becoming increasingly relevant due to its potential to transform products, business models, and processes (Geissdoerfer et al., 2018). Simultaneously, the conditions for firms in rural locations to engage in digitalization are far more difficult than in agglomerations (Salemink et al., 2017). This is of great significance because two-thirds of German HCs are located in rural areas (Schenkenhofer, 2020).

Regional resource endowment is no longer viewed as an external factor in the economic geography literature (Lengauer & Tödtling, 2010). As a result, the relevance of private actors in endogenous regional development has been strengthened (Sotarauta et al., 2012). As the vast majority of corporate engagement is intra-regional, the connection of regional socio-economic growth and enterprises' engagement is particularly relevant (Labigne et al., 2018). Virtually no research on digitalization-specific corporate local and regional responsibility (CLRR) exists. Further, research on engagement in rural areas in general has received little attention (Müller, 2016). Due to various characteristics, such as organizational and institutional thinness, limited

capacity of smaller municipalities and communities, and a problematic outlook in terms of demographic, infrastructural and economic indicators (Tödtling & Trippl, 2005), this appears particularly relevant for this geographic setting (Bürcher, 2017).

In subnational development, leadership has been described as a critical but often overlooked driver (Sotarauta et al., 2017). Several aspects renew the relevance of place leadership, including the partial withdrawal of the state from rural areas and forces of liberalization, deregulation, and privatization of formerly governmental duties. These have resulted in non-state actors exerting place-based leadership (Albers & Suwala, 2020) and in new digital technologies that necessitate contributions to regional development by actors capacitated in these realms (David & Foray, 2002). It was only recently that CLRR and place leadership have been put in relation (Albers & Suwala, 2020; Voegtlin et al., 2012). Scholars have emphasized the ability of communities and businesses to exercise place leadership when faced with adversity in regional conditions, particularly in rural settings (Kroehn et al., 2010).

Correspondingly, we respond to a call (Sotarauta et al., 2017) to better understand the relationship between place leadership, entrepreneurship, recession and crisis (Bailey & Berkeley, 2014). Additionally, since two-thirds of HCs are family enterprises (Rammer & Spielkamp, 2015), we contribute to studies on the interaction between family firms and regional engagement (Basco, 2015). We aim at closing a twofold research gap. First, there is scant research on HCs' CLRR in general. In particular, CLRR and place leadership have never been jointly studied in the context of HCs and in rural areas. Secondly, we examine digitalization as a new facet of corporate engagement and place leadership.

In this article, we focus on business-led place leadership and analyze regional economic development from an actor-centric viewpoint of HCs. We apply a qualitative study design to analyze semi-structured expert interviews by employing qualitative content analysis (Mayring,

2014). In total, we conducted 57 interviews with management representatives of HCs and other regional actors in four rural German regions.

The remainder of the study is organized as follows. Chapter 2 portrays a synthesis and conceptual model of the state of the literature, and, based on this, develops the research question. The methodology is described in Chapter 3. Our findings are presented in Chapter 4. Afterwards, the results are being discussed in Chapter 5, followed by further suggestions for regional policymakers.

4.2 Literature review

Several streams of literature relate to this study. In the following four sections, we summarize relevant research on CLRR, place leadership, digitalization in rural areas, and Hidden Champions as a specific firm type. Subsequently, these are being connected in section *2.5 Synthesis of research and conceptual model.*

4.2.1 Corporate local and regional responsibility (CLRR)

The regional engagement of economic actors regarding socio-economic regional development in rural areas has until recently rarely been examined (Müller, 2016). Concurrently, the economic geography literature has moved away from conceiving regional resource endowment as an external factor, solely influenced by local or regional administration or the natural environment (Lengauer & Tödtling, 2010). As a consequence, scholars have recognized the importance of private actors for regional development (Sotarauta et al., 2012). Here, the territorial and social embeddedness of companies in the firm-place nexus has received increased attention (Basco, 2015).

The theoretical framework for socio-economic development by firms within their region is being provided by CLRR (Kiese & Schiek, 2016) and the related concept of corporate spatial responsibility (Albers & Suwala, 2021). Both emphasize the perceived responsibility of

companies for their region and actions resulting from it. Associated with corporate social responsibility (CSR) and corporate citizenship, but also highlighting the spatial nature of responsibility, their rational lies in firms' acknowledgment and pursuit of moral and ethical considerations in addition to core business operations (Carroll, 1979).

Rural areas face particular socio-economic challenges like organizational and institutional thinness – of regional innovation systems and beyond – and infrastructural deficiencies (Tödtling & Trippl, 2005). Improving the specific regional conditions of current company locations is perceived as an alternative to relocation (Albers & Suwala, 2018). Subsequently, this compensating strategy has been demonstrated as resulting in more intensive involvement of companies at stimulating rural development (Arato et al., 2016).

Various forms of agency are important in the context of this study (Isaksen et al., 2019). Specifically, research on CLRR distinguishes between inclusive and exclusive agency (Bürcher, 2017). Social capital is an important dimension, differentiated by bonding (regional networks among firms) and bridging social capital (regional networks between firms and other actors) (Westlund & Gawell, 2012). Additionally, research has made the agency-related distinction between personal engagement of firm decision-makers and corporate engagement in terms of corporate strategies, and has related this to place leadership as well (Sydow et al., 2011). Further, CLRR may be channeled into inclusive or exclusive benefit – positive effects for single companies, groups of firms and other actors, or the region at large (Kleine-König & Schmidpeter, 2012). When both agency and benefit of engagement are inclusive, the likelihood of positive regional economic development is highest (Kiese & Schiek, 2016).

Motives for CLRR are associated with both business and ethical considerations (Lengauer & Tödtling, 2010). For business considerations, motives can be managerial (e.g., employee retention), strategic (e.g., enhancing innovative potential and competitiveness) or reputational (e.g., better relations with public bodies). For ethical considerations, philanthropy (e.g.,

believes) is at the core. Additionally, the withdrawal of the state has been identified as another motive for firms to engage in CLRR (Suwala & Albers, 2020). This results in constellations where companies perform tasks and responsibilities that were formerly assigned to or connected with the respective governance structure (Suwala & Micek, 2018). Moreover, motives for corporate engagement differ based on firm-internal influencing factors. For instance, CLRR between family and non-family firms is characterized by different types of engagement (Campopiano et al., 2014). While sponsoring and volunteering are prevalent in most firms, family firms have been linked to activities of a long-term nature with motives frequently founded in high degrees of place attachment (Graffenberger & Görmar, 2021) and social capital (Westlund & Gawell, 2012).

Digitalization has so far not been analyzed in relation with corporate regional responsibility. Research has identified different areas of corporate spatial responsibility without considering digitalization-related initiatives, such as social and cultural infrastructure, housing, town center development, regional networking, and strategic regional development such as master plan initiatives (Bürcher & Mayer, 2018). Additionally, sustainability is an emerging new area of CLRR, which can be linked to digitalization through the consideration of the *Sustainable Development Goals* with its digitalization-related components (e.g., improving ICT skills) (Albers & Suwala, 2020; Sotarauta et al., 2012).

4.2.2 Place leadership

The spatial dimension has been rediscovered and strengthened in leadership research (Sotarauta & Beer, 2021). Leadership and the relevance of crucial actors in regional development is not an entirely new question and has long been portrayed as an important and often missing, neglected driver in subnational development – e.g., in studies on knowledge, proximity and innovation (Sotarauta et al., 2017). In this article, we employ the term *place leadership* (Sotarauta & Beer, 2021), which serves “to explore the relationship between structural

determinants of economic development and the agency of actors whose room for maneuver is both constrained and enabled by a specific institutional context" (Rossiter & Smith, 2017, p. 376).

Several factors justify the renewed actuality of this topic: First, the partial withdrawal of the state from rural areas and forces of liberalization, deregulation and privatization of formerly governmental duties have induced place-based leadership of non-state actors (Albers & Suwala, 2020). In addition, lacking capabilities and agility of governments contribute to this change (Owen, 2015). Second, regional conditions have changed, especially with regard to resource constraints and in terms of demographic, infrastructural, and economic indicators – leaving a bleak outlook, particularly in rural areas (Salemink et al., 2017). Third, new technologies, such as digitalization, require contributions to regional development by actors that are capacitated in these realms (David and Foray, 2002). Fourth, the emergence of the creative city and the knowledge-based region triggered the necessity for place leadership (Collinge and Gibney, 2010). In a knowledge-based economy, "new" styles of place leadership are collaborative, interdisciplinary, network-spanning, open, and inclusive – contrary to "traditional" leadership (ibid.). These changes induce stronger dependence on actors, industries, and institutions that are focused on knowledge production (Albers and Suwala, 2020). Fifth, reduced capacities of smaller municipalities and communities, a partial absence of consolidated government bodies and limited effectiveness of public authorities are further relevant (Albers and Suwala, 2021). Because of these recent developments, new cross-boundary and inter-institutional forms of place leadership, such as public-private partnerships, have emerged (Koppenjan and Klijn, 2004).

4.2.3 Digitalization in rural areas

For enterprises, digitalization has significant potential to transform products, business models, and processes, both internally and with external actors (Geissdoerfer et al., 2018).

Simultaneously, a large share of current challenges for rural regions in Germany are of great importance for digitalization (Häfner & Sternberg, 2020). Rural areas have not yet been able to fully reap the benefits of the digital revolution, underlining the notion of a digital divide (Malecki, 2003). The reasons for this situation are numerous and involve complex interactions between infrastructure, and supply- and demand-related dimensions (Salemink et al., 2017). In rural areas with lower population and economic density, they include technological constraints in terms of reach and higher cost structures in the supply of digital infrastructures. Moreover, it is additionally related to characteristics of the rural population, including their digital capabilities.

Digitalization in this article's context is commonly being structured into digital infrastructure and digital capabilities (Salemink et al., 2017). For regional development, digitalization is frequently associated with the expansion of broadband (Grubesic & Mack, 2015). As a result, political actors at all levels push for developing broadband internet in rural areas (Gillett et al., 2004). However, significant regional inequalities in broadband infrastructure provision exist in Germany. Concerning 100 Mbit/s bandwidth, the spectrum ranges from 11 percent to 90 percent, with a nationwide average of 67 percent (Maretzke et al., 2019). Other information and communication technologies, such as mobile internet, are also relevant in the context of this study, in addition to the economic implications of broadband availability. Recently, the transition to 5G has been identified as being important in this regard. Similar inequalities in mobile communications and mobile internet coverage exist between urban and rural locations (Townsend et al., 2013).

The literature underrepresents the specific influence of businesses, particularly SMEs and therefore HCs, on digitalization of rural areas and on consequences of digitalization for rural businesses from both supply and demand perspectives (Salemink et al., 2017). This is especially noteworthy given the importance of these firm types in rural areas (Colombo et al., 2013). Most

research concentrates on regional administrations and their development initiatives, or adopts a meso-level view of regional development.

4.2.4 Hidden Champions: CLRR and place leadership

HCs are highly innovative but little-known small- and medium-sized businesses with worldwide or continental market leadership in specialized products. HCs have a global orientation because of deliberate globalization (Simon, 2009). They maintain a global network of sales offices (Rammer & Spielkamp, 2015) and feature a 64 percent export share (compared to 39 percent for all German enterprises, according to Statistisches Landesamt Baden-Württemberg, 2020). As a result, the corporate network of HCs is composed of global actors. Furthermore, HCs possess abundant internal resources and high innovative capacity, distinguishing them from other SMEs (Witt & Carr, 2013). To preserve their link to their international networks and to engage in digitalization-related innovation, digitalization is a crucial dimension for HCs (Wittenstein, 2020). Since HCs are mostly located outside agglomeration centers, rural regions are an essential geographical category. Two-thirds of HCs in Germany have their headquarters in rural areas (Schenkenhofer, 2020) – compared to 39% of all enterprises in Germany (Stiftung Familienunternehmen, 2020). HCs further differ in their ownership structures, with two-thirds being family businesses and frequently being held in cross-generational family ownership (Rammer & Spielkamp, 2015). As shown above, family firms differ in their corporate responsibility from other firm types.

HC-related research on CLRR and place leadership is scarce. For Germany, there are two exceptions: BBSR (2019) examines HCs' regional engagement in small towns in terms of urban development projects. Using the same data, Graffenberger and Görmar (2021) investigate motives and measures of CLRR for three HCs in small German towns. As previously stated, regarding the influence of firm-internal characteristics, their findings confirm that family

enterprises – constituting the major share of HCs – are more committed to CLRR than non-family enterprises.

4.2.5 Synthesis of research and conceptual model

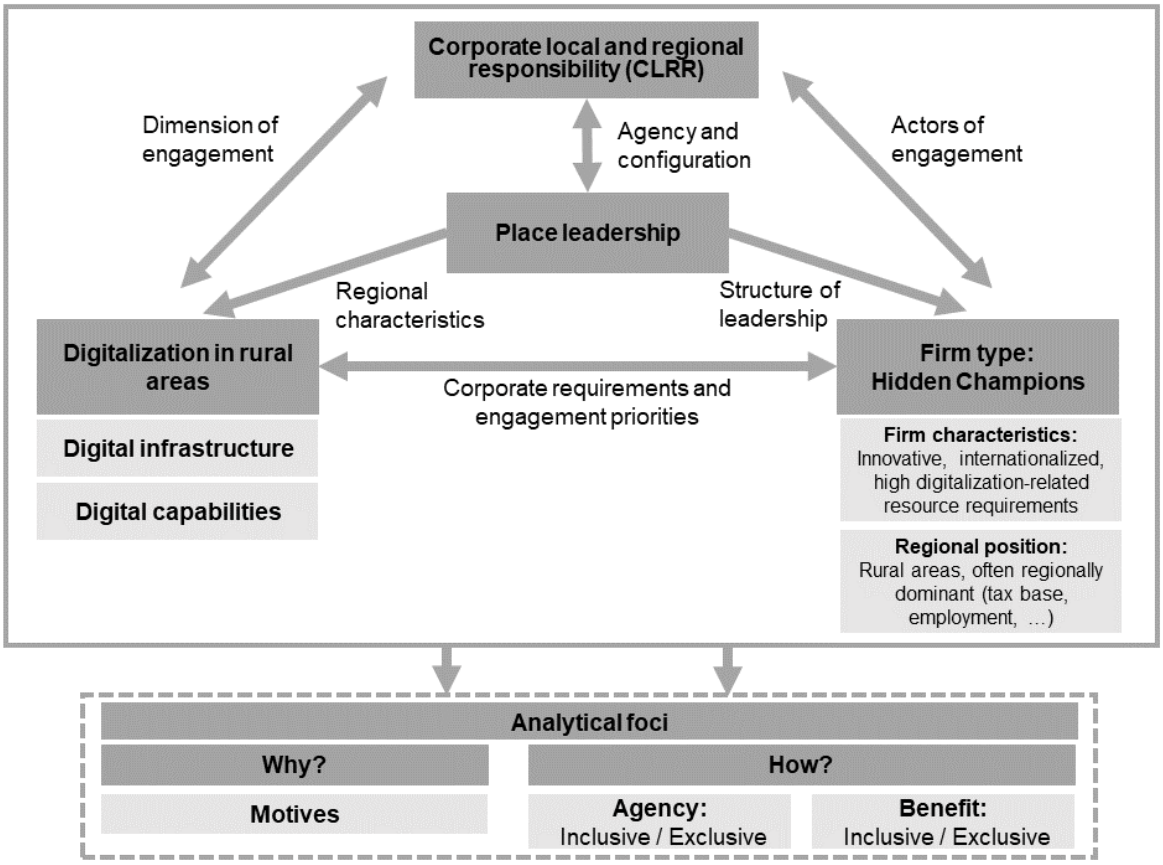
Putting CLRR and place leadership in conversation only occurred recently (Voegtlin et al., 2012; Albers & Suwala, 2020). The link between both concepts begins to arise in a special configuration when engagement of individual firms or groups becomes very intensive and pervasive, and when responsibilities originally performed by government are expected to be taken over by these firms (Basco & Suwala, 2020). Thereby, place leadership – expressed as the degree of commitment and agency (Albers & Suwala, 2020) – is exerted. Examples for this intersection are strategic measures of corporate engagement such as instruments for urban development or regional master plans initiated by private companies (Albers & Suwala, 2018). Scholars have emphasized the reflexive agency of place leadership in regional development and hence provided an agential perspective to analyze this realm of spatial development (Sotarauta et al., 2017).

