

## **Regional Innovation Systems and Global Flows of Knowledge**

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## Regional Innovation Systems and Global Flows of Knowledge

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**Abstract:** The literature on regional innovation systems emphasizes the role of the region as locus for interactive learning and knowledge exchange, stressing the importance of (geographical) proximity for innovation (Asheim and Gertler 2005). Even though the importance of extra-regional knowledge is widely acknowledged (Trippi et al. 2015), there has been only little emphasis on the particular role and the nature of global knowledge flows. The aim of this chapter is to explore the differentiated nature of global knowledge flows in regional innovation systems. We provide an overview of the different ways firms can gain access to global knowledge sources. Identified knowledge sourcing channels include international R&D collaborations, foreign direct investments, personally embedded relationships, international mobility of skilled labour, virtual communities and online platforms, and the participation in temporary clusters such as fairs, exhibitions, and conferences (Maskell et al. 2006, Aslesen and Sardo 2016). Depending on regional innovation system preconditions, firms use and combine different knowledge sourcing channels to access global knowledge. Firms in organisationally thick and diversified regional innovation systems have a geographical advantage in accessing knowledge globally, but even firms in peripheral areas can exchange knowledge worldwide, due to improved means of transport and communication at distance. Furthermore, not only multinational companies that are dominated by analytical or synthetic knowledge bases, but even small and medium sized enterprises in symbolic industries are often deeply involved in global knowledge sourcing activities. We illustrate our arguments with interview data collected among New Media firms in southern Sweden and in the Oslo Region in Norway.

**Keywords:** regional innovation systems; globalisation of innovation; knowledge sourcing; new media

**JEL:** O19 ; O33 ; L82 ; L86

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**Title:**

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**Abstract:** The literature on regional innovation systems emphasizes the role of the region as locus for interactive learning and knowledge exchange, stressing the importance of (geographical) proximity for innovation (Asheim and Gertler 2005). Even though the importance of extra-regional knowledge is widely acknowledged (Trippel et al. 2015), there has been only little emphasis on the particular role and the nature of global knowledge flows. The aim of this chapter is to explore the differentiated nature of global knowledge flows in regional innovation systems. We provide an overview of the different ways firms can gain access to global knowledge sources. Identified knowledge sourcing channels include international R&D collaborations, foreign direct investments, personally embedded relationships, international mobility of skilled labour, virtual communities and online platforms, and the participation in temporary clusters such as fairs, exhibitions, and conferences (Maskell et al. 2006, Aslesen and Sardo 2016). Depending on regional innovation system preconditions, firms use and combine different knowledge sourcing channels to access global knowledge. Firms in organisationally thick and diversified regional innovation systems have a geographical advantage in accessing knowledge globally, but even firms in peripheral areas can exchange knowledge worldwide, due to improved means of transport and communication at distance. Furthermore, not only multinational companies that are dominated by analytical or synthetic knowledge bases, but even small and medium sized enterprises in symbolic industries are often deeply involved in global knowledge sourcing activities. We illustrate our arguments with interview data collected among New Media firms in southern Sweden and in the Oslo Region in Norway.

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## **Introduction – from local to global knowledge**

In the literature on regional innovation systems (RIS), innovation is typically seen as localised process and the region as the main arena where innovation and knowledge creation takes place (Moulaert and Sekia, 2003; Asheim and Gertler, 2005). Innovation is understood as the result of knowledge exchange between various actors, and as dependent on relations between firms and their external environment. Companies interact with other organisations to access new knowledge and other innovation-related resources. Relevant RIS organisations include other firms, but also universities and research institutes conducting R&D and education, as well as governmental agencies providing various forms of policy support. Moreover, the innovation behaviour of firms is influenced by a common regional institutional framework, understood as the formal legal rules and the informal social norms that govern individual behaviour and social interactions (North, 1990; Gertler, 2010). Consequently, the RIS literature sees innovation as the outcome of exchanges and interdependencies between various organisations, governed by a common institutional framework that is linked to the geographical context in which innovation takes place (Cooke et al., 1998; Asheim and Gertler, 2005; Cooke et al., 2004).

Spatial and other types of proximity facilitate the exchange of knowledge and foster mutual learning, and consequently, intraregional interactions play a key role for innovation. However not all interactions take place in geographical proximity, and knowledge exchange may well cross regional and national boundaries (Asheim and Isaksen, 2002; Chaminade and Vang, 2008; Trippel et al., 2009). In fact, some scholars argue that it is actually the global exchange of knowledge that provide the most novel ideas and that lead to most radical innovation (Chaminade et al., forthcoming; Fitjar and Rodríguez-Pose, 2012). Even though the importance of extra-regional knowledge is acknowledged in the RIS literature (e.g. Maskell et al. 2006, Trippel et al. 2017), little emphasis is placed on the particular nature of global knowledge flows for different firms and in different regions.

The aim of this chapter is to explore the differentiated nature of global knowledge flows and to discuss in which ways firms can access them. First, we review the RIS literature with a focus on the role of global knowledge<sup>1</sup> for innovation. Recent contributions argue that different types of RIS differ in their propensity to access knowledge globally, arguing that firms in thick and metropolitan regions have better access to international knowledge, while firms in thin and peripheral regions are less exposed to global expertise. Furthermore, the RIS literature argues that firms in industries with different knowledge base vary in their likelihood to source knowledge globally, stressing that analytical industries deal with knowledge that is codifiable and easy to transfer over time and distance, whereas synthetic and in particular

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<sup>1</sup> With the term ‘global’, we refer to knowledge that is available at and sourced over long geographical distance. This typically excludes regional and national, but includes international knowledge sourcing. However, not all cases of international knowledge sourcing would qualify as global (e.g. cross-border collaboration between neighbouring regions).

symbolic industries tend to exchange knowledge in highly localized networks. In this chapter, we seek to extend the literature by providing insights into different ways how firms can gain access to global knowledge, focussing on small and medium sized enterprises (SMEs) and early start-up companies in thick and diversified RIS. We illustrate our arguments with interview data collected among New Media firms in southern Sweden and in the Oslo Region in Norway. We conclude that all firms can benefit from being embedded in global knowledge networks, and depending on RIS and knowledge-base preconditions, they use and combine different knowledge sourcing channels.

### **Differentiated RIS and global knowledge flows**

The RIS approach underlines the role of embeddedness of local actors in a web of interdependencies and a shared social and institutional context that facilitate learning and innovation. Nevertheless, RIS are also conceptualized as open systems in which extra-regional linkages play an important role. This has to do with the fact that regional economies are not self-sufficient and that relevant knowledge is created constantly in other parts of the world (Asheim et al., 2015).

Trippel, Grillitsch, and Isaksen (2017) discuss the role of global knowledge links for new path development in different types of RIS. The authors argue that regions differ in their needs, attractiveness, and absorption capacity for accessing extra-regional knowledge. Building on advances in internationalisation theory, Herstad (2017) argues that regions differ in the incentives and resources they provide to local firms in support of internationalisation.

