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When regional meets global: exploring the nature of global innovation networks in the video game industry in Southern Sweden

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ABSTRACT

For firms in symbolic (creative) industries, the region is usually seen as the main arena for knowledge sourcing and exchange. Why and how these firms use global innovation networks remains however poorly understood. This paper draws on in-depth interviews with firm representatives and network data collected through a survey of video game developers in southern Sweden. Video game development is a typical example of a symbolic industry, encompassing the development of non-tangible and symbol-intensive products and services. In recent years, this industry has advanced from a niche sector into a global mass market. Understanding how the hybrid character of the industry – with strong symbolic cultural roots but also a significant global engagement – affects the geography of innovation networks is the focus of this paper. The analysis reveals that knowledge sourcing and exchange take place likewise on the regional and global scale, but for different purposes and through different mechanisms. It also shows that not all variance in network engagement can be explained by differences in industrial knowledge bases or regional innovation systems. In contrast, the target market and the nature and geography of demand are important explanatory factors.

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1. Introduction: regional innovation systems and global innovation networks

The geography of innovation and knowledge networks is an ongoing debate in the literature on innovation, entrepreneurship and regional development (e.g. Waxell and Malmberg 2007; Lorentzen 2008; Aslesen and Harirchi 2015). In the literature on regional innovation systems (RISs), innovation is generally understood as an outcome of interactive knowledge creation processes and dependent on the relations between firms and other organizations in their external environment (Moulaert and Sekia 2003; Asheim and Gertler 2005). As physical and other types of (relational) proximity facilitate the exchange of knowledge and foster mutual learning, these interactions often take place locally (Boschma 2005; Torre and Rallet 2005). Further, firms' innovation efforts are influenced by institutions, understood as the legal rules and social norms that govern individual behaviour and social interactions, which are typically linked to a certain geographical setting (Cooke, Uranga, and Etzebarria 1998; Asheim and Gertler 2005). As a result, the *local* environment is seen as the key arena for interaction and knowledge exchange for innovation.

However, not all interactions take place in geographical proximity, and knowledge exchange may well cross regional and national boundaries. While some authors refer generically to the importance

of knowledge networks *outside the region* as a means to break negative lock-ins in peripheral regions (Grillitsch and Nilsson 2015; Tripl, Grillitsch, and Isaksen 2017), others refer explicitly to the role played by global knowledge sources in regional development (Plechero and Chaminade 2016b; Martin et al. 2018). The latter relates to an increasing literature on global innovation networks (GINs), which places key emphasis on the complex networked nature of *global* knowledge sourcing in relation to innovation (Herstad, Aslesen, and Ebersberger 2014; Barnard and Chaminade 2017; Cano-Kollmann, Hannigan, and Mudambi 2018). In fact, some argue that it is essentially the global exchange of knowledge, which provides the most novel ideas and, in turn, leads to the most radical innovations (Fitjar and Rodríguez-Pose 2012; Plechero and Chaminade 2016b).

The RIS literature recognizes that engaging in GINs can only be realized by a few regions, pointing to certain linkages between agglomeration economies, diversification and access to GINs. Notably institutionally and organizationally thick, metropolitan regions are thought to have the capacity to attract extra-regional actors to their local environment, while simultaneously being more capable of participating in GINs (Chaminade and Plechero 2015). In contrast, institutionally and organizationally thin, peripheral regions are less exposed to global expertise, which implies an additional regional disadvantage (Tripl, Grillitsch, and Isaksen 2017).

Further, the possibility to connect with GINs is often ascribed to firms in certain industry sectors. Mostly firms in science-based industries such as biotechnology and ICT, which innovate based on analytical knowledge, tend to engage in global knowledge networks (Collinson 2000; Aslesen, Hydle, and Wallevik 2017). In contrast, firms in engineering-based (synthetic) industries, but in particular in creative and arts-based (symbolic) industries, tend to primarily exchange knowledge in localized networks (Heebels and van Aalst 2010). This is usually explained by the project-based nature of innovation in creative industries (Grabher 2002b, 2002a; Garmann Johnsen 2011) and by the context-specificity of symbolic knowledge (Martin and Moodysson 2011; Plum and Hassink 2014). However, the argument that knowledge is predominantly exchanged within geographical proximity does not imply that knowledge is sourced *exclusively* from the local milieu. In fact, one could argue that all firms engage in both local and global knowledge networks, but to varying degrees, motivated by different goals, and using different knowledge sourcing mechanisms. However, how this is done in practice – why companies engage in GINs, which channels they use, as well as which factors enable or constrain their ability to engage in GINs – remains poorly understood.