However, characteristics of corporate place leadership and CLRR can be traced back at least to early industrialization, mostly related to one-company towns (Commander, 2018). The location of these settlements was predominantly based on access to natural resources for extraction and processing, such as coal in the German Ruhr area or timber in Scandinavia. Here, the dominating firms would develop urban infrastructure and provide social services, housing, and education to the workers and their families (Green, 2011).

Figure 6 presents the conceptual model, which connects the research streams summarized above, and is being employed in the empirical chapter below. We draw on the concepts of CLRR and place leadership to examine the modes (inclusive/exclusive agency and benefit) and motives of digitalization-related corporate engagement of HCs in rural areas. The combination of these two concepts is helpful in investigating a spatial context disproportionately challenged

in digitalization (rural areas). These areas host a type of innovative and internationalized firms (HCs), which is characterized by specific locational requirements, a frequently dominant regional position, and corresponding priorities of engagement. To better understand the actual dimension of engagement and its specifics, we link these concepts to the state of research on digitalization in rural areas. As a consequence, this dimension is structured into digital infrastructure and digital capabilities (Salemink et al., 2017). HCs function as actors of CLRR and place leadership. To deepen our comprehension of the acting organization involved in CLRR and place leadership, this firm type with its particulars is portrayed in greater detail. Hence, both regional characteristics and the structure of leadership are considered through connecting these concepts and areas of research.

Figure 6: Conceptual model of CLRR and place leadership of HCs in rural areas



Source: Own elaboration, based on Sotarauta et al. (2012), Bürcher (2017), and Albers and Suwala (2020).

Addressing the context and research gap outlined above, the following research question is approached in this paper: ***How and why do HCs engage in digitalization-related corporate local and regional responsibility and place leadership*****?**

4.3 Methods: Sampling, data collection, and analysis

To examine how HCs utilize digitalization-related CLRR and place leadership we employed a qualitative research approach, applying qualitative content analysis of expert interviews (Mayring, 2014). This method has been chosen deliberately to cater to the explorative nature of this study. The interviews were framed as expert interviews, aiming at two key purposes of this format: First, to source information on CLRR activities and, second, to reconstruct subjective interpretations and contextual knowledge, e.g. on motives for CLRR (Bogner et al., 2009). Regarding limitations of the chosen methodology, we need to be aware of the risk of generalizations regarding both modes and motives of CLRR (Bathelt & Li, 2020) and of a potential bias towards firms that engage in CLRR and are affirmative of digitalization, and for that reason could have been participating in the interviews.

HCs were identified using Müller's (2018) Global Market Leader Index, which was manually expanded with additional firms identified by Chambers of Industry and Commerce representatives. All these firms were evaluated concerning their fit with Simon's (2009) definition of HCs[3] and whether they are located in rural areas, according to the Eurostat (2020) NUTS3-based definition of regions with a density of fewer than 300 inhabitants per km². An interview guide was constructed based on the conceptual model presented above. It contained questions about the dimensions (digital infrastructure, digital capabilities), modes, and motives of CLRR and place leadership.

[3] (1) Part of the top three companies in their market segment globally or are number 1 on their continent, (2) annual turnover below EUR 5 billion, (3) low level of firm familiarity among the general public or outside their industry.

We conducted 57 semi-structured interviews between September 2020 and March 2021. We interviewed two types of actors: Representatives of HC and regional actors. Table 11 provides an overview of the sample, with additional details available in Tables 12 and 13. HC representatives exclusively were members of the management as they are familiar with the firm's regional context and activities in terms of corporate engagement. We spoke with one representative per firm. Among the interviewed 28 HCs, 89% are active in manufacturing, while the remaining HCs exclusively produce software – comparable to the general population of German HCs. The average revenue of EUR 195 million per year is lower than the average of all HCs (EUR 325 million; Simon, 2018). Then, 29 regional actors in the vicinity of HCs were interviewed to enrich perspectives on CLRR of HCs. All interviews were conducted remotely because of the continuing COVID-19 pandemic.

Table 11: Overview of semi-structured interviews

Type of organization	**Number of interviews**
Hidden Champions	**28**
Industrial design	11
Automotive and ship suppliers	5
Chemistry	3
Software and IT services	3
Other	6
Regional actors	**29**
Regional development agencies	12
Chambers of Commerce and Industry	8
Mayors	2
Other	7
Total	**57**

Source: Own elaboration.

Table 12: Detailed overview of interviewed Hidden Champions

ID	Industry	Position of interviewed representative	Firm foundation	Firm revenue (mn. €)	Employees (#)	Interview duration (min.)
HC1	Extension spindles	CEO	1990s	~5	~50	85
HC2	Wireless controls	Co-CEO	1990s	~50	~180	64
HC3	Lithium-ion batteries	CIO	2000s	~90	~1600	51
HC4	Water ultrafiltration	CEO	2000s	n/a	~140	59
HC5	Ladder systems	BU CEO	1940s	~150	~500	59
HC6	Slicing systems	CTO	1980s	~250	~1400	56
HC7	Bowden cables	CEO	2000s	n/a	n/a	30
HC8	Steel construction	CEO	1990s	~30	~200	35
HC9	Extraction and filtration	CEO	1990s	~30	~130	55
HC10	Electrical safety	CIO	1940s	~150	~900	50
HC11	Buffet solutions	CSO	1980s	~5	~20	51
HC12	Festive decoration	CEO	1890s	~10	~150	45
HC13	Fine chemistry	CEO	1990s	~15	~50	44
HC14	Marine gearboxes	CEO	1870s	~80	~500	63
HC15	Digital radio systems	CMO	1980s	~90	~50	92
HC16	Specialized textiles	CIO	1990s	~40	~150	40
HC17	Confectionery lines	CEO	1920s	~50	~250	49
HC18	Foundry technology	CEO	1990s	n/a	~30	54
HC19	Welding machines	CEO	1910s	~120	~500	57
HC20	Office furniture	CIO	1900s	~80	~600	57
HC21	Spark extinguishers	CIO	1910s	~90	~650	74
HC22	Central heating	CEO	1920s	~600	~3700	60
HC23	Welding torches	CEO	1940s	~300	~2200	62
HC24	Powertrain technology	CTO	1940s	~800	~4000	63
HC25	Software engineering	CEO	1990s	~10	~80	69
HC26	Switchgear	CEO	1990s	~60	~200	46
HC27	Seed production	CFO	1850s	~1700	~5700	50
HC28	Float glass	CEO	2000s	~300	~250	65
Average:				**195**	**890**	**57**

Source for firm data: Bureau van Dijk (2020) and desk research; latest data available for revenue and employees. Abbreviations: CEO = Chief Executive Officer, CIO = Chief Information Office, BU = Business Unit, CTO = Chief Technology Officer, CSO = Chief Sales Officers, CMO = Chief Marketing Officer, CFO = Chief Financial Officer

Table 13: Description of interview sample of regional actors

ID	Type of regional actor	Interview duration (min.)
RA1	Regional economic development agency	56
RA2	Regional economic development agency	40
RA3	Chamber of Commerce and Industry (CCI)	60
RA4	CCI	60
RA5	Regional economic development agency	63
RA6	CCI	60
RA7	Regional economic development agency	60
RA8	CCI	63
RA9	Regional economic development agency	50
RA10	Regional innovation agency	65
RA11	Regional economic development agency	45
RA12	Employers association	75
RA13	Technology transfer agency	60
RA14	Regional economic development agency	60
RA15	CCI	60
RA16	Regional innovation agency	64
RA17	Employers association	65
RA18	Mayor	50
RA19	Mayor	48
RA20	Regional economic development agency	30
RA21	State economic development agency	75
RA22	Regional economic development agency	60
RA23	Regional economic development agency	50
RA24	Regional economic development agency	70
RA25	Regional economic development agency	60
RA26	CCI	50
RA27	Regional location marketing agency	25
RA28	CCI	60
RA29	CCI	60
Average:		**57**

Source: Own elaboration.

Overall, we recorded 54 hours of interview material with an average interview duration of 57 minutes and subsequently transcribed the records. Interviewees' statements were anonymized and translated into English for this article. The interviews were coded and analyzed using qualitative content analysis methodology (Mayring, 2014). Coding into categories and re-coding was guided by the dimensions, modes, and motives of CLRR and place leadership described above. This process was performed using the *f4 (f4transkript/f4analyse)* software. Additionally, secondary data sources such as regional newspapers, annual reports, and corporate websites were used to triangulate the interview material (Graebner et al., 2012).

4.4 Results

Presenting the results, we focus on two dimensions of CLRR and place leadership that have emerged from the interviews: (a) digital infrastructure and (b) digital capabilities. The following two sub-sections portray both dimensions in terms of their modes (how?) and motives (why?).

4.4.1 CLRR and place leadership for digital infrastructure

Modes (*how?*) of engagement: digital infrastructure

Regarding digital infrastructure, CLRR of HCs in their rural areas encompasses several technologies. According to the interviewed actors, HCs in rural areas are mainly involved in developing digital infrastructure that is already broadly available in agglomerations such as broadband or fiber. As multiple HCs report having refrained from relocating IT infrastructure or R&D functions to areas with better digital infrastructure, they have upgraded their local digital infrastructure, driven by self-initiative (HC18/27).

"We have our main data center and our central R&D departments located here. That is why we laid down a very thick cable early on – or rather got involved so that it would be laid down here." (HC27)

Public-private partnerships are common platforms for HCs to develop digital infrastructure. In these, management representatives of HCs are portrayed as driving forces, supported by regional public actors (RA25). In particular, regional development agencies are involved as public actors in ensuring sufficient digital infrastructure. However, HCs frequently criticize the limited capacity, as these actors are more knowledgeable in other realms of economic development.

In terms of political backing for expedited provision of high-speed internet connections, firm size appears to be a differentiating factor: HCs with more than a few hundred employees have praised the rapid governmental reaction to their connectivity needs (HC22/27, RA1).

Particularly remote firm locations pose additional challenges for connectivity. Here, questions of cost allocation and whether connectivity-related expenses of individual HCs are to be covered by fiscal budgets are contested (HC24). Frequently, the last mile to the grid is portrayed as a major undertaking in rural locations of HCs. Through modes of exclusive agency and benefit (Bürcher, 2017), some companies have independently drilled the last segment to ensure connectivity (HC18, RA8). As these cases are isolated and remote locations of single firms, limited positive externalities exist for neighboring firms in terms of benefitting from newly developed digital infrastructure.

"In some cases, they are located so far in the periphery that a connection is sometimes very difficult. The service providers of such technologies are simply not willing to lay the last 300 meters of fiber, because only one company is involved. […]They had to finance it themselves." (RA8)

HCs in rural areas also take on leading positions in endowing their regions with novel technologies such as 5G, albeit to a lesser extent than broadband and fiber internet (HC27). Those novel technologies are mainly limited to HCs that take an affirmative stance towards the

potential of digitalization, and have advanced their digitalization strategies and digitalization-related innovation, for example with 5G campus and factory networks as applications for manufacturing-oriented HCs. Again, inclusive agency of groups of HCs is mentioned as a common mode of engagement.

"We are very strongly involved [in developing new regional digital infrastructure]. Together with the state of Lower Saxony, we would like to create an enclave here: We are involved in the state government's 5G project. In these realms, we frequently also join forces with [other regional HCs]." (HC27)

Digital infrastructure for remote work is another component of HC-led CLRR. The COVID-19 pandemic was mentioned by all interviewed firms as an accelerator for work from home. This in particular has implications for fast internet connections of remotely working employees (HC22). To compensate for weak internet and other challenging conditions in working from home, many HCs are considering co-working spaces for their commuting employees (HC14/27). These facilities are another important element of digital infrastructure that HCs are involved in developing, funding, and operating on a regional level. Again, this measure is mainly portrayed as a joint and inclusive effort with other local companies, regional development agencies, and a local university of applied sciences.

"The new co-working space "ZediTA"! There is also funding, which helps some partners to come together there. Hamelin is also a medium-sized center and has the Weserbergland University of Applied Sciences, and this underused space in the central train station, which is perfect in terms of centrality." (RA19)

Motives (*why?*) for engagement: digital infrastructure

HCs describe their motivation for taking a leading position in the development of new digital infrastructure in their rural regions as driven by both necessity and anticipated potential. A lack of swiftness by municipal and regional administrations in developing required digital infrastructure is stated as a motive by HCs to engage in place leadership (HC9/18).

According to the interviewed actors, several examples detail pro-active corporate engagement by HCs to develop broadband access due to absent public actors in providing this (RA3). The situation is portrayed as exacerbated by increased urgency – due to accelerating technological developments or unexpected crises such as the COVID-19 pandemic that necessitate more digital ways of working (HC8). The following quote also emphasizes that such expansions of digital infrastructure are not a singular event, but are anticipated to occur repeatedly in the future.

"I started the process five years ago. Out of necessity, because we have many remote workers. Something must be done here. The mills grind so slowly. We needed a dedicated line dug here – virtually at our own expense. We are now paying it off very expensively. […] Now the cables have been laid, but it's too late. After all, it's a sore subject we are dealing with here. The coverage is no longer up to date. It no longer keeps pace with the development of the world." (HC9)

Although plans for public broadband coverage of these remote locations are reported as existing in most interviewed cases, urgency is stated as an additional motive by HCs to develop these infrastructures independently (RA3).

"It took seven years to apply for it, and then we finally got it. However, we drilled the last two km to the distributor ourselves with a drilling machine. Otherwise, it would have taken another two years. We said: Enough is enough." (HC18)

4.4.2 CLRR and place leadership for digital capabilities

Modes (*how?*) of engagement: digital capabilities

Analyzing the interview records reveals how and why HCs are engaged in developing digital capabilities in the population of their rural locations. In the context of this paper, CLRR in this realm excludes knowledge spillovers by internally-trained HC employees switching to other regional firms as this regional diffusion of digital skills is not intended. Hence, this section focuses on forms of corporate giving, volunteering, and support to foster regional digital capabilities (Hohn et al., 2014).

An area of corporate engagement related to digital capabilities are endowed professorships with local universities (RA8). Here, forms of HC-specific inclusive place leadership become visible. In localities with high densities of HCs, such as Haiger in Central Hesse, pooling of interests and joint engagement by groups of HCs is taking place – for instance, for funding endowed professorships. Frequently, the engagement of HCs for digital capabilities already commences at an early age, including programming workshops and other forms of technical education, as well as support for supra-regional initiatives such as the "Little Scientists' House" ["*Haus der kleinen Forscher"*] (RA28/29).

"[HC] has been very active in promoting technical education in kindergartens. They have developed a technology kit to develop children's affinity for digital technology. [Another HC] is involved in this area, too." (RA3)

Occasionally, regional business clubs develop solutions for schools to improve digital capabilities and then approach HCs to fund them. The individual agency of management members plays an important role.

"These learning robots can cost anywhere from 2-3,000 €. The HCs are then approached: "Do you want to support this? It is the school in your town, your logo will be on it and you will have

access to the school and its students. They will learn about technology and potentially be your trainees in five years." […] The individual companies do not initiate it, but a regional association of young entrepreneurs does." (RA6)

Another instrument of HC-led CLRR that aims at both digital infrastructure and capabilities are digital hubs. As an example, one HC in rural Leine-Weser in Lower Saxony has developed and operates it through individual agency (RA9/16).

"This 'digital hub' is run only by [HC CEO] as a private investor. He does it, because he is currently only a manufacturer of special machinery. He foresees that his business model is massively threatened by digitalization. Ultimately, he needs to have digital competencies. One of the driving forces behind this digital hub is to establish it as a service provider with corresponding competences. I think it's always legitimate for companies to engage themselves regionally. It's not because they're good people, but because certain needs need to be met. He really is very strongly committed to this. […] The district and the university will set up digital labs, so that students can experience things outside their curriculum." (RA9)

Motives (*why?*) for engagement: digital capabilities

Motives for CLRR in this realm are portrayed as being strongly founded in regional recruiting of skilled workers, especially with digital capabilities. Additionally, HCs are portrayed as being particularly active in this regard compared with other firm types.

"It is especially the HCs. If they originate from here, it is a mixture of marketing and sales strategy. Not so much in the sense of selling their own products, but with the motivation "I have to be seen to be attractive for potential employees." As these firms have a high export share, it makes no sense to market your products here. However, for skilled worker recruiting, it is important that they are seen." (RA7)

The strategic long-term nature of CLRR of HCs is emphasized, being coupled with the motivation to make these rural places attractive for current and potential employees (RA12/25/28/29).