Organisationally thick and diversified RIS typically exhibit several features that explain a high level of attractiveness and absorption capacity. At the same time, the need for global knowledge links may be smaller than for other regions. A high level of diverse sets of knowledge and skills and capable actors involved in both knowledge exploration and exploitation imply high capacities to identify and appropriate external knowledge. These characteristics, but also the symbolic value of metropolitan regions and their easy accessibility due to advanced communication and transport infrastructures explain the attractiveness for external actors to establish linkages with thick and diversified RIS. But then again, due to the diversity and quality of competences and resources available regionally, metropolitan areas may need global knowledge links to a lesser extent than other types of RIS.

Actors in organizationally thin, peripheral RIS depend to a high degree on extra-regional knowledge linkages in order to innovate and maintain a competitive advantage. The lack of knowledge and skills explains the high need for global knowledge sources in the periphery (Grillitsch and Nilsson, 2015; Chaminade and Plechero, 2015). However, this implies also limited attractiveness and local resources in support of internationalisation (Herstad and Ebersberger, 2015), and low levels of absorptive capacity. It can thus be argued that in peripheral regions innovation-based competitive advantages (in contrast to cost-based

comparative advantages) can only be achieved by enhancing the competencies of regional actors while at the same time facilitating their access to global knowledge sources.

**Table 1: RIS types and global flows of knowledge**

	<b>Organizationally thick &amp; diversified RIS</b>	<b>Organizationally thick &amp; specialized RIS</b>	<b>Organizationally thin RIS</b>
<b>NEED for extra-regional knowledge</b>	LOW (well-endowed with endogenous knowledge sources)	HIGH (extra-regional knowledge is key to overcome lock-in and to strengthen existing specialisation)	HIGH (need to compensate for weak local knowledge endowment)
<b>SUPPORT for (endogenous) extra-regional knowledge sourcing</b>	HIGH (point of convergence in international networks and labor mobility flows)	HIGH (for the specialized industrial sectors) LOW (for industrial sectors not part of initial specialization)	LOW (limited international contact points and experiences with international operations)
<b>ATTRACTIVENESS for (exogenous) extra-regional knowledge</b>	HIGH (attractive for external actors to create linkages with metropolitan areas)	LOW (overall low due to lacking diversity and attractiveness in particular for international talent) HIGH (for the specialized industrial sectors which will attract relevant skills and knowledge)	LOW (low accessibility and attractiveness)
<b>ABSORPTION CAPACITY for extra-regional knowledge</b>	HIGH (diverse local knowledge base and capable public and private sector actors)	HIGH absorption capacity for <i>related</i> knowledge LOW capability to absorb <i>unrelated</i> knowledge	LOW (lack of local skills and relative homogenous knowledge bases)

Source: own draft inspired by Tripl, Grillitsch, and Isaksen (2017) and Herstad and Ebersberger (2015)

The relative need, attractiveness, and absorption capacity differs also for (old) industrial regions, i.e. regions that are specialized in a relatively narrow and typically traditional industry (Hassink, 2005; Cooke, 1995; Tödtling and Tripl, 2004). Such regions are often well embedded in global production networks (Henderson et al., 2002; Coe et al., 2004; Chaminade and Vang, 2008), implying that actors have a relative high absorptive capacity and attractiveness to establish and generate value from global knowledge linkages within the same area of specialization. This supports incremental innovations in terms of improvement of products and processes. However, due to cognitive myopia (Maskell and Malmberg, 2007)

and different forms of lock-in (Grabher, 1993; Hassink, 2010), actors in such regions have a relatively low capability to identify, absorb, and attract knowledge in unrelated fields. This becomes a problem when the respective industry matures or declines thus requiring more radical change. Finally, specialised regions are faced with the challenge that the local economy has limited capacity to absorb spillovers and transform them into impetuses for innovation outside current strongholds.

Table 1 provides an overview of the theoretical arguments made above (see also Tripl, Grillitsch, and Isaksen 2017 for an elaboration on the role of non-local knowledge for regional industrial change).

### **Knowledge bases and the geography of knowledge flows**

In addition to the characteristics of the RIS in which they are located, the propensity of firms to engage into global knowledge exchange also differs with regard to the type of knowledge applied and exchanged in the course of innovation (e.g. Laestadius, 1998; Moodysson, 2007; Gertler, 2008; Asheim et al., 2011). Three types of knowledge bases are distinguished in the RIS literature, namely analytical, synthetic and symbolic, that differ in various respects such as the rationale for knowledge creation, the development and use of knowledge, the actors involved and the role of spatial proximity in the innovation process (Asheim et al., 2011).

Amongst other, the knowledge base distinction has been applied to study industry specific differences in the geography of knowledge flows. Existing studies reveal clear differences between industries when it comes to the global reach and the actors involved in knowledge exchange (Plum and Hassink, 2011; Martin and Moodysson, 2013; Martin, 2013; Herstad et al., 2014). In analytical industries, innovation involves strongly codified and universally valid knowledge, which is relatively easy to transfer over time and distance. Analytical knowledge is not bound to a particular geographical area, which opens up possibilities for global knowledge exchange. Consequently, firms source and exchange knowledge in globally configured epistemic communities and with highly specialised knowledge providers in different parts of the world. Important knowledge providing organisations include universities and other public and private research organisations. In synthetic industries, innovation relies on the application of existing knowledge in new ways, often taking the form of concrete problem solving and interactive learning with customers and suppliers. More than in other industries, fruitful cooperation and knowledge exchange requires trust and reciprocity that needs to be earned through repeated interactions and face-to-face meetings. Relatively little collaboration takes place over long distance, while national or regional networks prevail. Innovation in symbolic industries is even more governed by the local context, and firms collaborate with a number of altering partners in close geographical proximity. Companies change their cooperation partners frequently. They are tied together for the short period of an innovation project before they switch to other projects and other collaboration partners. The importance of cultural knowledge and project-based innovation implies that knowledge



exchange in symbolic industries takes place primarily within localized networks (Plum and Hassink, 2014; Manniche and Larsen, 2013).

**Table 2: Knowledge bases and global knowledge flows**

	<b>Analytical</b>	<b>Synthetic</b>	<b>Symbolic</b>
<b>Actors involved in innovation</b>	Collaboration between research units, universities, R&D centres	Interactive learning with customers and suppliers	Experimentation in studios, flexible project teams
<b>Knowledge types</b>	Strong codified knowledge, highly abstract, know why	Partially codified knowledge, strong tacit component, know how	Importance of cultural knowledge, sign values; know who
<b>Context specificity of knowledge</b>	Meaning relatively constant between places	Meaning varies between places	Meaning highly variable between place, class and gender
<b>Dominant geography of knowledge flows</b>	Highly global	Primarily national/regional	Highly regional/local
<b>Global network linkages</b>	Extensive R&D contracting & collaboration possible due to codifiability of knowledge	Selective R&D contracting & collaboration; stronger search, communication and absorptive capacity constraints due to tacitness and complexity of knowledge	Events & internet platforms Interpersonal networks

Source: own draft inspired by Asheim and Gertler 2005, Martin and Moodysson 2013

While these findings on the geography of knowledge flows generally hold true on an industry level, micro-level studies stress that there exists strong heterogeneity between firms in the same industry (Srholec and Verspagen, 2012). Firms in one industry may rely on different competencies and specialise into different activities (see, for instance, Pina and Tether, 2016: on knowledge intensive business services). In fact, combinations of knowledge bases can occur at the level of the industry and at the level of firms. This argument has been advanced in recent works on knowledge base combinations (Manniche et al., 2014; Grillitsch et al., 2016), indicating that innovations are often the result of diverse knowledge inputs that are acquired from various sources and combined in the innovation process.