This paper aims to address this gap by investigating the motives, channels and enablers engaging in GINs among firms that build their competitive advantage on symbolic knowledge, namely video game developers located in southern Sweden. Video game development is a typical example of a creative (symbolic) industry, encompassing the development of non-tangible and symbol-intensive products and services for which design and aesthetics play a key role (see also Plum and Hassink 2014; Miörner and Tripl 2017). In recent years, this industry has advanced from a niche sector into a global mass market, generating high revenues worldwide. The Swedish video game industry has experienced rapid growth since the late 1990s – a trajectory that continues today (Swedish Games Industry 2018).

Understanding how the hybrid character of the industry – with its strong symbolic roots and a significant global spread – affects the geography of innovation networks is the focus of this paper. This paper draws on in-depth interviews with entrepreneurs, firm representatives and industry experts, and as well as social network data collected through a survey of video game developers in southern Sweden. The primary focus is on the knowledge sourcing mechanisms used by companies, the types of knowledge sourced, the reasons for global knowledge sourcing, as well as the role of regional environment in facilitating GINs. This paper addresses the following research question:

How, where, and why do video game companies in southern Sweden engage in global innovation networks?

The paper is structured as follows. Based on a literature review, we begin by arguing that the propensity of firms to engage in GINs depends on knowledge base and RIS specificities, and that firms can use different mechanisms to source knowledge globally. Second, based on structured

interviews and social network analysis (SNA), we examine the (global) knowledge sourcing activities of video game developers in southern Sweden. Finally, we conclude our findings and provide an overview for future research.

2. Theoretical framework: drivers for firms' global innovation network engagement

2.1. Differentiated knowledge bases and global innovation networks

The literature typically distinguishes among three types of knowledge bases, namely analytical, synthetic and symbolic. These 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.

The knowledge base typology has been applied amongst others to studying industry-specific differences in the geography of knowledge sourcing (Plum and Hassink 2011; Herstad, Aslesen, and Ebersberger 2014). Previous studies demonstrate that the global reach and the actors involved in knowledge exchange clearly differ between industry sectors. In analytical industries, innovation involves a high degree of codified knowledge, which is relatively easy to transfer over time and distance. Companies in these industries source and exchange knowledge in globally configured epistemic communities and with specialized knowledge providers, often located in other parts of the world (Chaminade and Vang 2008; Chaminade and Plechero 2015). In synthetic industries, innovation relies on the application of existing knowledge in new ways, often taking the form of concrete problem solving and learning by interacting with customers and suppliers. This requires the building of trust and reciprocity that is best earned through repeated interactions and face-to-face meetings. Relatively little long distance collaboration takes place, while national or regional knowledge networks prevail (Martin and Moodysson 2013; Zukauskaitė and Moodysson 2016). Innovation in symbolic industries, such as video games, is even more governed by the local context, and firms collaborate with a number of alternating partners in close geographical proximity. Symbolic firms and freelancers work together for the short period of an innovation project before they switch to other projects and other collaboration partners (Grabher 2002a). 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). However, certain symbolic industries have been shown to have significant global reach in their innovation networks (Balland, De Vaan, and Boschma 2013). Further, in many symbolic industries, such as the media industry, technological change has led to a shift in the type of knowledge needed for innovation (e.g. digital artists also need competency in computer programming in order to succeed in their profession). This also implies a broad range of knowledge-sourcing mechanisms used by firms.

Overall, the literature suggests that the propensity of firms to engage with GINs differs with regard to the type of *knowledge base* applied and exchanged in the course of innovation (Laestadius 1998; Gertler 2008; Asheim, Boschma, and Cooke 2011; Boschma 2018). Furthermore, the *capacity* and the *need* for firms to engage with GINs is also determined by characteristics of the firms' RIS, as will be discussed next.