“It is a long-term strategy. They can’t get a serious advantage directly from each of these activities. [The CEO of a HC] states very openly in the regional media that it is extremely important for him to establish the region as an attractive location. […] They have a sports program, a cultural program, and simply appear on the map in various ways.” (RA10)

In particular, regional retention of young people is stated as a major strategic component for such engagement of HCs. Not solely bounded to limited capabilities, HCs are further reported as contributing to regional employment platforms, such as career fairs (RA27).

"Of course, it is also in their own interest, because in a region like ours, we simply live off the young local people. We are not yet succeeding in getting even more people from other regions of Germany to move to the region. […] Hence, the self-interest of the HCs to get involved there: On the one hand, to promote STEM education, on the other hand, to also be visible as early as possible." (RA12)

Other stated motives for CLRR also entail identity-related emotional attachment to the region, particularly for family businesses (Banalieva & Eddleston, 2011). Additionally, *regional loyalty* has been attributed to corporate behavior in certain regions in particular (e.g., Silicon Valley; Saxenian, 1996).

4.4.3 Summary of results

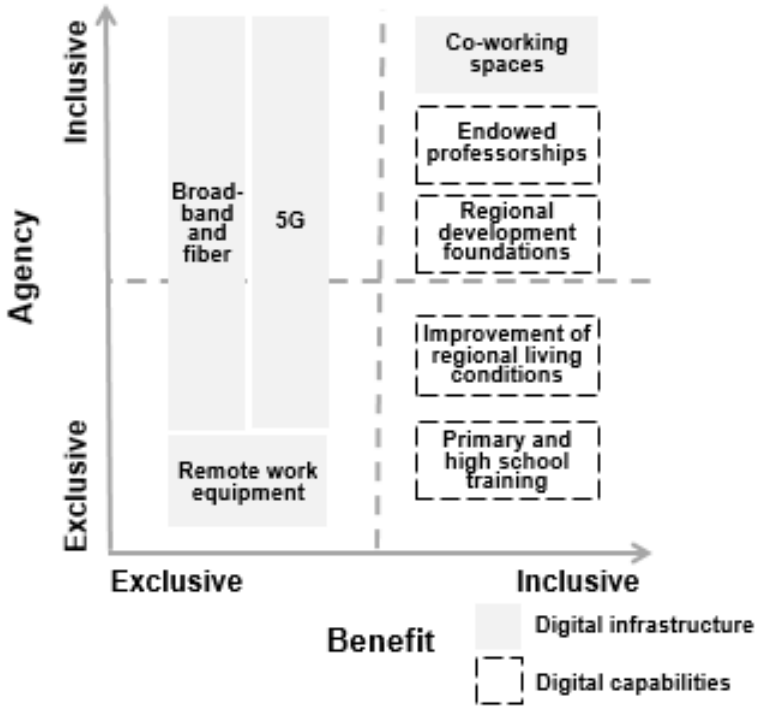
We examined modes and motives of digitalization-related CLRR and place leadership of HCs in German rural areas in Germany in this study. In particular, we approached the following research question: *How and why do HCs engage in digitalization-related corporate local and*

regional responsibility and place leadership? Our results indicate that HCs are involved in CLRR activities regarding both digital infrastructure and capabilities.

For digital infrastructure, measures include the regional extension of broadband, fiber, and 5G technologies. Additionally, HCs are reported being active in the development of co-working spaces and the distribution of remote working equipment. Regarding the first analytical focus of modes of CLRR and place leadership, the majority of initiatives can be characterized by exclusive benefit, particularly for remote firm locations. Agency of place leadership has been portrayed as existing both exclusively and inclusively – for the latter through public-private partnerships or alliances among HCs or with other firms. Many HCs report having made major efforts to secure adequate connectivity, including (i) engaging local politicians, (ii) pressuring regional grid operators to speed up construction of infrastructure, (iii) dedicated lines with expensive contracts with telecom carriers, or even (iv) building their own lines. Regarding the second analytical focus of motives, lacking swiftness by public actors in ensuring digital connectivity has been emphasized. This can be interpreted as an additional dimension of the withdrawal of the state having been identified in the literature (Suwala & Albers, 2020).

Regarding digital capabilities, HCs are involved in several areas of CLRR at most levels of education, such as workshops at schools and endowed professorships. Additional engagement is aimed at improving regional living conditions to attract and retain highly qualified workforce with digital skills. Modes of place leadership are predominantly driven by the individual agency of members of the management. Regional hiring of skilled workers, especially with digital capabilities, is depicted as a key motive for regional engagement in this field. Figure 7 and Table 14 depict the identified measures of digital infrastructure and capabilities regarding their modes of CLRR and place leadership in terms of agency and benefit (Bürcher, 2017).

Figure 7: Agency and benefit of HC's CLRR and place leadership



Source: Own elaboration; axis dimensions based on Bürcher (2017).

Table 14: Areas, agency, benefit, and motives: CLRR and place leadership

Dimension	Sub-dimensions	Agency	Benefit	Motives
Digital infrastructure	Broadband and fiber	Predominantly exclusive	Mainly exclusive in the short-term	• Driven by both necessity and perceived potential • Lack of swiftness of regional administrations • Increased urgency • Expansions of digital infrastructure anticipated as periodic events
	5G	Inclusive, mainly public-private partnerships	Depending on scope and scale of measure	
	Remote work equipment	Predominantly exclusive	Inclusive mainly on a household level	
	Co-working spaces	Inclusive	Inclusive	
Digital capabilities	Endowed professorships	Inclusive, mainly groups of HCs	Inclusive	• Regional recruiting of skilled workers, especially with digital capabilities • Strategic long-term nature • Regional retention of young people • Improve local living conditions for current and potential employees • Identity-related emotional attachment to the region
	Primary and high school training, including digital hubs	Identified both in- and exclusively	Inclusive	
	Regional development foundations	Inclusive, with individual HCs often in leadership positions	Inclusive	
	Improvement of regional living conditions	Identified both in- and exclusively	Inclusive	

Source: Own elaboration.

4.5 Discussion

In this article, we focused on private enterprise-led regional development through means of CLRR and modes of place leadership. With this study, we react to the scarcity of research regarding CLRR of HCs in general, and in particular for its relation to place leadership. Additionally, we aimed at incorporating digitalization as a novel dimension thus far not associated with CLRR and place leadership.

We showed that HCs as highly internationalized and innovative firms play an active role in advancing the digitalization of their rural home regions, both concerning digital infrastructure and capabilities. When compared to other business types, HCs are described as being particularly active in developing digital skills and securing relevant workforce regionally. Regarding these two dimensions, it needs to be discussed whether differences exist between infrastructure- and capabilities-related engagement in terms of spillovers and externalities to other regional actors – in other words, whether there is rather an exclusive or inclusive benefit. Further, it needs to be discussed whether the analysis reveals a pattern of historical revival of CLRR and corporate place leadership in rural areas, which was initiated by one-company settlements close to natural resources. Moreover, it should be reflected upon whether the regional loyalty of HCs is similar to firms in large and iconic regional clusters, such as Silicon Valley (Saxenian, 1996). Here, it should be taken into consideration that the collective nature of clusters is often absent for HCs, which are mostly located independently and in a more isolated pattern in rural areas.

Our findings contribute to filling the research gap of CLRR and place leadership thus far not jointly studied for HCs and in rural areas. We also contribute to the application of digitalization as a novel facet of corporate engagement. First, we show that HCs are a relevant firm type to intertwine CLRR and place leadership. They are innovative firms with significant resource requirements in often resource-scarce rural areas, and frequently possess a regionally dominant

position through their tax base or employment. Second, digitalization expands existing knowledge of CLRR in other domains, such as housing or social services. The findings on motives of CLRR echo previous findings for other firm types and contexts, such as emotional attachment to the region, but emphasize the relevance of lacking swiftness and capacity of governmental actors, resulting in place leadership. Both agency and benefit of digitalization-related CLRR resemble findings in the aforementioned other domains. However, they deviate in the tendency towards inclusive agency when developing digital infrastructure, which has been identified as more exclusive in other fields by Bürcher (2017).

The findings of this article offer several implications for regional policymakers. As some HCs pursue regional engagement through exclusive agency and additionally frequently remain hidden in their initiatives, greater alignment of regional and corporate development goals and measures regarding digitalization may help create improved regional conditions. This is particularly relevant for HCs that are regionally dominant in terms of place leadership or economic dimensions such as tax base or employment, or both. As these larger firms are vital for the economic health of rural regions (Meili & Shearmur, 2019), their digitalization-related requirements should receive attention by municipal and regional policies. Other regional private-sector actors should be integrated to aim at more inclusive agency and benefit of digitalization-related corporate engagement. Further, regional administrations in certain rural areas are portrayed as lacking swiftness in digitalization-related development, especially concerning digital infrastructure. This provides an impetus for improved efficiency. Regarding ownership structures of HCs, regional actors should target family firms concerning digitalization-focused initiatives, as this firm type has been shown as particularly strongly committed to regional stewardship (Banalieva & Eddleston, 2011).

There are limitations of this article's analysis that need to be discussed. First, additional research is required to understand how other firm types such as SMEs or MNEs differ from HCs in terms

of digitalization-related corporate responsibility and CLRR leadership. While HCs possess market leadership and high innovative capacity, this does not necessarily translate into advanced requirements for digital infrastructure and capabilities. Second, additional consideration of regional specificity in terms of digitalization-related resources may contribute to a better understanding of HCs and their regional context. Third, the example of investment for digital infrastructure such as broadband – particularly for individual firms with remote sites – underline the ongoing discussion whether these expenses should be socialized or rather considered private corporate investment. As a consequence, it can be deliberated whether CLRR is an appropriate concept for cases of exclusive agency and benefit.

The results provide a foundation for future research. Additional analysis on other regional contributions of HCs and the companies' importance for their rural home regions in terms of economic and intangible effects can deepen the understanding of the firm type's relevance. Moreover, digitalization-related corporate engagement and place leadership of HCs should be contrasted and compared with other firm types. Further research should investigate influencing factors of digitalization-related engagement, such as firm-internal factors like ownership structure. As advancing digitalization is also linked to lessened regional embeddedness and to the relocation of firms (Asheim & Isaksen, 2002), examining changes in overall CLRR in these circumstances may be additionally relevant.

Chapter 5: Conclusion and discussion

This final chapter summarizes the dissertation's key findings and discusses their theoretical, managerial, and policy implications. It further considers the limitations of this thesis and provides recommendations for future research.

5.1 Summary of main findings

This section presents the main findings of the three articles and an aggregate summary, responding to the overall research question: ***How do Hidden Champions in rural Germany deal with digitalization, and what is their role in their home region and its digitalization?***

Chapter 2 (Article One) examines the dimensions, conditions, and outcomes of digitalization for HCs in rural Germany. For these firms, patterns were identified of distinct potential and risk assessments of digitalization – ranging from affirmative to skeptical – and availability of digitalization-relevant resources, ranging from abundant to scarce. Hence, while HCs possess market leadership and high innovative capacity, this does not necessarily translate into an affirmative stance toward digitalization and advanced digital infrastructure and capabilities requirements. Thus, I developed a typology of four HC types differing in their digitalization strategies and related innovation outcomes: Digital Hidden Champions (DHC), Hidden Champions of Digitalization (HCD), Traditional Hidden Champions (THC), and Digitalization-Skeptical Hidden Champions (SHC). DHCs exclusively produce niche digital products and services. They are small- to medium-sized firms, predominantly owner-managed or start-ups, with an affirmative view of digitalization. HCDs mainly produce analog products and have emerged in manufacturing and other industrial segments. They include large HCs with up to a few thousand staff and abundant internal resources, and were identified as strongly advancing the digital transformation, especially of their production processes and business models. THCs

manufacture analog products, mainly in classic mechanical engineering. They are overwhelmingly small- to medium-sized family businesses, often with a long tradition. These enterprises try to maintain the balance between seizing the advantages of digitalization and conserving their tradition and identity. SHCs exclusively produce of an analog nature, and have their company origins in manufacturing. They are mainly small-sized firms and are – similar to THCs – family businesses with a long-lasting tradition.

In Chapter 3 (Article Two), the integration of HCs in rural RIS in Germany is studied. Firm-internal and firm-external regional influencing factors for the integration in two RIS subsystems (knowledge generation and diffusion, and knowledge application and exploitation) are identified. Key influences for rural RIS integration of this firm type are firm size, ownership structure, organizational status, location economies, and urbanization economies. Family firms are on average more integrated than other firm types, but display large differences in their integration. It can be argued that this is due to the increased importance of managerial agency, and variations in regional social capital. HCs as subsidiaries of larger corporations, particularly international ones, display lower integration in RIS – similar to findings on MNEs (Kramer & Diez, 2012). The overall firm size of HCs was negatively associated with integration in rural RIS. There is a crucial distinction between the size of the firm's regional location and the size in cases of HCs with multiple locations. Location and urbanization economies were identified as important dimensions for firm-external regional influences. Increased resource availability regarding a qualified workforce and relevant educational and research institutions was positively related to RIS integration of HCs. Regional knowledge bases, which share cognitive proximity with the HC's technological focus, increase the integration of HCs into the respective RIS.

Chapter 4 (Article Three) investigates how and why HCs advance digitalization in rural areas through corporate engagement. These actions are studied employing the concepts of corporate

local and regional responsibility (CLRR) and place leadership. These firms strategically use these instruments to develop digitalization-related resources and assets in their rural regions, which frequently lag behind in digitalization. HCs are active in CLRR activities regarding both digital infrastructure and capabilities. Measures related to digital infrastructure include the regional extension of broadband, fiber, and 5G technologies. For digital capabilities, HCs focus on CLRR activities at various levels of education (e.g., workshops at schools or endowed professorships). Further engagement targets improving local living conditions to retain and attract a highly qualified workforce with digital skills. Employing the analytical categories of agency and benefit, the identified initiatives of CLRR and place leadership are conducted both in inclusive and exclusive modes, depending on the scope of engagement. Motives for these corporate activities by HCs are related to a perceived lack of swiftness and capacity of public regional actors. These also feature emotional attachment and loyalty to the region. This particularly applies to family businesses.

To summarize the findings of this dissertation, HCs can be framed as agents of digitalization in rural areas in Germany. This assessment pertains to their predominantly affirmative view of digitalization-related innovation and their endowment with relevant resources, including digital infrastructure and capabilities. In addition, these highly innovative and internationalized niche market leaders are active in advancing the digitalization of their rural home regions through corporate engagement, which features elements of place leadership through these particular firms. Moreover, rural German HCs use their integration into regional innovation systems to diffuse and collaborate on digital (and other) innovations. Such integration differs between firms of this type and is mainly influenced by the respective ownership structure, firm size, organizational status, location economies, and urbanization economies. However, German rural HCs are more integrated than expected, considering the technological specialization and internationalization of this firm type.

5.2 Theoretical implications and contributions

Through its three articles, this dissertation offers theoretical implications and contributions in the nexus of digitalization and rural areas, and therein on the role of and implications for the firm type of HCs. HCs are defined by common features of market leadership, small to medium size in terms of revenue, and limited public awareness of their brand (and have a common geographical context in this dissertation with its rural focus). The findings show that several influential factors induce differing innovation strategies towards digitalization, characteristics of rural RIS integration, and modes of digitalization-related CLRR.

In Chapter 2 (Article One), I have highlighted important managerial and spatial contextual factors of corporate digitalization. These fill the research gap to deeper and more differentiated knowledge of HCs' digitalization behavior. The developed typology of four HC types accounts for digitalization's specific dimensions, conditions, and outcomes. Categories such as potential and risk assessments, resource availability, strategy and innovation allow for the explanation of divergent corporate behavior. The findings of this chapter/article demonstrate that highly innovative market and technology leaders in rural areas are not always front-runners in digitalization. This article focuses on an understudied issue of internationalized and innovative enterprises with ample internal resources operating in a regional environment with digitalization-related resource scarcity. Additionally, the findings enrich the literature of innovation in rural areas, featuring a highly innovative firm type predominantly located rurally.

By giving additional insight into firm-internal and firm-external influencing variables through Chapter 3 (Article Two), I contribute to the debate on influences on rural RIS integration of HCs. HCs as a distinct firm type had yet to be investigated in terms of RIS integration overall and specifically in rural areas. Hence, existing knowledge on RIS integration of other firm types, such as SMEs, MNEs, and family businesses, is expanded. This paper enriches existing research of innovation in rural areas through this case study of highly innovative enterprises

with international market leadership based in this regional context (Fritsch & Wyrwich 2021a). I show that a large fraction of these enterprises is integrated into rural RIS, which is conditional on certain firm-internal and firm-external factors. These observed patterns of integration defy dichotomies between "*rural entrepreneurship*" and "*entrepreneurship in the rural*" (Korsgaard et al., 2015, p. 5). In addition, I contribute to demands for cross-fertilization of economic geography and family business studies (Basco & Suwala, 2020). Moreover, my findings help to understand how HCs decouple their internal innovative capacities from their regional setting and resources (Vonnahme, 2021).