From the discussion above follows that firms located in different RIS and belonging to different industries also differ in their likelihood to engage into global knowledge network. While firms in science-based industries located in peripheral RIS would have the strongest

need to engage into global knowledge network (for instance, the space industry located in Kiruna/Northern Sweden), firms in symbolic industries located and thick and diversified RIS are already well served by locally available knowledge (for instance, New Media in Malmö/Southern Sweden). In the following, we go beyond the argument that particular knowledge sourcing geographies prevail in different industries and regions. Instead, we show by using the cases of New Media in southern Sweden and in Oslo, that even firms that are best served by local knowledge (i.e. firms in symbolic industries and located and thick and diversified RIS) access global flows of knowledge, by using a range of different knowledge sourcing channels. The research question we address in this chapter is the following:

*Through which mechanisms do firms in symbolic industries located and thick and diversified RIS source knowledge globally?*

### **Firms and global knowledge sourcing mechanisms**

Research in the tradition of international business (Fernhaber et al., 2008; Johanson and Vahlne, 2009) provides a number of indications on how firms may access knowledge globally. Typically, much attention has been devoted to foreign direct investments (FDI) and the question of whether technology and knowledge transfers within multinational enterprises (MNEs) are associated with spillovers into the region (Fosfuri et al., 2001; Balsvik, 2011; Henderson, 2007; Belderbos et al., 2008; Görg and Strobl, 2005; Görg and Greenway, 2004). Recently, it has been acknowledged that globalisation of innovation is not confined to MNEs and FDI, and more attention has been paid to other types of knowledge linkages. For instance, outsourcing of R&D to foreign partners may provide the basis for learning at home (D'Agostino et al., 2012) and for stronger, more committed international linkages to form at later stages (Maskell et al., 2007). Of particular importance among these is innovation *collaboration* (Herstad and Ebersberger, 2015). Collaborative linkages involves committed two-way exchanges of knowledge between independent organisations located in different countries that as such have the capacity to transfer complex, tacit knowledge (Ebersberger and Herstad, 2011; Torre, 2008). Some authors therefore consider collaborative ties a defining characteristic of 'global innovation networks' (GINs) (Herstad et al., 2014).

Until recently, research in the RIS tradition expressed concerns that global innovation networks would decouple firms from the local collaboration networks on which local knowledge dynamics were assumed to depend. This has now shifted to an emphasis on the importance of external learning interfaces for regions to avoid lock-in. Moreover, the knowledge dynamics of locations are now to a lesser extent assumed to depend on the collaborative linkages, than associated with informal relationships and labour market mobility (e.g. Cotic-Svetina et al., 2008). In line with that, the focus of investigation has been broadened. First, from attention specifically to technology transfer and the governance implications of inward FDI (Brown, 2000; Asheim and Herstad, 2005), to research on knowledge transfers within and around multinationals more generally (Meyer et al., 2011; Bellak, 2004). Second, from attention predominantly to the role of FDI in the globalisation of

innovation, to a strong interest in innovation collaboration as means by which firms that are not multinationals establish linkages to actors, regions and networks abroad. This broadening include, third, a call for research to look beyond the realm of formal business networks (Rutten and Boekema, 2012), and consider how informal relationships and processes beyond the direct control of the firm (i.e. ‘untraded interdependencies’) influences their knowledge bases, search spaces, organisational routines and thus innovation capacities (Coviello and Munro, 1997; Solheim and Fitjar, 2016).

Such informal relationships can be of various nature. *Labour mobility* is one important mechanism for firms to acquire knowledge. International mobility often provides novel competencies that are particularly valuable for innovation in firms and regions (Saxenian, 2006; Williams et al., 2004). Studies have shown that companies value international labour mobility as a means of fostering cultural diversity and redistributing international expertise across their branches (Williams, 2007; Williams et al., 2004). Moreover, *temporal professional gatherings* are seen as important for creating global knowledge linkages. This was emphasized already by Maskell et al. (2006), who coined the term ‘temporary clusters’, and by Torre (2008), who argues that they create ‘temporary geographical proximity’, which allows for knowledge transmission between actors who are usually located at distance. Furthermore, it has been recognized that firms acquire knowledge globally through *online platforms and virtual communities*, comprising internet fora such as social networking sites, blogs, listservers, and shared interest sites (Miller et al., 2009; Grabher and Ibert, 2014; Aslesen and Sardo, 2016). Online communities can span over large distance, and typical gather around a certain interest field or technology. Examples for virtual communities can be found amongst others in the healthcare sector, where medical practitioners use online platforms to share common concerns and problems and thereby increase their medical knowledge and their confidence in their ability to provide health care (Sims, 2016). According to Aslesen and Sardo (2016), the virtual dimension in the creation and support of knowledge linkages on a global scale requires more attention, even though scholars have recently started to examine the geography of virtual spaces (Rallet and Torre, 2009). Further, *personally embedded networks* can be enablers for inter-organizational knowledge exchange, when skilled employees exchange ideas across organizational boundaries or seek help from former colleagues and other associates that they met in the course of their professional carriers. Often, inter-organizational collaboration in form of strategic alliances or R&D collaborations are mediated through inter-personal relations between managers or research staff. Such knowledge transfer mechanisms demands that complementarities between different formal and informal mechanisms are accounted for, as they influence one another through dynamic complementarities that also influence their combined effects on the innovation capacities of firms (Ebersberger and Herstad, 2011; van Beers and Zand, 2014).

Common to these perspectives is that they, implicitly or explicitly, conceptualize global innovation network linkages as interlinked with local economy characteristics, and draws attention to the symbiotic relationship between the global and the local. On the one hand, local institutional and industrial conditions attract or deter (different types of) inward FDI, and provide firms with incentives for tapping global knowledge flows that may or may not be

backed by local resources in its support (O'Farrell et al., 1996; Herstad and Ebersberger, 2015; Ebersberger et al., 2014). Such include privileged local contact points to global networks, due to the presence of 'gatekeepers' (Graf, 2010) and favourable positions in international labour mobility flows (e.g. Oettl and Agrawal, 2008). On the other hand, they influence the capacity of regions to absorb the resources that local firms access globally (Meyer and Sinani, 2009; Boschma and Iammarino, 2009), and transform them into impetuses for innovation-based growth.

### **Introduction to the cases - the media industries in southern Sweden and Oslo**

In the following, we will turn to the question how firms in the New Media industry in southern Sweden and the Oslo Region acquire knowledge globally.

The New Media industry covers a range of activities related to the generation of media content and the development and use of media technology (Cooke, 2002; Martin and Moodysson, 2011). New Media is part of the creative and cultural industries, in which symbolic knowledge plays a central role, but firms also rely on synthetic knowledge to develop technological solutions to display and distribute media content. Innovation is typically organized in short-term projects involving a range of different collaboration partners, often in close geographical proximity (Grabher, 2002; Cooke, 2002). The flexible and project-based nature of innovation as well as the context specificity of symbolic knowledge implies that New Media companies have a strong tendency to cluster geographically, which could also be observed in the two case studies analysed in this chapter.