In Chapter 4 (Article Three), I focus on private enterprise-led regional development in the dimension of digitalization by employing the concepts of CLRR and place leadership. I demonstrate that HCs, as highly internationalized and innovative businesses, are working to advance the digitalization of their rural home regions, both in terms of digital infrastructure and capacities. This study contributes to the corporate engagement literature by examining place-based leadership from the following angles. There is a paucity of studies on engagement for regional development by specific firm types. Corporate responsibility and place leadership, in particular, have thus far not been studied together for a specific firm type. I consider digitalization a new dimension that had yet to be linked to CLRR and place leadership.

5.3 Policy and managerial implications

Besides theoretical contributions, this dissertation also has policy and managerial implications. In light of recent policy advances, such as the new EU Cohesion Policy 2021-2027, the all-German funding system (*Gesamtdeutsches Fördersystem*) for structurally weak regions, and updates to the joint federal government and *Länder* scheme for improving regional economic structures *(Gemeinschaftsaufgabe "Verbesserung der regionalen Wirtschaftsstruktur", GRW),* there is potential to reflect on policy implications at various spatial scales. In addition, challenge-oriented innovation policy for closing digital gaps and other realms has recently

gained prominence (Hassink et al., 2021). These policy implications, which emphasize the specificity of rural areas, can be segmented into actor-based policies for HCs and place-based/system-based policies (Isaksen et al., 2018).

Actor-based policies are one dimension of these implications, highlighting the relevance of conceiving private companies as agents of regional development and change (Grillitsch & Sotarauta, 2020). Regional policymakers should expand digitalization policy formulation specific to the four identified HC types. A targeted and diversified regional policy approach to specific firm types can better meet these enterprises' distinct requirements. Aided by a better understanding of the particular digitalization approaches of HCs, policies for the four HC types can range from providing digital infrastructure over education programs for digital skills to subsidies for investment in digital technologies. These all would have the potential to allow HCs to remain competitive in their rural locations. Greater synchronization of regional and corporate digitalization development goals and actions may help to produce improved regional conditions. Based on the finding that some HCs are engaged regionally through exclusive agency and benefit, this goal especially applies to regionally dominant HCs in economic factors like tax base and employment. Because these larger businesses are vital for rural economies (Meili & Shearmur, 2019), municipal and regional policy should pay increased attention to their requirements for digitalization. Other regional private-sector actors should be integrated to create a more inclusive agency of digitalization-related CLRR. In terms of HC ownership structures, family businesses have been demonstrated as being particularly dedicated to regional stewardship and, as a result, should be pursued by regional actors concerning regional development projects, which are related to digitalization and beyond (Banalieva & Eddleston, 2011). Through enhancing family firm structures – notably in the realm of firm successions – the regional embeddedness of HCs may be strengthened.

For place-based and system-based policies, a deeper understanding of innovation management and processes of HCs, and their institutional and spatial patterns, can aid in developing appropriate regional support structures regarding digitalization, and beyond. This approach depends on the characteristics of the HCs and the regions they are located in, thus moving away from *one-size-fits-all* approaches for regional innovation policies (Tödtling & Trippl, 2005). Attempts to support rural RIS in enhancing localized learning can be fruitful given HCs' low regional integration – despite their general preference for intra-regional collaboration. Such approaches should be actor-specific: Through their function as anchor enterprises, large HCs can encourage cluster growth in rural areas. Spillovers and other externalities from HCs as highly innovative enterprises toward their regional setting can be reinforced and amplified by regional policymakers, strengthening the respective rural region as a whole. The lack of awareness of many HCs regarding prospective regional innovation partners can be remedied by improving the dissemination of relevant information. Furthermore, regional administrations in some German rural areas are perceived as being slow to respond to the digitalization requirements of firms, particularly for infrastructure. This may act as a catalyst for increased efficiency. Additionally, enforcing the development of digital capabilities and infrastructure on a broader regional scale and improving soft location factors for increased quality of life would increase the locational attractiveness for both HCs and other economic actors. Inter-municipal and inter-regional cooperation may be attractive instruments here.

To sum up, these policy implications may contribute to entering new regional development and growth paths. As many German rural areas have constantly lost employment and economic activity, HCs could play a vital role in these endeavors. As HCs are frequently significant regional economic actors and possess high innovative capacities, they could hence contribute to stabilizing rural areas to enter a new state of equilibrium (Kilkenny & Otto, 1994). For this, supporting the locational requirements of HCs for business success and fostering greater

regional embeddedness are greatly important. This argument is especially valid for digitalization as a particularly challenging and onerous issue in rural areas.

This dissertation further offers several important managerial implications, especially in rural areas. The primary suggestions for management of HCs in terms of internal digitalization center on considering resource availabilities in digitalization-related corporate behavior. Firm leaders should take internal and external resource availability into account in their digitalization potential and risk assessments, and consequently in their digitalization strategy. To realize the envisioned innovation outcomes in connection with digital business models, products, or processes, compensation and exploitation strategies for resource availability at the firm locations should be explored. These correspond to the regional context in terms of digital infrastructure and capabilities and relevant actors in RIS. Regarding implications for different firm types, other SMEs can emulate HCs' handling of digitalization. This recommendation is based on the rationale that it corresponds to the optimal utilization of available internal resources. However, this depends on the respective conditions of these firms, which may limit the potential for imitation.

5.4 Critical review

The previous sections of this dissertation summarized the dissertation's findings and formulated key theoretical contributions, and policy and managerial implications. However, three main limitations to the results must be addressed to properly frame the results.

First, while this study addresses a specific firm type, the research design does not directly compare with other firm types in rural areas, such as MNEs or family firms. This will be further detailed in the research outlook below. As a consequence, the distinctiveness and specificity of HCs through their internationalized niche position, and their market and technology leadership can only be indicated and outlined. My research questions apply to potentially varying corporate strategies and innovation concerning digitalization, rural RIS integration, and digitalization-

related CLRR and place leadership. Since this firm type has been mainly discussed in applied management studies (Schenkenhofer, 2022), differences to other firm types have thus far only been described vaguely (Benz et al., 2021; Witt & Carr, 2013). For instance, this realization is valid for differences between HCs and SMEs, of which HCs are a subgroup, and family firms, of which some are classified as HCs. As a result, questioning the results' transferability to other SMEs due to a hypothesized lack of internal resources and technological competence becomes critical. However, the concept of HCs is difficult to operationalize particularly regarding the criteria of market leadership and hiddenness (Schenkenhofer, 2022). Here, a pragmatic approach for the applicability of the research findings of this dissertation is to understand the concept of HCs as a heuristic for innovative and internationalized SMEs (Vonnahme, 2021).

Second, another category of limitations evolves around the regional context of this dissertation. The study's interview sampling focus on four rural regions and their respective unique socio-economic conditions may make it difficult to apply the findings in a larger, more generalized, context (Bathelt & Li, 2020). This argument applies to both the greater German context and HCs in other countries. These restrictions call for additional rural differentiation of the rural – that is, to consider the specificity of extremely rural places, for example (Glückler et al., 2022; Shearmur, 2011). Emphasizing geographical characteristics may undervalue the agency and impact of individual actors, such as HCs and their respective leadership (Bathelt & Glückler, 2018). Consequently, the importance of the regional context may be overestimated (Beugelsdijk, 2007).

Third, another line of critique targets the effectiveness of endogenous regional development in less-developed regions through HCs as individual firms, being the underlying rationale of this dissertation. From a policy perspective, it needs to be emphasized that such approaches can only be conceived as supplementary to spatial redistribution on a federal or more central level in the realm of creating equivalent living conditions (Margarian, 2013). In addition, the

universality of firm-level innovation-based, export-led development models may be limited by the dynamics and interdependencies between and within organizations in specific innovation systems (Marques & Morgan, 2021). This perspective is echoed by Shearmur's (2016) argument that local innovation and local development are not the same thing. However, subsequent to integration in RIS, the findings of this dissertation emphasize the role of HCs in regional development through measures of corporate engagement.

Fourth, limiting innovation system research in this thesis to inter-firm linkages of HCs constitutes a limitation regarding intra-firm linkages and their relevance for knowledge creation (Ernst & Kim, 2002). As HCs maintain extensive international networks of sales offices and are further active in opening satellite offices for R&D functions – particularly regarding digital capabilities – the spatial implications of digitalization for intra-firm linkages of HCs deserve further attention. I refer to the dissertation by Vonnahme (2021) for related analyses. Additionally, the importance of in-house capacities of HCs in advancing innovation of digital products, business models, and processes could enrich the scope of this dissertation (Grillitsch & Nilsson, 2017).

5.5 Research outlook

The findings of this dissertation open up new avenues for potential future research that I outline in the following. First, I would like to encourage scholars to further compare HCs with other firm types (cf. Witt & Carr, 2013). As described in the three articles, contrasting the findings with SMEs, MNEs, or family firms may contribute to a deeper understanding of the specificity of HCs and their approaches to digitalization, integration in RIS, and digitalization-related CLRR. Such comparative analyses would also be fruitful with HCs in other regional settings such as agglomeration areas (Fritsch & Wyrwich, 2021b; Vonnahme & Lang, 2017). Differentiating and segmenting rural areas would further be valuable. This goal can to provide

insights into the relevance of regional conditions for digitalization and innovation for this firm type.

Second, future research is encouraged to further connect the areas of research investigated in this dissertation. For instance, additional studies on the digitalization-related transformation of knowledge creation (Vonnahme, 2021) or the regional integration of HCs can be insightful in exploring this connection. Studies on various regional contributions by HCs and their importance for their home region, measured in socio-economic metrics or intangible effects, may enrich our understanding of the firm type's relevance for rural areas. For instance, externalities and spillovers through labor force and skills, contacts with local actors, and demonstration effects may be necessary here due to the high innovative capacity of HCs (Blomström & Kokko, 2001). Furthermore, contributions to entrepreneurial ecosystems may be another insightful dimension (Schäfer & Mayer, 2019). Moreover, locational choices of HCs are another important realm uniting the research questions of this dissertation. Corporate decision making between (i) relocating to agglomerations with better digital infrastructure and capabilities and other advantages (e.g., thicker RIS) and (ii) remaining in their respective rural home regions as (predominantly) single-establishment firms and engaging in CLRR and other compensating strategies may be of relevance here.

Third, the findings of this dissertation indicate the importance of family businesses in rural RIS integration and for digitalization-related CLRR and place leadership. Considering the high share of family-owned and family-operated firms among all German HCs, further analyses of the effect of mergers and acquisitions of family business HCs may prove useful in establishing the influence of firm-internal factors on regional integration, such as ownership structure (Lenz & Glückler, 2021). This equally applies to influential factors of digitalization-related corporate engagement.

Fourth, quantitative research or further qualitative interviews in other regions could validate this dissertation's qualitative findings. For instance, quantitative statistical identification of digitalization types besides the findings in Chapter 2 (Article One) may help to validate the typology.

In addition to these four research avenues, I encourage scholars to further explore the notion of dominance or primacy in connection with HCs. While questions of dominance regarding international market and technology leadership have been investigated in the literature on HCs (Schenkenhofer, 2022), regional dominance represents a research void. Both export base theory and growth pole theory were related concepts employed for similar spatial situations in past research (Maier et al., 2006; Perroux, 1950). Regional dominance can be linked to concentrations of economic activity and contributions by individual firms in terms of business tax and employment (frequently in terms of a quasi-monopsony), human capital build-up, innovation, knowledge spillovers, activities in corporate responsibility, and place leadership. Many of these dimensions have been described throughout the expert interviews conducted for this dissertation. Regional corporate dominance in rural areas has been under-researched, especially for manufacturing and services firms. In the literature, the concept has thus far predominantly been applied to urban areas in the context of company towns (Commander, 2018), plants of multi-national enterprises solely with production capacities (Meyer et al., 2011), plantations (Xue et al., 2013), mines (De Haas & Poelhekke, 2019), and infrastructure hubs such as ports and airports (Gray et al., 1996) in rural areas. Here, theoretical contributions include anchor firms (Feldman, 2003), flagship enterprises (Ernst & Kim, 2002; Rugman & D'Cruz, 1997), focal firms (Munari et al., 2012), lead firms (Giblin, 2011), hub-and-spoke industrial districts (Markusen, 2002), growth poles (Perroux, 1950), as well as company towns and factory villages (Edelblutte & Legrand, 2012). Such research on "*regional lighthouses*" (Cooke, 2011, p.105) within various territorial innovation models (TIM) (Moulaert & Sekia,

2003) would enrich our understanding of the importance of HCs for their rural home regions. Additionally, RIS integration of regionally dominant innovative enterprises has only been examined in agglomerations and industrial districts, opening up pathways for dominant firms in regions with a thin economic base (Munari et al., 2012). This approach could also be extended to other dominant non-agricultural firms in rural areas not classified as HCs – examples in the German context could be multinationals, such as Adidas in Herzogenaurach (Bavaria) or Würth in Künzelsau (Baden-Württemberg). A critical assessment of regional disadvantages of rural dominance, including dependencies and single-focus regional policies toward the needs of these large firms (Eder & Trippl, 2019), should be part of such analyses.

As some last general remarks on the firm type, which have emerged in this research, one of the three defining criterions of HCs – their market leadership – deserves further examination. First, markets are difficult to define and delineate, and market sizes and shares are challenging to measure (Blundell et al., 1999). So, the market leadership criterion of HCs may be subject to ambiguity and deserves additional methodological rigor. Second, the link between market leadership and innovative capacity has been claimed in the literature (Rammer & Spielkamp, 2015) but is rarely systematically investigated. It would hence benefit from additional future research. In particular, companies that maintain market leadership without innovating, either deliberately by relying on traditional technologies such as the boot industry in Texas (Gibson & Brennan-Horley, 2016) or through deprioritizing innovation, would also be classified as HCs. Third, the desirability of high market shares as a (competitor-oriented) management objective must be critically reflected. While management research has been debating the positive relationship between market shares and profitability for a long time (Yannopoulos, 2010), this question requires additional attention in the context of HCs – being a popularized and prominent phenomenon, with prizes being awarded to firms matching the definition of HCs.