Both regions, southern Sweden and Oslo, can be regarded as thick and diversified RIS. As the capital of Norway, Oslo is the centre of the national media industry with major TV, radio and publishing companies having their headquarters in the region. The media industry further covers a very large share of small- and medium-sized firms that develop media-related technologies and provide creative media content partly to the national media outlets. In southern Sweden, the media industry is a rapidly growing sector and comprises today of approximately 360 innovative SMEs, as well as a dedicated RIS support structure. The support structure includes a cluster initiative (Media Evolution, ME), a large business park (Media Evolution City, MEC) and business incubator (Malmö Incubator MINC) that supports new start-ups in the industry, as well as a study programme and a research centre on New Media at the local university (Malmö University).

The empirical analysis is based on document studies and in-depth interviews with firm representatives. In total, 32 firms were interviewed, 16 firms in southern Sweden and 18 firms in Oslo. The firm population was identified on the basis of business statistics and sectoral codes (parts of NACE 58-63 and 73-74). Contact was made with RIS support organizations to identify companies that are innovative and maintain global knowledge linkages. The sample of interviewed firms was constructed to represent a large variation with respect to different subsectors and firm sizes (from 5 to 250 employees). The interviews were conducted between

January and July 2016 and lasted between 60 and 90 minutes. The interviews were transcribed and analysed with regards to the nature of global knowledge sourcing.

### **Empirical analysis - how firms gain access to global knowledge sources**

Despite the prevalence of local knowledge exchange that is typical for firms in symbolic industries and in thick and diversified RIS, all interviewed firms use a number of mechanisms to access knowledge globally. Based on a review of the literature and the interview material, we identify seven key mechanisms that are used to access global knowledge (See table 3).

**Table 3: Knowledge sourcing channels in the media industry and their spaces**

<b>Knowledge sourcing channel</b>	<b>Frequency</b>	<b>Traded/untraded</b>	<b>Space</b>
Virtual communities and online platforms	frequent	untraded	global
Temporary professional gatherings	frequent	untraded	global, partly local
Personally embedded networks	frequent	untraded	local, partly global
Mobility of skilled labour	frequent	untraded	local, few global
R&D collaborations	rare	traded	local, few global
Foreign direct investments (FDI)	rare	traded	global
Hierarchies	rare	traded/untraded	global

Source: own draft

One of the most important knowledge sourcing mechanisms used by the firms are *online platforms and virtual communities*. In online communities, new and often economically useful knowledge is generated through interaction between users and producers and despite an absence of co-location and geographical proximity. Grabher and Ibert (2014) demonstrate that knowledge practices in online communities can achieve quite demanding collective goals in a wide range of domains, including business areas such as furniture, photography, ICT and drug development. They can generate substantial value for the involved actors, ranging from collective knowledge creation and innovation to power, influence and prestige that arise from engagement with these communities (Agarwal et al., 2008). By creating organizational proximity, virtual spaces have the ability to compensate for a lack of geographical proximity for interactive learning. Romano et al. (2001) go so far as to talk of “virtual clusters”, in cases where customers, suppliers, distributors and business providers are linked in digital networks, through which they collaborate, compete and exchange knowledge with one another. In virtual clusters, tacit and codified knowledge are created and exchanged through diverse media channels, with “sharing” as main governance mechanism (Romano et al., 2001).

The importance of digital platforms and online communities has also become apparent in the interviews as all interviewed firms connect to the internet and access new ideas through virtual communities. This includes in particular technology forums that are used to search for solutions for practical problems that occur in the innovation process by actively taking part in online groups and engage into interactive problem solving, often with technology developers and users. Frequently mentioned example are software development platforms that are

specialised on mobile operating systems (in particular Android or iOS). Companies interact on these platforms to find solutions to technological problems related to the display and distribution of media content on different media devices (e.g. displaying media content on mobile phones, tablet computers and TV sets). Rather than being confined to the region, these technologically-centred online communities have a global reach.

*“This [conference] is more for inspiration, rather than to get the...the real knowledge. Basically, the real knowledge they’re gonna find online.”* (Firm representative, southern Sweden)

A second important knowledge sourcing channel are *temporary professional gatherings*, including conferences, conventions and trade fairs (Maskell et al., 2006; Bathelt et al., 2014; Torre, 2008; Comunian, 2016; Rallet and Torre, 2009; Power and Jansson, 2008). Such gatherings are used by firms to exhibit their latest and most advanced new products and services, which are then examined and evaluated by peers and competitors, as well as by customers and suppliers. Firms undertake considerable investments in terms of time and money to participate in these events, in order to identify the latest market developments and trends and to advance their own innovation strategies. Temporary clusters serve as a forum for information exchange concerning latest market trends, experiences and requirements for future products and services and gives insights that triggers new discussions and ideas at the firm level (Maskell et al., 2006). Some say that what is played out at the conference scene itself is not what is most important; it is to meet the right people. During a trade fair, firms establish social relations with their customers and attempt to attract new customers to market their products, and of course to monitor competitors. As many of those temporary professional gathering take place cyclically (Power and Jansson, 2008), often annually, firms intensify their inter-organisational relations through recurring interactions over time, which may well lead to long-term and trustful relationships with partners over large geographical distance.

Among the interviewed media firms, the participation in conferences and trade fair is a common mechanism to meet global partners and acquire knowledge internationally. Depending on their size and their financial scope, the interviewed firms send representatives and qualified employees to professional gatherings in other parts of the world (e.g. Game Developer Conference GDC in San Francisco, CeBIT in Hanover, CrossMedia in London, South by Southwest in Texas, WAN-IFRA conferences), to present their products and to network with other firms, suppliers and customers. Additionally, employees are sent to conferences and fairs that are organized on local or national scale. Participation at local conferences is often less costly and allows to meet up with local partners, customers and decision makers. A yearly summit for game developers in the Nordic countries (Nordic Game Conference in Malmö) as well an annual media conference (The Conference in Malmö), hosted by the local cluster support organisation, are frequently mentioned temporary gathering events. These events are important platforms for local companies to exchange ideas with other local firms, but also to link up to multinational ICT companies, media publishers or potential customers nationally and internationally.

*“We go to conferences. It’s a good way to get inspiration. (...) It’s a good way to get an international input. We have sent people to New York and to Amsterdam and to Norway and here in Malmö, to ‘The Conference’.”* (Firm representative, southern Sweden)

*Personally embedded networks* are a third key mechanism for firms to access knowledge globally. The term refers to interactions between individuals in different firms, who know each other personally and interact beyond official work duties (Grabher and Ibert, 2006; Huber, 2011). Such networks can be informal, but they may also overlap with formalized relations, as long as they involve personal acquaintance and knowledge exchange beyond formal job roles (Huber, 2013). Thus, discussions with strangers (e.g. at conferences or trade fairs) or interactions on virtual platforms would not qualify as personal relationship. Previous collaborations and face-to-face interactions lead to the formation of personal relationships that can be drawn upon in later stages, even in absence of geographical proximity. Huber (2012; 2013) shows that in science-based industries such as ICT, important forms of knowledge exchange occur through personal networks between skilled employees. They are particularly important to acquire business knowledge, that is, when senior managers interact with fellow managers to keep up-to-date on latest developments in their professional domain. Personal networks are argued to be particularly important for creative and cultural industries, where innovation is organized in short-term projects with changing collaboration partners (Grabher and Ibert, 2006; Grabher, 2002). Garmann Johnsen (2011) shows that in symbolic industries, knowledge is often exchanged in a dynamic interplay between formal project collaboration and informal social networking. Even though the regional level plays a vital role for collaboration in symbolic industries, networks are not limited to spatial proximity, but can span over long distances (Vang and Chaminade, 2007; van Egeraat et al., 2013)

Among the interviewed media firms, personal relations play a central role for the acquisition of new knowledge. Even though personal relationships are often situated within the same regional or national context, important relations also span over national boundaries. Many of the interviewed companies are young and small, and the entrepreneur’s personal network is vital to the success of the firm. Personal relations as a source to access knowledge are perceived especially important for these small firms with less financial resources. Personal relations of the entrepreneur and key staff members, very often created during school and college education, play a key role in different respects: First, entrepreneurial activities of former class mates or co-workers often serve as role model and source of inspiration to start a venture. Second, personal relations are often used to draw upon when complementary skills and knowledge are needed for the development of a new product or service. Within their personal networks, the entrepreneurs ask for managerial or technical advice, which they receive informally, based on trust and reciprocity. And third, personal networks are used to acquire knowledge about global markets and business opportunities. Personal contacts to entrepreneurs with experience in other, global markets (in particular in Silicon Valley, USA) have been frequently mentioned by the interviewed firms as important stimulus for innovation and product development:

*“I am getting free knowledge, about digital platforms, that even the biggest Norwegian companies would dream of. That’s the informal kind of buildup.”* (Firm representative, Oslo)

A forth key mechanism to acquire knowledge is *labour mobility*, that is, the movement of skilled personnel between organizations (Williams et al., 2004; Saxenian, 2006; Tripl, 2013). As important types of knowledge are tacit and embodied into people, hiring skilled labour is a natural way for firms to source new knowledge for innovation. Studies that deal with the impact of labour flows on firm performance show that the skills of newly recruited employees should be related, but not too similar to the existing knowledge base of a firm (Boschma et al., 2009; Herstad et al., 2015). Asheim and Hansen (2000) show that skilled labour that draws on symbolic knowledge (e.g. artists, designers, writers) value the quality of place higher than skilled labour that draw on analytical knowledge (e.g. physicists, mathematicians, life-science professionals) or synthetic knowledge (e.g. engineers, technicians), who mostly move to places with strong and diversified regional economies. Alfken (2015) shows that job conditions outweigh the importance of amenity-related factors even for skilled labour in symbolic industries. Inter-regional mobility is typical for creative labour in an early career phase, while geographical mobility decreases in later phases of career development.

The interviewed firms report that recruiting is a key mechanism for getting new knowledge. Being located in a thick and diversified RIS is important in order to attract talent from abroad, which has been emphasized by the firms in Oslo. Some of the companies were in need for specific computer skills which was hard to find locally and even nationally, therefore recruiting international labors. However, most of the New Media industry is characterised by high local labour mobility, as many of the employees are on short-term contracts and further, that some employees are more driven by the specific project they would like to work on than by which company they are hired by. The high local mobility rate (also among leaders) suggests sector transparency (e.g. Herstad and Ebersberger, 2014), and one interviewee meant that the tight network in the sector was a barrier for innovation, a kind of lock-in of a certain mind-set. This suggests a dilemma in symbolic industries between the need to hire people able to adapt innovations to local context, and that of triggering newness from outside. While international orientation and cultural diversity among the staff is considered as important for innovativeness of the firms, staff with different cultural background is usually hired locally, rather than internationally, due to the project-based nature of the industry:

*“One of our value words is ‘diversity’. I think it’s really important that you come from another culture and that you have another way of looking at the problem...but we are getting challenged all the time, it is a really rapid movement and changing a lot”.* (Firm representative, southern Sweden)

Only few companies report of formal international *R&D collaborations*. Some have research collaborations with local and national higher education organizations, very few report of such collaboration internationally. Those that do are characterized by more synthetic knowledge bases, including media-related programming and software development. Formal development contracts with clients are of importance, but most of these clients are local. In the case of



Oslo, several of the companies within production of films, video or TV- and radio programmes have been bought up by MNEs through *Foreign Direct Investments (FDI)* and as such become part of large global entities. Most of these mergers are due to well run production companies with accumulated and specific local knowledge. In both regions, there are examples of firms establishing subsidiaries in other countries in order to be near to their customers. This holds in particular for the larger firms in the sample. Such inward and outward investments lays the ground for intra-firm networks or *hierarchies* that can function as mechanisms for global knowledge flows (Lui and Liefner, 2016; Aslesen et al., 2017). Intra-firm networks are important mechanisms for knowledge flows, which are strengthened by organisational proximity through common identity and language (Boschma, 2005; Aguilera et al., 2012). One of the Oslo-based companies reported that almost 40% of knowledge sourcing came from within the MNC. Knowledge is exchanged through meetings during the year where all subsidiaries, often representing 15-20 countries, meet up to share ideas, formats and views on trends. Having Scandinavian sub-groups that meet more frequently to share ideas and trends seems of particular importance due to similarity in markets and the potential of developing products that can work in all these countries. Scandinavia is also seen as a context where new ideas more easily will be tried out:

“...we get a development culture that regenerates. So it's a high quality on innovation in the territory” (firm representative, Oslo)

## **Conclusions – understanding the global dimension of RIS**

The RIS literature acknowledges the importance of global knowledge sources and the open nature of regional systems, but few studies go beyond this and systematically analyse the nature of global knowledge flows. This chapter contributes to filling this void conceptually and empirically. Conceptually, the paper draws on the RIS and knowledge base approaches in order to conceptualise the regional and industrial context of global knowledge flows. Regions differ in their needs, attractiveness, support, and absorption capacity for global knowledge, which further depends on the prevailing knowledge base of the industries located in the respective regions. According to this conceptual framework, local knowledge is most relevant for firms in symbolic industries (importance of tacit knowledge and cultural embeddedness) located in diverse metropolitan areas (thick and diverse RIS). Empirically, we investigate what role global knowledge plays for and how it is acquired by firms well served with local knowledge. We find that even such firms actively use a variety of mechanisms to source knowledge globally; a finding that underlines the importance of developing a better understanding about the *global dimension of RIS*.