Bibliography

Agrawal, A., & Cockburn, I. (2003). The anchor tenant hypothesis: exploring the role of large, local, R&D-intensive firms in regional innovation systems. *International Journal of Industrial Organization*, *21*(9), 1227-1253. https://doi.org/10.1016/s0167-7187(03)00081-x

Albers, H. H., & Suwala, L. (2018). Unternehmensengagement als Standortfaktor – mit der Wirtschaft attraktive (Klein-) Städte schaffen. *Informationen zur Raumentwicklung*, *6*(1), 50-57. http://hdl.handle.net/10419/227113

Albers, H. H., & Suwala, L. (2020). Räumliches Unternehmensengagement (Corporate Spatial Responsibility) und Ortsführung (Place Leadership) in Kleinstädten. Perspektiven für eine neue Ortsführung? Eine Zusammenführung von zwei Diskursen. In S. Döringer & J. Eder (Eds.). *Schlüsselakteure der Regionalentwicklung: Welche Perspektiven bietet Entrepreneurship für ländliche Räume? (pp. 62-83).* Wien: Verlag der Österreichischen Akademie der Wissenschaften. https://doi.org/10.1553/0x003b5835

Albers, H. H., & Suwala, L. (2021). Place leadership and corporate spatial responsibilities. In M. Sotarauta & A. Beer (Eds.). *Handbook on City and Regional Leadership* (pp. 108-130). London: Edward Elgar Publishing. https://doi.org/10.4337/9781788979689.00016

Al-Laham, A., & Souitaris, V. (2008). Network embeddedness and new-venture internationalization: Analyzing international linkages in the German biotech industry. *Journal of Business Venturing*, *23*(5), 567-586. https://doi.org/10.1016/j.jbusvent.2007.09.001

Amorim, V., Bernardes, Ó., Santos, B., & Rua, O. (2021). Industry 4.0: The role of small and medium-sized enterprises in Germany. *Sustainable Business International Journal. Special Issue: Inovação e Transição Digital*, *1*(93). https://periodicos.uff.br/sbijournal/issue/view/2439

Amt für regionale Landesentwicklung Leine-Weser (2017). *Regionale Handlungsstrategie*. https://www.arl-lw.niedersachsen.de/download/128875/Regionale_Handlungsstrategie_Leine-Weser_2017.pdf

Appelfeller, W., & Feldmann, C. (2018). *Die digitale Transformation des Unternehmens. Systematischer Leitfaden mit zehn Elementen zur Strukturierung und Reifegradmessung.* Wiesbaden: Springer Gabler. https://doi.org/10.1007/978-3-662-54061-9

Arato, M., Speelman, S., & Van Huylenbroeck, G. (2016). Corporate Social Responsibility applied for rural development: An empirical analysis of firms from the American continent. *Sustainability*, *8*(1), 102-119. https://doi.org/10.3390/su8010102

Arndt, O., & Sternberg, R. (2000). Do manufacturing firms profit from intraregional innovation linkages? An empirical based answer. *European Planning Studies*, *8*(4), 465-485. https://doi.org/10.1080/713666423

Arregle, J. L., Hitt, M. A., Sirmon, D. G., & Very, P. (2007). The development of organizational social capital: Attributes of family firms. *Journal of Management Studies*, *44*(1), 73-95. https://doi.org/10.1111/j.1467-6486.2007.00665.x

Asheim, B. T., & Isaksen, A. (1997). Location, agglomeration and innovation: Towards regional innovation systems in Norway? *European Planning Studies*, *5*(3), 299-330. https://doi.org/10.1080/09654319708720402

Asheim, B. T., & Isaksen, A. (2002). Regional Innovation Systems: The Integration of Local 'Sticky' and Global 'Ubiquitous' Knowledge. *The Journal of Technology Transfer*, *27(1),* 77-86. https://doi.org/10.1023/A:1013100704794

Asheim, B. T., & Coenen, L. (2005). Knowledge bases and regional innovation systems: Comparing Nordic clusters. *Research Policy*, *34*(8), 1173-1190. https://doi.org/10.1016/j.respol.2005.03.013

Attaran, M., & Woods, J. (2019). Cloud computing technology: improving small business performance using the Internet. *Journal of Small Business & Entrepreneurship*, *31*(6), 495-519. https://doi.org/10.1080/08276331.2018.1466850

Audretsch, D. B., Lehmann, E. E., & Schenkenhofer, J. (2018). Internationalization strategies of hidden champions: lessons from Germany. *Multinational Business Review*, *26*(1), 2–24. https://doi.org/10.1108/mbr-01-2018-0006

Audretsch, D. B., Lehmann, E. E., & Schenkenhofer, J. (2021). A context-choice model of niche entrepreneurship. *Entrepreneurship Theory and Practice*, *45*(5), 1276-1303. https://doi.org/10.1177/1042258720936042

Autio, E. (1998). Evaluation of RTD in regional systems of innovation. *European Planning Studies*, *6*(2), 131-140. https://doi.org/10.1080/09654319808720451

Autio, E., Kenney, M., Mustar, P., Siegel, D., & Wright, M. (2014). Entrepreneurial innovation: The importance of context. *Research Policy*, *43*(7), 1097-1108. https://doi.org/10.1016/j.respol.2014.01.015

Bailey, D. & Berkeley, N. (2014). Regional Responses to Recession: The Role of the West Midlands Regional Taskforce. *Regional Studies*, *48*(11), 1787–1812. https://doi.org/10.1080/00343404.2014.893056

Balland, P. A., Boschma, R., Crespo, J., & Rigby, D. L. (2019). Smart specialization policy in the European Union: relatedness, knowledge complexity and regional diversification. *Regional Studies*, *53*(9), 1252-1268. https://doi.org/10.1080/00343404.2018.1437900

Banalieva, E. R., & Eddleston, K. A. (2011). Home-region focus and performance of family firms: The role of family vs non-family leaders. *Journal of International Business Studies*, *42*(8), 1060-1072. https://doi.org/10.1057/jibs.2011.28

Baronian, L. (2020). Digital platforms and the nature of the firm. *Journal of Economic Issues*, *54*(1), 214-232. https://doi.org/10.1080/00213624.2020.1720588

Basco, R. (2015). Family business and regional development—A theoretical model of regional familiness. *Journal of Family Business Strategy*, *6*(4), 259-271. https://doi.org/10.1016/j.jfbs.2015.04.004

Basco, R., & Suwala, L. (2020). Spatial familiness: a bridge between family business and economic geography. In A. Calabrò (Eds.). *A Research Agenda for Family Business – A Way Ahead for the Field* (pp. 185-202). London: Edward Elgar Publishing. https://doi.org/10.4337/9781788974073.00017

Basco, R., Stough, R. & Suwala, L. (2021). *Family Business and Regional Development*. London: Routledge. https://doi.org/10.4324/9780429058097

Bathelt, H., & Henn, S. (2017). National and regional innovation systems. In H. Bathelt, P. Cohendet, S. Henn, & L. Simon (Eds.). *The Elgar Companion to Innovation and Knowledge Creation* (pp. 457-471). London: Edward Elgar Publishing. https://doi.org/10.4337/9781782548522.00038

Bathelt, H., & Glückler, J. (2018). Relational Research Design in Economic Geography. In G. L. Clark, M. P. Feldman, M. S. Gertler, & D. Wójcik (Eds.). *The New Oxford Handbook of Economic Geography* (pp. 179-195). Oxford: Oxford University Press. https://doi.org/10.1093/oxfordhb/9780198755609.013.46

Bathelt, H., & Li, P. (2020). Building Better Methods in Economic Geography. *Zeitschrift für Wirtschaftsgeographie*, *64*(3), 103-108. https://doi.org/10.1515/zfw-2020-0014

Baù, M., Chirico, F., Pittino, D., Backman, M., & Klaesson, J. (2019). Roots to Grow: Family Firms and Local Embeddedness in Rural and Urban Contexts. *Entrepreneurship Theory and Practice*, *43*(2), 360-385. https://doi.org/10.1177/1042258718796089

Becker, W., Ulrich, P., & Botzkowski, T. (2017). *Industrie 4.0 im Mittelstand: Best Practices und Implikationen für KMU.* Wiesbaden: Springer Gabler. https://doi.org/10.1007/978-3-658-15656-5_14

Beckmann, M., Garkisch, M., & Zeyen, A. (2021). Together we are strong? A systematic literature review on how SMEs use relation-based collaboration to operate in rural areas. *Journal of Small Business & Entrepreneurship*. Advance online publication. https://doi.org/10.1080/08276331.2021.1874605

Benneworth, P., Pinheiro, R., & Karlsen, J. (2017). Strategic agency and institutional change: Investigating the role of universities in regional innovation systems (RISs). *Regional studies*, *51*(2), 235-248. https://doi.org/10.1080/00343404.2016.1215599

Benz, L., Block, J. H., & Johann, M. S. (2021). Hidden Champions as a Determinant of Regional Development: An Analysis of German Districts. *Zeitschrift für Wirtschaftsgeographie.* Advance online publication. https://doi.org/10.1515/zfw-2020-0043

Beugelsdijk, S. (2007). The regional environment and a firm's innovative performance: a plea for a multilevel interactionist approach. *Economic Geography*, *83*(2), 181-199. https://doi.org/10.1111/j.1944-8287.2007.tb00342.x

Bird, M., & Wennberg, K. (2014). Regional influences on the prevalence of family versus non-family start-ups. *Journal of Business Venturing*, *29*(3), 421-436. https://doi.org/10.1016/j.jbusvent.2013.06.004

Block, J. H. & Spiegel, F. (2011). Family firms and regional innovation activity: Evidence from the German Mittelstand. *MPRA*, [28604]. https://mpra.ub.uni-muenchen.de/28604/1/MPRA_paper_28604.pdf

Blomström, M., & Kokko, A. (2001). Foreign direct investment and spillovers of technology. *International Journal of Technology Management*, *22*(5-6), 435-454.

Bloomberg, J. (2018). Digitization, Digitalization, and Digital Transformation: Confuse Them At Your Peril. *Forbes*. https://www.forbes.com/sites/jasonbloomberg/2018/04/29/digitization-digitalization-and-digital-transformation-confuse-them-at-your-peril/

Blowfield, M., & Frynas, J. G. (2005). Editorial Setting new agendas: critical perspectives on Corporate Social Responsibility in the developing world. *International Affairs*, *81*(3), 499-513. https://doi.org/10.1111/j.1468-2346.2005.00465.x

Blundell, R., Griffith, R., & Van Reenen, J. (1999). Market Share, Market Value and Innovation in a Panel of British Manufacturing Firms. *The Review of Economic Studies*, *66*(3), 529-554. https://doi.org/10.1111/1467-937X.00097

Bodner, J., & Capron, L. (2018). Post-merger integration. *Journal of Organization Design*, *7(*1), 1-20. https://doi.org/10.1186/s41469-018-0027-4

Bogner, A., Littig, B., & Menz, W. (2009). Introduction: Expert interviews—An introduction to a new methodological debate. In A. Bogner A., B. Littig, & W. Menz (Eds.). *Interviewing experts* (pp. 1-13). London: Palgrave Macmillan. https://doi.org/10.1057/9780230244276_1

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

Boschma, R. A., & Frenken, K. (2010). The Spatial Evolution of Innovation Networks: A Proximity Perspective. In R. Boschma & R. Martin (Eds.), *The Handbook of Evolutionary Economic Geography* (pp. 120-135). Edward Elgar. https://doi.org/10.4337/9781849806497.00012

Boschma, R., & Frenken, K. (2011). The emerging empirics of evolutionary economic geography. *Journal of Economic Geography*, *11*(2), 295-307. https://doi.org/10.1093/jeg/lbq053

Bosworth, G., Price, L., Collison, M., & Fox, C. (2020). Unequal futures of rural mobility: Challenges for a "Smart Countryside". *Local Economy*, *35*(6), 586-608. https://doi.org/10.1177/0269094220968231

Branstetter, L. (2006). Is foreign direct investment a channel of knowledge spillovers? Evidence from Japan's FDI in the United States. *Journal of International Economics*, *68*(2), 325-344. https://doi.org/10.1016/j.jinteco.2005.06.006

Breyer-Mayländer, T. (Ed.) (2022). *Industrie 4.0 bei Hidden Champions*. Berlin: Springer.

Bundesinstitut für Bau-, Stadt- und Raumforschung [BBSR] (2017). Raumordnungsbericht 2017: Daseinsvorsorge sichern. Bonn: Bundesinstitut für Bau-, Stadt- und Raumforschung.

Bundesamt für Bauwesen und Raumordnung [BBSR] (2019). *Hidden Champions und Stadtentwicklung: Die wirtschaftliche und gesellschaftliche Bedeutung innovativer Unternehmen für Kleinstädte in peripherer Lage*. BBSR-Sonderpublikation, Bonn. https://www.bbsr.bund.de/BBSR/DE/veroeffentlichungen/sonderveroeffentlichungen/2019/hidden-champions-stadtentwicklung-dl.pdf?__blob=publicationFile&v=4

Bundesamt für Bauwesen und Raumordnung [BBSR] (2022). Indikatoren und Karten zur Raum- und Stadtentwicklung – INKAR. https://www.inkar.de/

Bundesministerium für Digitales und Verkehr [BMVI] (2022). Breitbandverfügbarkeit in Deutschland nach Landkreisen und kreisfreien Städten. www.breitbandatlas.de

Bureau van Dijk (2020). *MARKUS database of German company data*.

Bürcher, S. (2017). Regional engagement of locally anchored firms and its influence on socio-economic development in two peripheral regions over time. *Entrepreneurship & Regional Development*, *29*(7-8), 692-714. https://doi.org/10.1080/08985626.2017.1330903

Bürcher, S., & Mayer, H. (2018). Are there differences in social capital related to corporate regional engagement in dynamic and less dynamic non-core regions?. *European Planning Studies*, *26*(2), 342-364. https://doi.org/10.1080/09654313.2017.1361604

Campopiano, G., De Massis, A., & Chirico, F. (2014). Firm Philanthropy in Small- and Medium-Sized Family Firms: The Effects of Family Involvement in Ownership and Management. *Family Business Review*, *27*(3), 244-258. https://doi.org/10.1177/0894486514538450

Capello, R. (2014). Proximity and regional innovation processes: is there space for new reflections?. In A. Torre, & F. Wallet (Eds.). *Regional development and proximity relations* (pp. 163-194). London: Edward Elgar. https://doi.org/10.4337/9781781002896.00012

Capello, R. (2020). Proximity and Regional Competitiveness. *Scienze Regionali*, *19*(3), 373-394. http://www.rivisteweb.it/doi/10.14650/98284

Carroll, A. (1979). A Three-Dimensional Conceptual Model of Corporate Performance. *Academy of Management Review*, *4*(4), 497-505. https://doi.org/10.5465/amr.1979.4498296

Chesborough, H. (2003). *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Cambridge, MA: Harvard Business Press.

Chrisman, J. J., Memili, E., & Misra, K. (2014). Nonfamily Managers, Family Firms, and the Winner's Curse: The Influence of Noneconomic Goals and Bounded Rationality. *Entrepreneurship Theory and Practice*, *38*(5), 1-25. https://doi.org/10.1111/etap.12014

Christopherson, S., & Clark, J. (2007). Power in Firm Networks: What it Means for Regional Innovation Systems. *Regional Studies*, *41*(9), 1223-1236. https://doi.org/10.1080/00343400701543330

Ciffolilli, A., & Muscio, A. (2018). Industry 4.0: national and regional comparative advantages in key enabling technologies. *European Planning Studies, 26(12),* 2323-2343. https://doi.org/10.1080/09654313.2018.1529145

Clerck, J. (2017). *Digitization, digitalization and digital transformation: the differences*. i-Scoop. https://www.i-scoop.eu/digital-transformation/digitization-digitalization-digital-transformation-disruption/.

Coe, N. M., Hess, M., Yeung, H. W. C., Dicken, P. & Henderson, J. (2004). 'Globalizing' regional development: a global production networks perspective. *Transactions of the Institute of British Geographers*, *29*(4), 468-484. https://www.jstor.org/stable/3804369

Collinge, C., & Gibney, J. (2010). Connecting place, policy and leadership. *Policy studies*, *31*(4), 379-391. https://doi.org/10.1080/01442871003723259

Colombo, M. G., Croce, A., & Grilli, L. (2013). ICT services and small businesses' productivity gains: An analysis of the adoption of broadband Internet technology. *Information Economics and Policy*, *25*(3), 171-189. https://doi.org/10.1016/j.infoecopol.2012.11.001

Commander, S. (2018). One-company towns: Scale and consequences. *IZA World of Labor, (433)*. https://doi.org/10.15185/izawol.433

Cooke, P. (2002). Regional Innovation Systems: General Findings and Some New Evidence from Biotechnology Clusters. *The Journal of Technology Transfer*, *27*(1), 133-145. https://doi.org/10.1023/a:1013160923450

Cooke, P. (2004). The role of research in regional innovation systems: new models meeting knowledge economy demands. *International Journal of Technology Management*, *28*(3-6), 507-533. https://doi.org/10.1504/ijtm.2004.005307

Cooke, P. (2011). Transition regions: Regional–national eco-innovation systems and strategies. *Progress in Planning*, *76*(3), 105-146. https://doi.org/10.1016/j.progress.2011.08.002

Cooke, P., Clifton, N., & Oleaga, M. (2005). Social capital, firm embeddedness and regional development. *Regional Studies*, *39*(8), 1065-1077. https://doi.org/10.1080/00343400500328065

Cooke, P., De Laurentis, C., Tödtling, F., & Trippl, M. (2007). *Regional knowledge economies: markets, clusters and innovation*. London: Edward Elgar Publishing. https://doi.org/10.4337/9781847206930

Cooke, P., Heidenreich, M., & Braczyk, H. (Eds.) (2004). *Regional Innovation Systems. The Role of Governance in a Globalized World.* London: Routledge. https://www.routledge.com/Regional-Innovation-Systems-The-Role-of-Governances-in-a-Globalized-World/Braczyk-Cooke-Heidenreich/p/book/9780415303699

Cravotta, S., & Grottke, M. (2019). Digitalization in German family firms–some preliminary insights. *Journal of Evolutionary Studies in Business*, 4(1), 1-25. https://doi.org/10.1344/jesb2019.1.j051

Cucculelli, M., Dileo, I., & Pini, M. (2021). Filling the void of family leadership: institutional support to business model changes in the Italian Industry 4.0 experience. *The Journal*

of Technology Transfer. Advance online publication. https://doi.org/10.1007/s10961-021-09847-4

David, P., & Foray, D. (2002). An introduction to the knowledge economy and society. *International Social Science Journal*, 54(171), 9-23. https://doi.org/10.1111/1468-2451.00355

Davidsson, P., Delmar, F., & Wiklund, J. (2006). Conceptual and Empirical Challenges in the Study of Firm Growth. In P. Davidsson, F. Delmar, & J. Wiklund (Eds.). *Entrepreneurship and the Growth of Firms* (pp. 39-61). https://doi.org/10.4337/9781781009949.00010

De Haas, R., & Poelhekke, S. (2019). Mining matters: Natural resource extraction and firm-level constraints. *Journal of International Economics*, *117*, 109-124. https://doi.org/10.1016/j.jinteco.2019.01.006

Delgado, M., Porter, M. E., & Stern, S. (2014). Clusters, convergence, and economic performance. *Research Policy*, 43(10), 1785-1799. https://doi.org/10.1016/j.respol.2014.05.007

Demary, V., Engels, B., Röhl, K. H., & Rusche, C. (2016). *Digitalisierung und Mittelstand: Eine Metastudie.* Köln: IW-Analysen.

Doloreux, D. (2003). Regional innovation systems in the periphery: The case of the Beauce in Québec (Canada). *International Journal of Innovation Management, 7*(1), 67-94. https://doi.org/10.1142/s1363919603000738

Doloreux, D., & Dionne, S. (2008). Is regional innovation system development possible in peripheral regions? Some evidence from the case of La Pocatière, Canada. *Entrepreneurship and Regional Development*, *20(*3), 259-283. https://doi.org/10.1080/08985620701795525

Doloreux, D., & Porto Gomez, I. (2017). A review of (almost) 20 years of regional innovation systems research. *European Planning Studies*, *25*(3), 371–387. https://doi.org/10.1080/09654313.2016.1244516

Edelblutte, S., & Legrand, J. (2012). Patrimoine et culture industriels en milieu rural: quelles spécificités?. *Revue Géographique de l'Est, 52*(3-4). https://doi.org/10.4000/rge.3683

Eder, J. (2019). Innovation in the periphery: A critical survey and research agenda. *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. *Growth and Change, 50*(4), 1511-1531. https://doi.org/10.1111/grow.12328

Ehret, M., & Wirtz, J. (2017). Unlocking value from machines: business models and the industrial internet of things. *Journal of Marketing Management, 33*(1-2), 111-130. https://doi.org/10.1080/0267257x.2016.1248041

Ernst, D., & Kim, L. (2002). Global Production Networks, Knowledge Diffusion, and Local Capability Formation. *Research Policy*, *31*(8-9), 1417-1429. http://dx.doi.org/10.2139/ssrn.2742956

Eurofound (2018). *Game changing technologies: Exploring the impact on production processes and work*. Luxembourg: Publications Office of the European Union.

Eurostat (2020). *Methodology on Rural-Urban Typology (NUTS-2021).* https://ec.europa.eu/eurostat/web/rural-development/methodology

Feldman, M. (2003). The locational dynamics of the US biotech industry: knowledge externalities and the anchor hypothesis. *Industry and innovation*, *10*(3), 311-329. https://doi.org/10.1080/1366271032000141661

Fernandes, C., Farinha, L., Ferreira, J. J., Asheim, B., & Rutten, R. (2021). Regional innovation systems: what can we learn from 25 years of scientific achievements?. *Regional Studies, 55*(3), 377-389. https://doi.org/10.1080/00343404.2020.1782878

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

Fitjar, R. D., & Rodríguez-Pose, A. (2020). Where cities fail to triumph: The impact of urban location and local collaboration on innovation in Norway. *Journal of Regional Science, 60*(1), 5-32. https://doi.org/10.1111/jors.12461

Flammer, C., & Kacperczyk, A. (2019). Corporate social responsibility as a defense against knowledge spillovers: Evidence from the inevitable disclosure doctrine. *Strategic Management Journal*, *40*(8), 1243-1267. https://doi.org/10.1002/smj.3025

Freimark, A. J., Habel, J., Hülsbömer, S., Schmitz, B., & Teichmann, M. (2018). *Hidden Champions - Champions der digitalen Transformation?.* Munich: IDG Business Media GmbH. https://faculty-research.esmt.berlin/publication/hidden-champions-champions-digital-transformation

Fritsch, M., & Wyrwich, M. (2021a). Does successful innovation require large urban areas? Germany as a counterexample. *Economic Geography, 97*(3), 284-308. https://doi.org/10.1080/00130095.2021.1920391

Fritsch, M., & Wyrwich, M. (2021b). Is innovation (increasingly) concentrated in large cities? An international comparison. *Research Policy, 50*(6), [104237]. https://doi.org/10.1016/j.respol.2021.104237

Geissdoerfer, M., Vladimirova, D., Van Fossen, K., & Evans, S. (2018). Product, service, and business model innovation: A discussion. *Procedia Manufacturing*, *21*, 165-172. https://doi.org/10.1016/j.promfg.2018.02.107

Genders, S., & C. Seynstahl (Eds.) (2021). CSR und Hidden Champions. Wiesbaden: Springer Gabler. https://doi.org/10.1007/978-3-662-62816-4

Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The governance of global value chains. *Review of International Political Economy*, *12*(1), 78-104. https://doi.org/10.1080/09692290500049805

Gertler, M. S., Wolfe, D. A., & Garkut, D. (2000). No place like home? The embeddedness of innovation in a regional economy. *Review of International Political Economy*, *7*(4), 688-718. https://doi.org/10.1080/096922900750034581

Gertler, M. S. (2003). Tacit knowledge and the economic geography of context, or the undefinable tacitness of being (there). *Journal of Economic Geography*, *3*(1), 75-99. https://doi.org/10.1093/jeg/3.1.75

Gibbs, G. (2018). *Analyzing qualitative data. Volume 6 of The SAGE qualitative research kit.* Los Angeles: SAGE Publications. https://uk.sagepub.com/en-gb/eur/analyzing-qualitative-data/book244633

Giblin, M. (2011). Managing the Global–Local Dimensions of Clusters and the Role of "Lead" Organizations: The Contrasting Cases of the Software and Medical Technology Clusters in the West of Ireland. *European Planning Studies*, *19*(1), 23-42. https://doi.org/10.1080/09654313.2011.530529

Gibson, C., & Brennan-Horley, C. (2016). Putting the boot into creative cluster theory. In R. Shearmu, C. Carrincazeaux, & D. Doloreux (Eds.). *Handbook on the Geographies of Innovation* (pp. 241-254). London: Edward Elgar Publishing. http://dx.doi.org/10.4337/9781784710774.00027

Gillett, S. E., Lehr, W. H., & Osorio, C. (2004). Local government broadband initiatives. *Telecommunications Policy*, *28*(7-8), 537-558. https://doi.org/10.1016/j.telpol.2004.05.001

Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking qualitative rigor in inductive research: Notes on the Gioia methodology. *Organizational research methods*, *16*(1), 15-31. https://doi.org/10.1177/1094428112452151

Glückler, J. (2014). How controversial innovation succeeds in the periphery? A network perspective of BASF Argentina. *Journal of Economic Geography*, *14*(5), 903-927. https://doi.org/10.1093/jeg/lbu016

Glückler, J., Shearmur, R., & Martinus, K. (2022). From Liability to Opportunity: Reconceptualizing the Role of Periphery in Innovation. *SPACES online*, *17*(1). www.spacesonline.com

Götz, M., & Jankowska, B. (2017). Clusters and Industry 4.0–do they fit together?. *European Planning Studies*, 25(9), 1633-1653. https://doi.org/10.1080/09654313.2017.1327037

Grabher, G., & Ibert, O. (2014). Distance as asset? Knowledge collaboration in hybrid virtual communities. *Journal of Economic Geography*, *14*(1), 97-123. https://doi.org/10.1093/jeg/lbt014

Graebner, M. E., Martin, J. A., & Roundy, P. T. (2012). Qualitative data: Cooking without a recipe. *Strategic Organization*, *10*(3), 276-284. https://doi.org/10.1177/1476127012452821

Graffenberger, M., & Görmar, F. (2021). Family firms and corporate responsibility in peripheral regions. In R. Basco, R. Stough, & L. Suwala (Eds.*). Family Business and Regional Development* (pp. 157-174). London: Routledge. https://doi.org/10.4324/9780429058097-12

Granovetter, M. S. (1973). The Strength of Weak Ties. *American Journal of Sociology*, *78*(6), 1360-1380. https://doi.org/10.1086/225469

Gray, M., Golob, E., & Markusen, A. (1996). Big Firms, Long Arms, Wide Shoulders: The 'Hub-and-Spoke' 'Industrial District in the Seattle Region. *Regional Studies, 30*(7), 651-666. https://doi.org/10.1080/00343409612331349948

Green, H. (2011). *The company town: the industrial Edens and satanic mills that shaped the American economy*. New York: Basic Books Press.

Greenberg, Z., Farja, Y., & Gimmon, E. (2018). Embeddedness and growth of small businesses in rural regions. *Journal of Rural Studies*, *62*(1), 174-182. https://doi.org/10.1016/j.jrurstud.2018.07.016

Grillitsch, M., & Asheim, B. (2018). Place-based innovation policy for industrial diversification in regions. *European Planning Studies*, *26*(8), 1638-1662. https://doi.org/10.1080/09654313.2018.1484892

Grillitsch, M., & Nilsson, M. (2017). Firm performance in the periphery: on the relation between firm-internal knowledge and local knowledge spillovers. *Regional Studies*, *51*(8), 1219-1231. https://doi.org/10.1080/00343404.2016.1175554

Grillitsch, M., & Sotarauta, M. (2020). Trinity of change agency, regional development paths and opportunity spaces. *Progress in human geography*, *44*(4), 704-723. https://doi.org/10.1177/0309132519853870

Grubesic, T. H., & Mack, E. A. (2015). *Broadband Telecommunications and Regional Development*. London: Routledge. https://doi.org/10.4324/9781315794952

Gärtner, C. (2016). *Deep-tech in good old Germany: Digitale Hidden Champions.* XING Insider. https://www.xing.com/news/insiders/articles/deep-tech-in-good-old-germanydigitale-hidden-champions-532499.

Halaszovich, T. F., & Lundan, S. M. (2016). The moderating role of local embeddedness on the performance of foreign and domestic firms in emerging markets. *International Business Review*, *25*(5), 1136-1148. https://doi.org/10.1016/j.ibusrev.2016.02.003

Hassink, R., Gong, H., Fröhlich, K., & Herr, A. (2021). Exploring the scope of regions in challenge-oriented innovation policy: the case of Schleswig-Holstein, Germany. *European Planning Studies*. Advance online publication. https://doi.org/10.1080/09654313.2021.2017857

Herb, C., & Neiberger, C. (2021). Intermediation, Disintermediation und Cybermediäre: Zum Einfluss der Digitalisierung auf Wertschöpfungsketten in der Schuhbranche. *Zeitschrift für Wirtschaftsgeographie*. Advance online publication. https://doi.org/10.1515/zfw-2020-0036

Hohn, U., Kleine-König, C., & Schiek, M. (2014). Corporate Local and Regional Responsibility: Gesellschaftliche Verantwortung von Unternehmen für Quartier, Stadt und Region. *Berichte. Geographie und Landeskunde*, *88*, 124-152.

Horlings, I., & Padt, F. (2013). Leadership for sustainable regional development in rural areas: Bridging personal and institutional aspects. *Sustainable Development*, *21*(6), 413-424. https://doi.org/10.1002/sd.526

Hozdić, E. (2015). Smart factory for industry 4.0: A review. *International Journal of Modern Manufacturing Technologies*, *7*(1), 28-35.

Hu, X., & Hassink, R. (2017). Place leadership with Chinese characteristics? A case study of the Zaozhuang coal-mining region in transition. *Regional Studies*, *51*(2), 224-234. https://doi.org/10.1080/00343404.2016.1200189

Huggins, R., & Thompson, P. (2015). Entrepreneurship, innovation and regional growth: a network theory. *Small Business Economics*, *45*(1), 103-128. https://doi.org/10.1007/s11187-015-9643-3

Häfner, L., & Sternberg, R. (2020). Spatial implications of digitization: State of the field and research agenda. *Geography Compass*. Advance online publication. https://doi.org/10.1111/gec3.12544

Isaksen, A. (2001). Building regional innovation systems: is endogenous industrial development possible in the global economy?. *Canadian Journal of Regional Science*, *24*(1), 101-120.

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. 277-286). London: Edward Elgar Publishing. https://doi.org/10.4337/9781784710774.00030

Isaksen, A., & Trippl, M. (2017). Exogenously led and policy-supported new path development in peripheral regions: Analytical and synthetic routes. *Economic Geography*, *93*(5), 436-457. https://doi.org/10.1080/00130095.2016.1154443

Isaksen, A., Tödtling, F., & Trippl, M. (2018). Innovation Policies for Regional Structural Change: Combining Actor-Based and System-Based Strategies. In A. Isaksen, R. Martin & M. Trippl (Eds.). *New Avenues for Regional Innovation Systems - Theoretical Advances, Empirical Cases and Policy Lessons* (pp. 221-238). Berlin: Springer. https://doi.org/10.1007/978-3-319-71661-9

Johann, M. S., Block, J. H., & Benz, L. (2021). Financial performance of hidden champions: Evidence from German manufacturing firms. *Small Business Economics*. Advance online publication. https://doi.org/10.1007/s11187-021-00557-7

Kalantaridis, C., & Bika, Z. (2006). Local Embeddedness and Rural Entrepreneurship: Case-Study Evidence from Cumbria, England. *Environment and Planning A: Economy and Space*, *38*(8), 1561-1579. https://doi.org/10.1068/a3834

Kalantaridis, C., & Bika, Z. (2011). Entrepreneurial origin and the configuration of innovation in rural areas: the case of Cumbria, North West England. *Environment and Planning A*, *43*(4), 866-884. https://doi.org/10.1068%2Fa43341

Kamp, B. (2018). Expanding International Business Via Smart Services: Insights From 'Hidden Champions' in the Machine Tool Industry. In R. van Tulder, A. Verbeke & L. Piscitello (Eds.). *International Business in the Information and Digital Age* (pp. 273-293). Bingley: Emerald Publishing Limited. https://doi.org/10.1108/s1745-886220180000013012

Kaudela-Baum, S., Kocher, P.-Y., & Scherrer, S. (2014). Innovationen fördern: die Gestaltung von Freiräumen als Führungsaufgabe von Hidden Champions. *Zeitschrift für Führung + Organisation: ZfO*, *83*(2), 74-79.