We study firms in the New Media industry, that is, firms anchored in a symbolic knowledge base, located in southern Sweden and Oslo, Norway, two thick and diversified RIS. The study provides evidence that such firms frequently source knowledge globally using informal mechanisms. This includes virtual communities and online platforms, temporary professional gatherings, and personally embedded networks. Furthermore, recruitment of skilled labour is

an important albeit less frequent mechanism for global knowledge sourcing. Notwithstanding some recent literature foregrounding informal mechanisms to source knowledge globally (Grabher and Ibert, 2014; Comunian, 2016; Bathelt et al., 2014), the bulk of literature focusses on R&D collaborations and FDI. Hence, our study raises a question as regards the relative importance of informal, low-cost versus formal, high-cost mechanisms to source knowledge globally. Informal, low-cost mechanisms are used much more frequently than formal, high-cost mechanisms, and they are clearly important. However, it could be the case that informal, low-cost mechanisms do not provide a competitive advantage as they are available to all firms in the New Media industry. This is often the case for virtual communities and online platforms even though limited access based on invitation is possible and used. Access to temporary professional gatherings varies by type, trade fairs are open to everybody while certain workshop and activities may be based on invitations. This leads to personally embedded networks, which are by definition not ubiquitous and depend on previous social interactions. Therefore, we conclude that it is conceivable that informal, low-cost mechanisms to source global knowledge give rise to competitive advantage and should be investigated in more depth.

Furthermore, our study raises the question of how local and global knowledge sourcing relate to each other. In the literature, the argument has been made that local and global knowledge are complementary, that strong local knowledge facilitates the sourcing of global knowledge, which in turn strengthens the local knowledge base. Bathelt et al. (2004) present this as symbiosis between local buzz and global pipelines (however, ignoring informal mechanisms of global knowledge sourcing). Camagni (1995) argues that “external energy”, meaning knowledge from extra-regional sources, adds momentum to an innovative milieu. Belussi and Sedita (2012) argue that it is the combination of local and distant as well as emergent and deliberate knowledge structures that enhances the competitiveness of industrial districts. On the other hand, recent studies suggest that firms potentially are able to compensate for a lack of local knowledge with sourcing knowledge at other geographical scales (Fitjar and Rodríguez-Pose, 2011; Tödtling et al., 2012; Grillitsch and Nilsson, 2015). It remains unclear to what extent local knowledge shapes the access to and possibilities to absorb global knowledge and what conditions this relationship. As an entry to this question, the knowledge base approach has documented different spatial patterns of knowledge networks depending on the type of knowledge industries use (Tödtling and Grillitsch, 2014; Martin, 2013). Equally it may relate to the mode of innovation (Jensen et al., 2007), as well as institutional factors that foster or constrain knowledge flows over distance. This ties in to the question of the relative importance of local versus global knowledge. Following the frequently observed absence of input-output relationships in clusters, it has been widely postulated that the effect of collocation lies in the possibilities to acquire new knowledge, learn and become innovative (Maskell, 2001; Malmberg and Maskell, 2006; Storper, 1995). Depending on the relative importance of local knowledge and the role that global knowledge can play in innovation processes of firms, these knowledge-based explanations of spatial clustering may also need to be revised.

## References

- Agarwal R, Gupta AK and Kraut R. (2008) Editorial Overview—The Interplay Between Digital and Social Networks. *Information Systems Research* 19: 243-252.
- Aguiléra A, Lethiais V and Rallet A. (2012) Spatial and Non-spatial Proximities in Inter-firm Relations: An Empirical Analysis. *Industry and Innovation* 19: 187-202.
- Alfken C. (2015) Ich will nicht nach Berlin! – Life course analysis of inter-regional migration behaviour of people from the field of design and advertising. *Environment and Planning A* 47: 2187-2203.
- Asheim B, Grillitsch M and Trippel M. (2015) Regional Innovation Systems: Past – Presence – Future. *Papers in Innovation Studies*.
- Asheim BT, Boschma R and Cooke P. (2011) Constructing regional advantage: platform policies based on related variety and differentiated knowledge bases. *Regional Studies* 45: 893-904.
- Asheim BT and Gertler MS. (2005) The Geography of Innovation: Regional Innovation Systems. In: Fagerberg J, Mowery DC and Nelson RR (eds) *The Oxford Handbook of Innovation*. Oxford: Oxford University Press, 291-317.
- Asheim BT and Herstad S. (2005) Regional innovation systems, varieties of capitalisms and non-local relations: Challenges from the globalising economy. In: Boschma RA and Kloosterman RC (eds) *Learning from Clusters: A critical Assessment for an Economic-Geographical Perspective*. Dordrecht: Springer.
- Asheim BT and Isaksen A. (2002) Regional Innovation Systems: The Integration of Local ‘Sticky’ and Global ‘Ubiquitous’ Knowledge. *The Journal of Technology Transfer* 27: 77-86.
- Aslesen HW, Hydle KM and Wallevik K. (2017) Extra-regional linkages through MNCs in organizationally thick and specialized RISs: a source of new path development? *European Planning Studies* 25: 443-461.
- Aslesen HW and Sardo S. (2016) Dynamic knowledge linkages and extended innovation. *AAG Annual Meeting 2016*. San Francisco
- Balsvik R. (2011) Is labor mobility a channel for spillovers from multinationals? Evidence from Norwegian manufacturing. *Review of Economics and Statistics* 93: 285-297.
- Bathelt H, Golfetto F and Rinallo D. (2014) Temporary Markets and Temporary Clusters. In: Bathelt H, Golfetto F and Rinallo D (eds) *Trade shows in the globalizing knowledge economy*. Oxford: Oxford University Press, 40-55.
- Bathelt H, Malmberg A and Maskell P. (2004) Clusters and knowledge: local buzz, global pipelines and the process of knowledge creation. *Progress in Human Geography* 28: 31-56.
- Belderbos R, Lykogianni E and Veugelers R. (2008) Strategic R&D location by multinational firms: Spillovers, technology sourcing, and competition. *Journal of Economics & Management Strategy* 17: 759-779.
- Bellak C. (2004) How domestic and foreign firms differ and why does it matter? *Journal of Economic Surveys* 18: 483-514.
- Belussi F and Sedita SR. (2012) Industrial Districts as Open Learning Systems: Combining Emergent and Deliberate Knowledge Structures. *Regional Studies* 46: 165-184.
- Boschma R. (2005) Proximity and Innovation: A Critical Assessment. *Regional Studies* 39: 61-74.
- Boschma R, Eriksson R and Lindgren U. (2009) How does labour mobility affect the performance of plants? The importance of relatedness and geographical proximity. *Journal of Economic Geography* 9: 169-190.
- Boschma R and Iammarino S. (2009) Related Variety, Trade Linkages, and Regional Growth in Italy. *Economic Geography* 85: 289-311.
- Brown R. (2000) Clusters, supply chains and local embeddedness in Fyrstad. *European Urban and Regional Studies* 7: 291-305.
- Camagni R. (1995) The concept of *innovative milieu* and its relevance for public policies in european lagging regions. *Papers in Regional Science* 74: 317-340.
- Chaminade C, De Fuentes C, Harirchi G, et al. (forthcoming) The Geography and Structure of Global Innovation Networks: Global Scope and Regional Embeddedness. In: Doloreux D (ed) *Handbook on the Geography of Innovation*. Edward Elgar.