Keeble, D., Lawson, C., Smith, H. L., Moore, B., & Wilkinson, F. (1998). Internationalisation processes, networking and local embeddedness in technology-intensive small firms. *Small Business Economics, 11*, 327-342. https://doi.org/10.1023/a:1007942612220

Kerry, C., & Danson, M. (2016). Open innovation, Triple Helix and Regional Innovation Systems: Exploring CATAPULT Centres in the UK. *Industry and Higher Education, 30*(1), 67-78. https://doi.org/10.5367/ihe.2016.0292

Kiese, M., & Schiek, M. (2016). Unternehmerische Verantwortung in der Stadt- und Regionalentwicklung. *Standort, 40*, 9-12. https://doi.org/10.1007/s00548-016-0415-3

Kilkenny, M., & Otto, D. (1994). A General Equilibrium Perspective on Structural Change in the Rural Economy. *American Journal of Agricultural Economics, 76*(5), 1130-1137. https://doi.org/10.2307/1243404

Kleine-König, C., & Schmidpeter, R. (2012). Gesellschaftliches Engagement von Unternehmen als Beitrag zur Regionalentwicklung. In A. Schneider, & R. Schmidpeter (Eds.). *Corporate Social Responsibility – Verantwortungsvolle Unternehmensführung in Theorie und Praxis* (pp. 681-700). Berlin: Springer. https://doi.org/10.1007/978-3-642-25399-7_45

Kluge, S. (2000). Empirically grounded construction of types and typologies in qualitative social research. *Forum: Qualitative Social Research, 1*(1). https://doi.org/10.17169/fqs-1.1.1124

Koppenjan, J., & Klijn, E. H. (2004). *Managing Uncertainties in Networks: Public Private Controversies*. London: Routledge. https://doi.org/10.4324/9780203643457

Korsgaard, S., Müller, S., & Tanvig, H. W. (2015). Rural entrepreneurship or entrepreneurship in the rural - between place and space. *International Journal of Entrepreneurial Behavior & Research, 21*(1), 5-26. https://doi.org/10.1108/IJEBR-11-2013-0205

Kramer, J. P., & Diez, J. R. (2012). Catching the Local Buzz by Embedding? Empirical Insights on the Regional Embeddedness of Multinational Enterprises in Germany and the UK. *Regional Studies, 46*(10), 1303-1317. https://doi.org/10.1080/00343404.2011.571240

Kraus, P., Stokes, P., Tarba, S. Y., Rodgers, P., Dekel-Dachs, O., Britzelmaier, B., & Moore, N. (2022). The ambidextrous interaction of RBV-KBV and regional social capital and their impact on SME management. *Journal of Business Research, 142*, 762-774. https://doi.org/10.1016/j.jbusres.2021.12.047

Kroehn, M., Maude, A., & Beer, A. (2010). Leadership of place in the rural periphery: lessons from Australia's agricultural margins. *Policy Studies, 31*(4), 491-504. https://doi.org/10.1080/01442871003723457

Küpper, P. (2016). Abgrenzung und Typisierung ländlicher Räume. *Thünen Working Papers*, [68]. https://literatur.thuenen.de/digbib_extern/dn057783.pdf

Labigne, A., Gilroy, P., Kononykhina, O., Hollmann, D., Schilcher, C., Riess, B. (2018). *CC-Survey: Unternehmensengagement und Corporate Citizenship in Deutschland – bessere Daten für besseres Unternehmensengagement.* Gütersloh: Bertelsmann Stiftung. https://www.ziviz.de/medien/cc-survey-2018

Lalić, A. B., & Purg, D. (Eds.) (2021). *Hidden Champions in Dynamically Changing Societies: Critical Success Factors for Market Leadership*. Berlin: Springer Nature. https://doi.org/10.1007/978-3-030-65451-1

Larsson, S., & Malmberg, A. (1999). Innovations, competitiveness and local embeddedness: a study of machinery producers in Sweden. *Geografiska Annaler: Series B, Human Geography*, *81*(1), 1-18. https://doi.org/10.1111/j.0435-3684.1999.00045.x

Lehmann, E. E., Schenkenhofer, J., & Wirsching, K. (2019). Hidden champions and unicorns: a question of the context of human capital investment. *Small Business Economics*, *52*(2), 359-374. https://doi.org/10.1007/s11187-018-0096-3

Lehning, M. (2021). Kassel. In H. Heinelt, B. Egner, N.-K. Hlepas (Eds.). *The Politics of Local Innovation. Conditions for the Development of Innovations* (pp. 104-116). London: Routledge. https://doi.org/10.4324/9781003084006

Lehrer, M., & Schmid, S. (2015). Germany's industrial family firms: Prospering islands of social capital in a financialized world?. *Competition & Change*, *19*(4), 301-316. https://doi.org/10.1177/1024529415581970

Lengauer, L., & Tödtling, F. (2010). Regional embeddedness and corporate regional engagement: Evidence from three industries in the Austrian region of Styria. Conference Paper presented at the 8th European Urban & Regional Studies Conference, Vienna.

Lenka, S., Parida, V., & Wincent, J. (2017). Digitalization capabilities as enablers of value co-creation in servitizing firms. *Psychology & Marketing*, *34*(1), 92-100. https://doi.org/10.1002/mar.20975

Lenz, R., & Glückler, J. (2021). Same same but different: regional coherence between institutions and policies in family firm succession. *European Planning Studies*, *29*(3), 536-555. https://doi.org/10.1080/09654313.2020.1757041

Li, L., Su, F., Zhang, W., & Mao, J.-Y. (2018). Digital transformation by SME entrepreneurs: A capability perspective. *Information Systems Journal*, *28*(6), 1129-1157. https://doi.org/10.1111/isj.12153

Liefner, I., & Schätzl, L. (2017). *Theorien der Wirtschaftsgeographie* (11th ed.). Stuttgart: Uni-Taschenbücher.

Lumpkin, G. T., & Brigham, K. (2011). Long–Term Orientation and Intertemporal Choice in Family Firms. *Entrepreneurship Theory and Practice*, *35*(6), 1149-1169. https://doi.org/10.1111/j.1540-6520.2011.00495.x

MacKinnon, D. (2012). Beyond strategic coupling: reassessing the firm-region nexus in global production networks. *Journal of Economic Geography*, *12*(1), 227-245. https://doi.org/10.1093/jeg/lbr009

Malecki, E. J. (2003). Digital development in rural areas: potentials and pitfalls. *Journal of Rural Studies, 19*(2), 201–214. https://doi.org/10.1016/s0743-0167(02)00068-2

Malecki, E. J. (2010). Global knowledge and creativity: new challenges for firms and regions. *Regional Studies*, *44*(8), 1033-1052. https://doi.org/10.1080/00343400903108676

Maier, G., Tödtling, F., & Trippl, M. (2006). *Regional- und Stadtökonomie 2: Regionalentwicklung und Regionalpolitik.* Wien: Springer.

Maretzke, S., Ragnitz, J., & Untiedt, G. (2019). Betrachtung und Analyse von Regionalindikatoren zur Vorbereitung des GRW-Fördergebietes ab 2021 (Raumbeobachtung). *ifo Dresden Studien, 83*. https://www.ifo.de/publikationen/2019/monographie-autorenschaft/betrachtung-und-analyse-von-regionalindikatoren-zur

Margarian, A. (2013). A constructive critique of the endogenous development approach in the European support of rural areas. *Growth and Change*, *44*(1), 1-29. https://doi.org/10.1111/grow.12000

Markusen, A. (2002). Sticky places in slippery space: A typology of industrial districts. In T. Barnes & M. S. Gertler (Eds.). *The New Industrial Geography* (pp. 120-146). Routledge. https://doi.org/10.4324/9780203021866

Marques, P., & Morgan, K. (2021). Innovation without Regional Development? The Complex Interplay of Innovation, Institutions, and Development. *Economic Geography*. Advance online publication. https://doi.org/10.1080/00130095.2021.1972801

Martin, R., & Sunley, P. (1998). Slow convergence? The new endogenous growth theory and regional development. *Economic Geography*, *74*(3), 201-227. https://doi.org/10.2307/144374

Mayer, J. (2018). Digitalization and industrialization: Friends or foes. *UNCTAD Research Papers*, [25]. https://unctad.org/webflyer/digitalization-and-industrialization-friends-or-foes

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

Mayring, P. (2014). *Qualitative content analysis: theoretical foundation, basic procedures and software solution.* Klagenfurt. https://nbn-resolving.org/urn:nbn:de:0168-ssoar-395173

McAdam, R., McConvery, T., & Armstrong, G. (2004). Barriers to innovation within small firms in a peripheral location. *International Journal of Entrepreneurial Behavior & Research*, *10*(3), 206-221. https://doi.org/10.1108/13552550410536780

Meili, R., & Shearmur, R. (2019). Diverse diversities - Open innovation in small towns and rural areas. *Growth and Change*, *50*(2), 492-514. https://doi.org/10.1111/grow.12291

Mertens, P., Barbian, D., & Baier, S. (2017). *Digitalisierung und Industrie 4.0 – eine Relativierung*. Wiesbaden: Springer.

Meuser, M., & Nagel, U. (2009). The Expert Interview and Changes in Knowledge Production. In A. Bogner, B. Littig, & W. Menz (Eds.). *Interviewing Experts. Research Methods*

Series (pp. 17-42). London: Palgrave Macmillan. https://doi.org/10.1057/9780230244276_2

Meyer, K. E., Mudambi, R., & Narula, R. (2011). Multinational Enterprises and Local Contexts: The Opportunities and Challenges of Multiple Embeddedness. *Journal of management studies*, *48*(2), 235-252. https://doi.org/10.1111/j.1467-6486.2010.00968.x

Miller, D., & Le Breton-Miller, I. (2020). Family Firms: A Breed of Extremes? *Entrepreneurship Theory and Practice*, *45*(4), 663-681. https://doi.org/10.1177/1042258720964186

Moulaert, F., & Sekia, F. (2003). Territorial Innovation Models: A Critical Survey. *Regional Studies*, *37*(3), 289-302. https://doi.org/10.1080/0034340032000065442

Moßig, I. (2000). Lokale Spin-off-Gründungen als Ursache räumlicher Branchencluster. Das Beispiel der deutschen Verpackungsmaschinenbau-Industrie. *Geographische Zeitschrift*, *88*(3), 220-233. https://www.jstor.org/stable/27818886

Munari, F., Sobrero, M., & Malipiero, A. (2012). Absorptive capacity and localized spillovers: focal firms as technological gatekeepers in industrial districts. *Industrial and Corporate Change*, *21*(2), 429-462. https://doi.org/10.1093/icc/dtr053

Müller, S. (2016). A progress review of entrepreneurship and regional development: What are the remaining gaps?. *European Planning Studies*, *24*(6), 1133-1158. https://doi.org/10.1080/09654313.2016.1154506

Müller, C. (2018). Der Weltmarktführer-Index für die DACH-Region. In J. P. Büchler (Ed.). *Fallstudienkompendium Hidden Champions – Innovationen für den Weltmarkt* (pp. 223-229). Wiesbaden: Springer Gabler. https://doi.org/10.1007/978-3-658-17829-1_13

Müller-Seitz, G., & Weiss, W. (2018). *Strategien zur Umsetzung der digitalen Transformation: Einblicke in die Erfolgsfaktoren eines Hidden Champions*. Munich: Vahlen. https://doi.org/10.15358/9783800659241

Norris, L. (2020). The spatial implications of rural business digitalization: case studies from Wales. *Regional Studies, Regional Science*, *7*(1), 499-510. https://doi.org/10.1080/21681376.2020.1841674

Oberst, C. A., Kempermann, H., & Schröder, C. (2019). Räumliche Entwicklung in Deutschland. In M. Hüther, J. Südekum, & M. Voigtländer (Eds.). *Die Zukunft der Regionen in Deutschland: Zwischen Vielfalt und Gleichwertigkeit* (pp. 87–114). Köln: IW. https://www.econstor.eu/handle/10419/215907

Owen, T. (2015). *Disruptive power: The crisis of the state in the digital age*. Oxford University Press.

Pahnke, A., & Welter, F. (2019). The German Mittelstand: antithesis to Silicon Valley entrepreneurship?. *Small Business Economics*, *52*(2), 345-358. https://doi.org/10.1007/s11187-018-0095-4

Pallares-Barbera, M., Tulla, A. F., & Vera, A. (2004). Spatial loyalty and territorial embeddedness in the multi-sector clustering of the Berguedà region in Catalonia (Spain). *Geoforum*, *35*(5), 635-649. https://doi.org/10.1016/j.geoforum.2004.03.004

Parida, V., Sjödin, D., & Reim, W. (2019). Reviewing literature on digitalization, business model innovation, and sustainable industry: Past achievements and future promises. *Sustainability, 11*(2), 2-391. https://doi.org/10.3390/su11020391

Peillon, S., & Dubruc, N. (2019). Barriers to digital servitization in French manufacturing SMEs. *Procedia CIRP, 83*, 146-150. https://doi.org/10.1016/j.procir.2019.04.008

Perroux, F. (1950). Economic Space: Theory and Application. *The Quarterly Journal of Economics, 64*(1), 89–104. https://doi.org/10.2307/1881960

Petrov, A. (2011). Beyond Spillovers. Interrogating Innovation and Creativity in the Peripheries. In H. Bathelt, M. P. Feldman, & D. Kogler, (Eds.). *Beyond Territory. Dynamic Geographies of Knowledge Creation, Diffusion, and Innovation* (pp. 149-167). London: Routledge.

Pike, A., Rodriguez-Pose, A., & Tomaney, J. (2006). *Local and regional development*. London: Routledge.

Polèse, M., & Shearmur, R. (2006). Why some regions will decline: A Canadian case study with thoughts on local development strategies. *Papers in Regional Science, 85*(1), 23-46. https://doi.org/10.1111/j.1435-5957.2006.00024.x

Raagmaa, G., & Keerber, A. (2016). Regional higher education institutions in regional leadership and development. Regional Studies, *51*(2), 260-272. https://doi.org/10.1080/00343404.2016.1215600

Rammer, C. & Spielkamp, A. (2015). Hidden champions – driven by innovation: Empirische Befunde auf Basis des Mannheimer Innovationspanels. *ZEW-Dokumentation*, [15-03]. https://www.zew.de/publikationen/hidden-champions-driven-by-innovation-empirische-befunde-auf-basis-des-mannheimer-innovationspanels

Rammer, C., & Spielkamp, A. (2019). The Distinct Features of Hidden Champions in Germany: A Dynamic Capabilities View. *ZEW-Centre for European Economic Research Discussion Paper*, [19-012]. https://doi.org/10.2139/ssrn.3381500

Regionale Planungsgemeinschaft Magdeburg (2021). *Landeshauptstadt Magdeburg*. https://www.regionmagdeburg.de/Region-im-%C3%9Cberblick/Die-Region/Magdeburg/

Regionalmanagement Mittelhessen (2021). *Cluster – Mittelhessen*. https://www.mittelhessen.eu/wirtschaft-wissenschaft/innovation/cluster

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/10.1108/EJIM-06-2015-0043

Ritter, T., & Pedersen, C. L. (2020). Digitization capability and the digitalization of business models in business-to-business firms: Past, present, and future. *Industrial Marketing Management, 86*, 180-190. https://doi.org/10.1016/j.indmarman.2019.11.019

Romer, P. M. (1990). Endogenous technological change. *Journal of Political Economy, 98*(52), 71-102.

Rossiter, W., & Smith, D. J. (2017). Institutions, place leadership and public entrepreneurship: Reinterpreting the economic development of Nottingham. *Local Economy*, *32*(4), 374-392. https://doi.org/10.1177/0269094217707280

Rugman, A., & D'Cruz, J. (1997). The theory of the flagship firm. *European Management Journal*, *15*(4), 403-412. https://doi.org/10.1016/s0263-2373(97)00019-4

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

Saxenian, A. (1996). *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*. Harvard University Press.

Schäfer, S., & Mayer, H. (2019). Entrepreneurial ecosystems: Founding figures and research frontiers in economic geography. *Zeitschrift für Wirtschaftsgeographie*, *63*(2-4), 55-63. https://doi.org/10.1515/zfw-2019-0008

Schneider, P. (2018). Managerial challenges of Industry 4.0: an empirically backed research agenda for a nascent field. *Review of Managerial Science*, *12*(3), 803-848. https://doi.org/10.1007/s11846-018-0283-2

Schenkenhofer, J. (2020). Hidden champions: A review of the literature and future research avenues. *UO Working Papers*, 20(06). http://hdl.handle.net/10419/222408

Schenkenhofer, J. (2022). Hidden champions: A review of the literature & future research avenues. *Management Review Quarterly*. Advance online publication. https://doi.org/10.1007/s11301-021-00253-6

Schlepphorst, S., Schlömer-Laufen, N., & Holz, M. (2016). Determinants of hidden champions: Evidence from Germany. *IfM Working Papers*, [03/16]. https://www.econstor.eu/bitstream/10419/146411/1/86797303X.pdf

Schuh, G., Anderl, R., Gausemeier, J., ten Hompel, M., & Wahlster, W. (2017). *Industrie 4.0 Maturity Index: Die digitale Transformation von Unternehmen gestalten*. Munich: Herbert Utz Verlag. https://www.acatech.de/publikation/industrie-4-0-maturity-index-die-digitale-transformation-von-unternehmen-gestalten/

Shearmur, R. (2011). Innovation, Regions and Proximity: From Neo-Regionalism to Spatial Analysis. *Regional studies*, *45*(9), 1225-1243. https://doi.org/10.1080/00343404.2010.484416

Shearmur, R. (2016). Why local development and local innovation are not the same thing: the uneven geographic distribution of innovation-related development. In R. Shearmur, C. Carrincazeaux, & D. Doloreux (Eds.). *Handbook on the Geographies of Innovation* (pp. 432-446). London: Edward Elgar Publishing. https://doi.org/10.4337/9781784710774.00046

Shearmur, R., & Doloreux, D. (2016). How open innovation processes vary between urban and remote environments: slow innovators, market-sourced information and frequency of interaction. *Entrepreneurship & Regional Development*, *28*(5-6), 337-357. https://doi.org/10.1080/08985626.2016.1154984

Simon, H. (2009). *Hidden Champions of the Twenty-First Century: Success Strategies of Unknown World Market Leaders.* Berlin: Springer Science and Business Media. https://doi.org/10.1007/978-0-387-98147-5

Simon, H. (2018). Hidden Champions: Innovative Speerspitze der Globalisierung. In J.-P. Büchler (Ed.), *Fallstudienkompendium Hidden Champions. Innovationen für den Weltmarkt* (pp. 3-19). Wiesbaden: Springer Gabler. https://doi.org/10.1007/978-3-658-17829-1_1

Simon, H. (2020). Erfolgsfaktoren von Hidden Champions bei der Digitalisierung. In M. Bruhn, C. Burmann & M. Kirchgeorg (Eds.). *Marketing Weiterdenken. Zukunftspfade für eine marktorientierte Unternehmensführung* (pp. 151-161). Wiesbaden: Springer Gabler. https://doi.org/10.1007/978-3-658-31563-4_8

Simon, H. (2021a). *Hidden Champions – Die neuen Spielregeln im chinesischen Jahrhundert*. Frankfurt am Main: Campus.

Simon, H. (2021b). Hidden Champions – Muy importante para las regiones. *Documentos a debate – IDOE (Instituto de Dirección y Organización de Empresas, Universidad de Alcalá), 112*. https://hermannsimon.com/wp-content/uploads/2021/07/DB-112.pdf

Slack (2021). *Company website*. https://slack.com

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. & Beer, A. (Eds.) (2021). Handbook on City and Regional Leadership. Research Handbooks in Urban Studies series. Edward Elgar Publishing. https://doi.org/10.4337/9781788979689

Sotarauta, M., Beer, A., & Gibney, J. (2017). Making sense of leadership in urban and regional development. *Regional Studies, 51*(2), 187-193. https://doi.org/10.1080/00343404.2016.1267340

Sotarauta, M., Horlings, I., & Liddle, J. (2012). *Leadership and Change in Sustainable Regional Development.* London: Routledge. https://doi.org/10.4324/9780203107058

Sotarauta, M., Kurikka, H., & Kolehmainen, J. (2022). Change agency and path development in peripheral regions: from pulp production towards eco-industry in Lapland. *European Planning Studies*. Advance online publication. https://doi.org/10.1080/09654313.2022.2054659

Statistisches Bundesamt (2021). *Gemeindeverzeichnis – Online*. https://www.statistikportal.de/de/gemeindeverzeichnis

Statistisches Landesamt Baden-Württemberg (2020). *Exportquote im Bundesländervergleich.* https://www.statistik-bw.de/HandelDienstl/Aussenhandel/AH-XP_exportquote.jsp

Sternberg, R., & Arndt, O. (2001). The Firm or the Region: What Determines the Innovation Behavior of European Firms?. *Economic Geography, 77*(4), 364-382. https://doi.org/10.2307/3594106

Stiftung Familienunternehmen (2020). *Die Bedeutung der Familienunternehmen für ländliche Räume. Beitrag für Wohlstand und Zusammenhalt.*

https://www.familienunternehmen.de/media/public/pdf/publikationen-studien/studien/Die-Bedeutung-der-Familienunternehmen-fuer-laendliche-Raeume_Studie_Stiftung-Familienunternehmen.pdf

Stimson, R. J., Stough, R., & Salazar, M. (2009). *Leadership and institutions in regional endogenous development*. London: Edward Elgar Publishing. https://doi.org/10.4337/9781848449435

Storper, M., Kemeny, T., Makarem, N., & Osman, T. (2015). *The Rise and Fall of Urban Economies - Lessons from San Francisco and Los Angeles.* Stanford: Stanford University Press. https://doi.org/10.1515/9780804796026

Streeck, W. (2009). *Re-Forming Capitalism: Institutional Change in the German Political Economy*. Oxford: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199573981.001.0001

Suwala, L., & Micek, G. (2018). Beyond clusters? Field configuration and regional platforming: the Aviation Valley initiative in the Polish Podkarpackie region. *Cambridge Journal of Regions, Economy and Society, 11*(2), 353-372. https://doi.org/10.1093/cjres/rsy010

Suwala, L., & Schlunze, R. D. (2019). The Stony Path of Management Geography. *SIEM Bulletin*, *1*(1), 1-5. http://hdl.handle.net/10419/221961

Suwala, L., & Albers, H. (2020). Corporate Spatial Responsibility and Sustainable Development Goals. In W. Leal Filho, A. Azul, L. Brandli, A. Lange Salvia, & T. Wall (Eds.). D*ecent Work and Economic Growth. Encyclopedia of the UN Sustainable Development Goals* (pp. 141-153). Berlin: Springer. https://doi.org/10.1007/978-3-319-71058-7_129-1

Sydow, J., Lerch, F., Huxham, C., & Hibbert, P. (2011). A silent cry for leadership: Organizing for leading (in) clusters. *The Leadership Quarterly*, *22*(2), 328-343. https://doi.org/10.1016/j.leaqua.2011.02.008

The Atlantic (2021). *Superstar Cities Are in Trouble.* https://www.theatlantic.com/ideas/archive/2021/02/remote-work-revolution/617842/

Toften, K., & Hammervoll, T. (2009). Niche firms and marketing strategy: An exploratory study of internationally oriented niche firms. *European Journal of Marketing*, *43*(11/12), 1378-1391. https://doi.org/10.1108/03090560910989948

Townsend, L., Sathiaseelan, A., Fairhurst, G., & Wallace, C. (2013). Enhanced broadband access as a solution to the social and economic problems of the rural digital divide. *Local Economy*, 28(6), 580-595. https://doi.org/10.1177/0269094213496974

Trippl, M., Tödtling, F., & Lengauer, L. (2009). Knowledge sourcing beyond buzz and pipelines: evidence from the Vienna software sector. *Economic geography*, *85*(4), 443-462. https://doi.org/10.1111/j.1944-8287.2009.01047.x

Tödtling, F., & Trippl, M. (2005). One size fits all?: Towards a differentiated regional innovation policy approach. *Research Policy*, *34*(8), 1203-1219. https://doi.org/10.1016/j.respol.2005.01.018

Venohr, B., & Meyer, K. (2007). The German Miracle Keeps Running: How Germany's Hidden Champions Stay Ahead in the Global Economy. *Berlin School of Economics Working Papers, 30*(1), 1-33. https://doi.org/10.2139/ssrn.991964

Virkkala, S. (2007). Innovation and Networking in Peripheral Areas - a Case Study of Emergence and Change in Rural Manufacturing. *European Planning Studie*s, *15*(4), 511-529. https://doi.org/10.1080/09654310601133948

Voegtlin, C., Patzer, M., & Scherer, A. G. (2012). Responsible Leadership in Global Business: A New Approach to Leadership and Its Multi-Level Outcomes. *Journal of Business Ethics, 105*(1), 1-16. https://doi.org/10.1007/s10551-011-0952-4

Vonnahme, L., & Lang, T. (2017). *Rethinking territorial innovation: World market leaders outside of agglomerations*. Leipziger Universitätsverlag. https://research.uni-leipzig.de/~sfb1199/app/uploads/2017/11/wp6_a02_vonnahme-lang_final.pdf

Vonnahme, L. (2021). *Knowledge creation and innovation beyond agglomeration: The case of Hidden Champions in Germany*. Dissertation. Leipzig University. https://www.researchgate.net/publication/353806954_Knowledge_creation_and_innovation_beyond_agglomeration_The_case_of_Hidden_Champions_in_Germany

Voudouris, I., Lioukas, S., Makridakis, S., & Spanos, Y. (2000). Greek hidden champions: lessons from small, little-known firms in Greece. *European Management Journal, 18*(6), 663-674. https://doi.org/10.1016/s0263-2373(00)00057-8

Watts, H. D., Wood, A. M., & Wardle, P. (2006). Owner-managers, clusters and local embeddedness: small firms in the Sheffield (UK) metal-working cluster. *Entrepreneurship and Regional Development, 18*(3), 185-205. https://doi.org/10.1080/08985620600680141

Weingarten, P., & Steinführer, A. (2020). Daseinsvorsorge, gleichwertige Lebensverhältnisse und ländliche Räume im 21. Jahrhundert. *Zeitschrift für Politikwissenschaft, 30*(4), 653-665. https://doi.org/10.1007/s41358-020-00246-z

Westlund, H., & Adam, F. (2010). Social capital and economic performance: A meta-analysis of 65 studies. *European Planning Studies, 18*(6), 893-919. https://doi.org/10.1080/09654311003701431

Westlund, H., & Gawell, M. (2012). Building social capital for social entrepreneurship. *Annals of Public and Cooperative Economics, 83*(1), 101-116. https://doi.org/10.1111/j.1467-8292.2011.00456.x

Williger, B., & Wojtech, A. (2018). *Digitalisierung im ländlichen Raum. Status Quo & Chancen für Gemeinden*. Whitepaper. Fraunhofer SCS. https://www.scs.fraunhofer.de/de/publikationen/studien/white-paper-digitalisierungimlaendlichenraum.html

Winter, J. (2020). The evolutionary and disruptive potential of Industrie 4.0. *Hungarian Geographical Bulletin, 69*(2), 83-97. https://doi.org/10.15201/hungeobull.69.2.1

Wirtschaftsregion Lausitz (2018). *Regionales Investitionskonzept Lausitz*. https://www.bmwi.de/Redaktion/DE/Downloads/P-R/regionales-investitionskonzept-lausitz.pdf

Witt, A., & Carr, C. (2013). A Critical Review of Hidden Champions and Emerging Research Findings on Their International Strategies and Orientations. In G. Cook & J. Johns (Eds.). *The Changing Geography of International Business* (pp. 95-113). London: Palgrave Macmillan. https://doi.org/10.1057/9781137277503_7

Wittenstein, D. (2020). Champions of Digital Transformation? The Dynamic Capabilities of Hidden Champions. *ZEW – Centre for European Economic Research Discussion Paper*, No. 20-065. https://doi.org/10.2139/ssrn.3736759

Xue, H., Ren, X., Li, S., Wu, X., Cheng, H., Xu, B., Gu, B., Yang, G., Peng, C., Ge, Y., & Chang, J. (2013). Assessment of private economic benefits and positive environmental externalities of tea plantation in China. *Environmental Monitoring and Assessment, 185*(10), 8501-8516. https://doi.org/10.1007/s10661-013-3191-6

Yannopoulos, P. (2010). The market share effect: New insights from Canadian data. *Journal of Global Business Management, 6*(2). http://www.jgbm.org/page/previous_V6-2.htm

Yeung, H. W. C. (2009). Regional Development and the Competitive Dynamics of Global Production Networks: An East Asian Perspective. *Regional Studies, 43*(3), 325-351. https://doi.org/10.1080/00343400902777059

Yeung, H. W. C. (2016). *Strategic Coupling: East Asian Industrial Transformation in the New Global Economy.* Ithaca: Cornell University Press. https://doi.org/10.7591/cornell/9781501702556.001.0001

Yin, R. K. (2011). *Applications of Case Study Research.* Thousand Oaks: Sage.

Yin, X., Chen, J., & Li, J. (2019). Rural innovation system: Revitalize the countryside for a sustainable development. *Journal of Rural Studies*. Advance online publication. https://doi.org/10.1016/j.jrurstud.2019.10.014

Appendix

Appendix 1: Interview guide: Hidden Champions – Digitalization

Strategies, potentials and challenges of digitalization

- How do you assess the potential and challenges/ hurdles of digitalization / digital transformation / Industry 4.0 for your company?
- Does your company have a digitalization / digital transformation / Industry 4.0 strategy? If so, what is its focus?
- What are success factors for your company that have contributed to the successful exploitation of digitalization potentials? Which ones could make a complementary contribution?

Digitalization and innovation

- Which digitalization-related product innovations have been implemented in your company or are in planning?
- Which digitalization-related business model innovations have been implemented in your company or are in planning?
- Which process innovations have been implemented in your company or are in planning? How does this differ according to company function?
- Which digitalization-related organizational innovations and working methods have been implemented in your company or are in planning? How does this differ according to corporate function?

Digitalization and innovation cooperation

- How does digitalization change research & development collaborations and product development collaboration with customers and suppliers?
- How does digitalization change cooperation with research and development units at other company locations?

Effects of digitalization on location requirements

- How does digitalization change the location requirements of your company? For example, what does this mean for your infrastructure and workforce requirements?
- How do the changed location requirements differ for production, research & development and other steering and support functions? Which of these functions are located at this site?
- How does digitalization change the attractiveness of your main location for your company?

Appendix 2: Interview guide: Hidden Champions – Regional integration

Connection to the region

- What connects your company with the region?
- To what extent can the region be considered a success factor for your company?

Regional economy and digitalization

- What relationships does your company have with other companies in its own region?
- How does digitalization change your company's relationships with other companies in the region?
- To what extent does your company serve as a role model, development partner or incubator for other SMEs and startups in the region?

Innovation collaborations and digitalization

- Does your company have regional research/development collaborations with research/education institutions or other companies?
- How are these changing as a result of digitalization?

Workforce and digitalization

- Does digitalization change your in-house education and training of workers?
- To what extent do regional educational institutions such as universities or vocational schools train workers according to your digitalization requirements?
- Are there frequent job transfers of workers between your and other regional companies?
- Municipal politics/civil society and digitalization
- What relationships does your company have with municipal politics and other public actors such as economic development agencies and chambers of commerce and industry?
- How are these relationships changing as a result of digitalization?
- How is your company's regional engagement changing as a result of digitalization? Are incentives to engage regionally increased or decreased?

Political support for digitalization

- What policy measures would help you stay rooted in your region?
- What political support for digitalization would be desirable for your company?

Appendix 3: Interview guide: Regional actors – Regional integration

Effects of digitalization on location requirements

- How is digitalization changing the location requirements of Hidden Champions in your region? What does this mean for infrastructure and workforce, for example?
- What opportunities and risks are associated with digitalization for your region in relation to the local economy?
- How is the attractiveness of your region as a location changing as a result of digitalization?

Connection to the region

- What connects the Hidden Champions with your region?
- To what extent do Hidden Champions see your region as creating identity or as a success factor?
- To what extent can your region benefit or be harmed by this connection, if any?

Regional economy and digitalization

- What relationships do the Hidden Champions have with other companies in the region?
- How is digitalization changing the relationships of Hidden Champions to other companies in the region?
- To what extent do Hidden Champions in your region serve as role models, development partners, or incubators for other SMEs and startups in the region?

Regional politics/civil society and digitalization

- What relationships do Hidden Champions in your region have with regional politics and other public actors such as economic development agencies and chambers of commerce?
- How are these relationships changing as a result of digitalization?
- How does digitalization change the regional engagement of Hidden Champions? Are there increased or decreased incentives to engage regionally?

Political support for digitalization

- What measures on the part of policymakers would help Hidden Champions stay rooted in your region?
- What political support for digitalization would be desirable for the Hidden Champions in your region? How does this differ by supraregional and regional level?
- Could the effects of digitalization on rural areas be better answered through inter-municipal cooperation?

Curriculum Vitae

Carsten Rietmann is a research associate at the Institute of Economic and Cultural Geography at Leibniz University Hannover. Born on 20 April 1991 in Cologne, he received his higher education entrance qualification in 2010. He completed his B.Sc. degree in Geography with a specialization in economic geography and economics at Leipzig University in 2014. During these undergraduate studies, he spent two semesters at Binghamton University – State University of New York. Subsequently, he completed his M.A. degree in Geography at the University of California, Los Angeles (UCLA) in 2017. In the course of his studies, he received scholarships from the German Academic Scholarship Foundation (Studienstiftung des deutschen Volkes), the Fulbright Commission, the German Academic Exchange Service (DAAD), and the Regents of the University of California. After his graduate degree, he worked for three years as a consultant for Kearney, a global management consulting firm. Thereafter, he started his doctoral studies in 2020 at Leibniz Universität Hannover, supervised by Prof. Dr. Ingo Liefner. The doctoral research was funded by the German Federal Department of Food and Agriculture.

List of Publications

Rietmann, C. (2021). Digital pioneers in the periphery? Toward a typology of rural Hidden Champions in times of digitalization. *Journal of Small Business & Entrepreneurship*. Advance online publication. https://doi.org/10.1080/08276331.2021.1979909

Rietmann, C. (2021). Hidden Champions and their integration in rural regional innovation systems: Insights from Germany. *Zeitschrift für Wirtschaftsgeographie/ZFW – Advances in Economic Geography*. Advance online publication. https://doi.org/10.1515/zfw-2021-0024

Rietmann, C. (2022). Corporate responsibility and place leadership in rural digitalization: The case of Hidden Champions. *European Planning Studies*. Advance online publication. https://doi.org/10.1080/09654313.2022.2059345