- Chaminade C and Plechero M. (2015) Do Regions Make a Difference? Regional Innovation Systems and Global Innovation Networks in the ICT Industry. *European Planning Studies* 23: 215-237.
- Chaminade C and Vang J. (2008) Globalisation of knowledge production and regional innovation policy: Supporting specialized hubs in the Bangalore software industry. *Research Policy* 37: 1684-1696.
- Coe NM, Hess M, Yeung HW-c, et al. (2004) 'Globalizing' regional development: a global production networks perspective. *Transactions of the Institute of British Geographers* 29: 468-484.
- Comunian R. (2016) Temporary Clusters and Communities of Practice in the Creative Economy: Festivals as Temporary Knowledge Networks. *Space and Culture* forthcoming.
- Cooke P. (1995) The Rise of the Rustbelt: Revitalizing Older Industrial Regions. London: UCL Press.
- Cooke P. (2002) New Media and New Economy Cluster Dynamics. In: Lievrouw LA and Livingstone S (eds) *Handbook of New Media: Social Shaping and Social Consequences of ICTs*. London: SAGE, 287-303.
- Cooke P, Heidenreich M and Braczyk H-J. (2004) Regional Innovation Systems: The Role of Governance in a Globalized World. 2 ed. New York: Routledge.
- Cooke P, Uranga MG and Etxebarria G. (1998) Regional systems of innovation: an evolutionary perspective. *Environment and Planning A* 30: 1563-1584.
- Cotic-Svetina A, Jaklic M and Prodan I. (2008) Does collective learning in clusters contribute to innovation? *Science and Public Policy* 35: 335-345
- Coviello NE and Munro HJ. (1997) Network relationships and the internationalization process of small software firms. *International Business Review* 6: 361-386.
- D'Agostino LM, Laursen K and Santangelo GD. (2012) The impact of R&D offshoring on the home knowledge production of OECD investing regions. *Journal of Economic Geography*.
- Ebersberger B and Herstad S. (2011) Product innovation and the complementarities of external interfaces. *European Management Review* 8: 117-135.
- Ebersberger B, Herstad S and Koller C. (2014) Does the composition of regional knowledge bases influence extra-regional collaboration for innovation? *Applied Economic Letters* 21: 201-204.
- Fernhaber SA, Gilbert BA and McDougall PP. (2008) International entrepreneurship and geographic location: An empirical examination of new venture internationalization. *Journal of international Business Studies* 39: 267-290.
- Fitjar RD and Rodríguez-Pose A. (2011) When local interaction does not suffice: sources of firm innovation in urban Norway. *Environment and planning. A* 43: 1248-1267.
- Fitjar RD and Rodríguez-Pose A. (2012) Firm collaboration and modes of innovation in Norway. *Research Policy* 42: 128-138.
- Fosfuri A, Motta M and Ronde T. (2001) Foreign direct investment and spillovers through workers' mobility. *Journal of International Economics* 51: 204-222.
- Garmann Johnsen IH. (2011) Formal Project Organization and Informal Social Networks: Regional Advantages in the Emergent Animation Industry in Oslo, Norway. *European Planning Studies* 19: 1165-1181.
- Gertler MS. (2008) Buzz without being there? Communities of practice in context. In: Amin A and Roberts J (eds) *Community, Economic Creativity, and Organization*. Oxford: Oxford University Press, 203-226.
- Gertler MS. (2010) Rules of the Game: The Place of Institutions in Regional Economic Change. *Regional Studies* 44: 1-15.
- Grabher G. (1993) The weakness of strong ties; the lock-in of regional development in the Ruhr area. In: Grabher G (ed) *The Embedded Firm: On the Socioeconomics of Industrial Networks*. London & New York: Routledge, 255-277.
- Grabher G. (2002) The Project Ecology of Advertising: Tasks, Talents and Teams. *Regional Studies* 36: 245-262.
- Grabher G and Ibert O. (2006) Bad company? The ambiguity of personal knowledge networks. *Journal of Economic Geography* 6: 251-271.
- Grabher G and Ibert O. (2014) Distance as asset? Knowledge collaboration in hybrid virtual communities. *Journal of Economic Geography* 14: 97-123.
- Graf H. (2010) Gatekeepers in regional networks of innovators. *Camb. J. Econ.*

- Grillitsch M, Martin R and Srholec M. (2016) Knowledge Base Combinations and Innovation Performance in Swedish Regions. *Economic Geography* forthcoming.
- Grillitsch M and Nilsson M. (2015) Innovation in peripheral regions: Do collaborations compensate for a lack of local knowledge spillovers? *The Annals of Regional Science* 54: 299-321.
- Görg H and Greenway D. (2004) Much ado about nothing? Do domestic firms really benefit from foreign direct investment? *The World Bank Research Observer* 19: 171-197.
- Görg H and Strobl E. (2005) Spillovers from foreign firms through worker mobility: An empirical investigation. *Scandinavian Journal of Economics* 107: 693-710.
- Hassink R. (2005) How to unlock regional economies from path dependency? From learning region to learning cluster. *European Planning Studies* 13: 521-535.
- Hassink R. (2010) Locked in Decline? On the Role of Regional Lock-ins in Old Industrial Areas. In: Boschma R and Martin R (eds) *The Handbook of Evolutionary Economic Geography*. Cheltenham, UK: Edward Elgar, 450-468.
- Henderson J, Dicken P, Hess M, et al. (2002) Global production networks and the analysis of economic development. *Review of International Political Economy* 9: 436-464.
- Henderson JV. (2007) Understanding knowledge spillovers. *Regional Science and Urban Economics* 37: 497-508.
- Herstad S, Aslesen HW and Ebersberger B. (2014) On industrial knowledge bases, commercial opportunities and global innovation network linkages. *Research Policy* 43: 495– 504.
- Herstad S and Ebersberger B. (2014) Urban agglomerations, knowledge intensive services and innovation activity: Establishing the core connections. *Entrepreneurship & Regional Development* 26: 211-233.
- Herstad S and Ebersberger B. (2015) On the link between urban location and the involvement of knowledge intensive business services in collaboration networks. *Regional Studies* 49: 1160-1175.
- Herstad SJ. (2017) Innovation strategy choices in the urban economy. *Urban Studies* Forthc. .
- Herstad SJ, Sandven T and Ebersberger B. (2015) Recruitment, knowledge integration and modes of innovation. *Research Policy* 44: 138-153.
- Huber F. (2011) On the Role and Interrelationship of Spatial, Social and Cognitive Proximity: Personal Knowledge Relationships of R&D Workers in the Cambridge Information Technology Cluster. *Regional Studies* 46: 1169-1182.
- Huber F. (2012) On the Sociospatial Dynamics of Personal Knowledge Networks: Formation, Maintenance, and Knowledge Interactions. *Environment and Planning A* 44: 356-376.
- Huber F. (2013) Knowledge-sourcing of R&D workers in different job positions: Contextualising external personal knowledge networks. *Research Policy* 42: 167-179.
- Jensen MB, Johnson B, Lorenz E, et al. (2007) Forms of knowledge and modes of innovation. *Research Policy* 36: 680-693.
- Johanson J and Vahlne JE. (2009) The Uppsala internationalization process model revisited: From liability of foreignness to liability of outsidership. *Journal of international Business Studies* 40: 1411-1431.
- Laestadius S. (1998) Technology Level, Knowledge Formation and Industrial Competence in Paper Manufacturing. In: Eliasson G and Green C (eds) *The Micro Foundations of Economic Growth*. Ann Arbor: University of Michigan Press, 212-226.
- Lui J and Liefner I. (2016) The Joint Influencing Mechanism of Proximities and Knowledge Base on Multinational Companies' Global Innovation Networks. *Papers in Innovation Studies* 2016/4.
- Malmberg A and Maskell P. (2006) Localized Learning Revisited. *Growth and Change* 37: 1-18.
- Manniche J and Larsen KT. (2013) Experience staging and symbolic knowledge: The case of Bornholm culinary products. *European Urban and Regional Studies* 20: 401-416.
- Manniche J, Moodysson J and Testa S. (2014) Combinatorial knowledge bases: integrating cognitive, organizational and spatial dimensions in innovation studies and economic geography. *Papers in Innovation Studies* 2014/28.
- Martin R. (2013) Differentiated Knowledge Bases and the Nature of Innovation Networks. *European Planning Studies* 21: 1418-1436.
- Martin R and Moodysson J. (2011) Innovation in Symbolic Industries: The Geography and Organization of Knowledge Sourcing. *European Planning Studies* 19: 1183-1203.

- Martin R and Moodysson J. (2013) Comparing Knowledge Bases: On the Geography and Organization of Knowledge Sourcing in the Regional Innovation System of Scania, Sweden. *European Urban and Regional Studies* 20: 170-187.
- Maskell P. (2001) Towards a knowledge-based theory of the geographical cluster. *Industrial and Corporate Change* 10: 921-943.
- Maskell P, Bathelt H and Malmberg A. (2006) Building global knowledge pipelines: the role of temporary clusters. *European Planning Studies* 14: 997-1013.
- Maskell P and Malmberg A. (2007) Myopia, knowledge development and cluster evolution. *Journal of Economic Geography* 7: 603-618.
- Maskell P, Pedersen T, Petersen B, et al. (2007) Learning Paths to Offshore Outsourcing: From Cost Reduction to Knowledge Seeking. *Industry and Innovation* 14: 239-257.
- Meyer K, Mudambi R and Narula R. (2011) Multinational enterprises and local contexts: The opportunities and challenges of multiple embeddedness. *Journal of Management Studies* 48: 235-252.
- Meyer K and Sinani E. (2009) Where and When Does Foreign Direct Investment Generate Positive Spillovers? A Meta Analysis. *Journal of international Business Studies* 40: 1075-1094.
- Miller KD, Fabian F and Lin S-J. (2009) Strategies for online communities. *Strategic Management Journal* 30: 305-322.
- Moodysson J. (2007) *Sites and modes of knowledge creation: on the spatial organization of biotechnology innovation*, Lund: Lund University Press.
- Moulaert F and Sekia F. (2003) Territorial innovation models: A critical survey. *Regional Studies* 37: 289-302.
- North DC. (1990) *Institutions, institutional change and economic performance*, Cambridge: Cambridge University Press.
- O'Farrell PN, Zheng J and Wood PA. (1996) Internationalization of Business Services: An Interregional Analysis. *Regional Studies* 30: 101 - 118.
- Oettl A and Agrawal A. (2008) International Labor Mobility and Knowledge Flow Externalities. *Journal of international Business Studies* 39: 1242-1260.
- Pina K and Tether BS. (2016) Towards understanding variety in knowledge intensive business services by distinguishing their knowledge bases. *Research Policy* 45: 401-413.
- Plum O and Hassink R. (2011) Comparing knowledge networking in different knowledge bases in Germany. *Papers in Regional Science* 90: 355-371.
- Plum O and Hassink R. (2014) Knowledge bases, innovativeness and competitiveness in creative industries: the case of Hamburg's video game developers. *Regional Studies, Regional Science* 1: 248-268.
- Power D and Jansson J. (2008) Cyclical clusters in global circuits: Overlapping spaces in furniture trade fairs. *Economic Geography* 84: 423-448.
- Rallet A and Torre A. (2009) Temporary Geographical Proximity for Business and Work Coordination: When, How and Where? 55. *Annual North American Meetings of the Regional Science Association International*. New York, USA: <http://prodinra.inra.fr/record/191090>.
- Romano A, Passiante G and Elia V. (2001) New sources of clustering in the digital economy. *Journal of Small Business and Enterprise Development* 8: 19-27.
- Rutten R and Boekema F. (2012) From Learning Region to Learning in a Socio-spatial Context. *Regional Studies* 46: 981-992.
- Saxenian A. (2006) *The new argonauts: regional advantage in a global economy*, Cambridge, Mass.: Harvard University Press.
- Sims JM. (2016) Communities of practice: Telemedicine and online medical communities. *Technological Forecasting and Social Change* in press.
- Solheim MCW and Fitjar RD. (2016) Foreign Workers Are Associated with Innovation, But Why? International Networks as a Mechanism. *International Regional Science Review*.
- Srholec M and Verspagen B. (2012) The Voyage of the Beagle into innovation: explorations on heterogeneity, selection, and sectors. *Industrial and Corporate Change* 21: 1221-1253.
- Storper M. (1995) The resurgence of regional economies, ten years later: the region as a nexus of untraded interdependencies. *European Urban and Regional Studies* 2: 191-221.

- Torre A. (2008) On the role played by temporary geographical proximity in knowledge transmission. *Regional Studies* 42: 869-889.
- Trippel M. (2013) Scientific Mobility and Knowledge Transfer at the Interregional and Intraregional Level. *Regional Studies* 47: 1653-1667.
- Trippel M, Tödting F and Lengauer L. (2009) Knowledge Sourcing Beyond Buzz and Pipelines: Evidence from the Vienna Software Sector. *Economic Geography* 85: 443-462.
- Tödting F and Grillitsch M. (2014) Types of Innovation, Competencies of Firms, and External Knowledge Sourcing—Findings from Selected Sectors and Regions of Europe. *Journal of the Knowledge Economy* 5: 330-356.
- Tödting F, Grillitsch M and Höglinger C. (2012) Knowledge Sourcing and Innovation in Austrian ICT Companies—How Does Geography Matter? *Industry and Innovation* 19: 327-348.
- Tödting F and Trippel M. (2004) Like Phoenix from the Ashes? The Renewal of Clusters in Old Industrial Areas. *Urban studies* 41: 1175-1195.
- van Beers C and Zand F. (2014) R&D Cooperation, Partner Diversity, and Innovation Performance: An Empirical Analysis. *Journal of Product Innovation Management* 31: 292-312.
- van Egeraat C, O'Riain S and Kerr A. (2013) Social and Spatial Structures of Innovation in the Irish Animation Industry. *European Planning Studies* 21: 1437-1455.
- Vang J and Chaminade C. (2007) Cultural Clusters, Global-Local Linkages and Spillovers: Theoretical and Empirical Insights from an Exploratory Study of Toronto's Film Cluster. *Industry and Innovation* 14: 401-420.
- Williams AM. (2007) International labour migration and tacit knowledge transactions: a multi-level perspective. *Global Networks* 7: 29-50.
- Williams AM, Baláž V and Wallace C. (2004) International Labour Mobility and Uneven Regional Development in Europe: Human Capital, Knowledge and Entrepreneurship. *European Urban and Regional Studies* 11: 27-46.