2.2. Variety of regional innovation systems and global innovation networks

It has been recently argued that companies located in different RISs differ in their need and capacity to access extra-regional knowledge (Plechero and Chaminade 2016a; Trippel, Grillitsch, and Isaksen 2017; Martin et al. 2018).

Organizationally thick and diversified, metropolitan regions have several features that can explain their high level of attractiveness and absorption capacity for global knowledge. The variety of existing regional knowledge bases and capable local actors indicates a large capacity to identify and appropriate knowledge globally. These features, as well as the symbolic value of metropolitan regions and their easy accessibility via transportation and communication infrastructure, can explain why global actors wish to

establish relationships with local firms and eventually even establish themselves in organizationally thick and diversified regions. Due to the diversity and quality of competences available within such areas, metropolitan regions may need global knowledge connections to a lesser degree than other types of RISs.

Organizationally thin, peripheral RISs, in contrast, depend heavily on extra-regional knowledge linkages to remain competitive, as they lack the variety of local skills and expertise (Isaksen and Trippel 2016). Peripheral regions are often characterized by a dominance of synthetic knowledge bases and a lack of analytical and symbolic ones, which limits their opportunities to innovate based on combinatorial knowledge bases (Manniche, Moodysson, and Testa 2017; Grillitsch, Martin, and Srholec 2017). Homogeneity within the local knowledge base, as well as a reduced accessibility due to deficient transportation and communication infrastructure, implies that they are seen as less attractive options for global knowledge providers.

The capacity and need to engage in GINs differs for organizationally thick and specialized RISs. These are typically old industrial regions, specialized in relatively narrow, traditional sectors (Coenen, Moodysson, and Martin 2015; Coenen, Campbell, and Wiseman 2018). Such regions are often well embedded in global production networks (Henderson et al. 2002; ChaminaDE and Vang 2008), suggesting that local firms have the necessary absorptive capacity to establish and generate value from global knowledge connections within the same field of specialization. This may support incremental innovation, however, due to cognitive, institutional and functional lock-ins (Grabher 1993; Hassink 2010), actors may have a limited capacity to identify or absorb knowledge in unrelated fields. This can turn into a negative lock-in, when the respective industry declines and a renewal requires more radical innovation and change (Coenen, Moodysson, and Martin 2015).

From this discussion follows that firms located in different RIS and belonging to different industries also differ in their likelihood to access global flows of knowledge. What the previous literature suggests is that firms in symbolic industries located in thick and diversified RIS are least likely to source knowledge globally, as they are already well served by locally available knowledge. Yet, as the empirical analysis will show, they do engage in different forms of knowledge acquisition and exchange on a global scale, using a range of different mechanisms. Understanding what motivates these firms and how they gain access to and engage in GINs is one of the main objectives of this paper.

2.3. Diversity of knowledge sourcing mechanisms

Knowledge sourcing and exchange processes can take place through a range of formal and informal mechanisms (Görg and Strobl 2005), which can take multiple forms (for an overview, see Martin et al. 2018). Paid knowledge acquisition usually takes place for goods and services whose value is easy to measure and the transaction is non-repetitive (Powell 1990). In paid transactions, knowledge flows tend to be unidirectional and short term and do not require trust between the parties (Trippel, Tödting, and Lengauer 2009). Furthermore, they can take place across large geographical distances.

Paid knowledge exchange, in contrast, require a greater degree of reciprocity and exchange between the parties. Mechanisms such as R&D contracts, R&D alliances or research consortia are examples of paid knowledge exchange, while social media and, to a lesser extent, epistemic communities or communities of practice are examples of unpaid knowledge sourcing mechanisms.

Spillovers are a typical example of unpaid knowledge exchange. Spillovers are unidirectional and short term and involve a variety of mechanisms that include mobility of human capital (Song, Almeida, and Wu 2003; Trippel 2013), informal one-term face-to-face contacts. Since unpaid knowledge exchange is often based on trust and trust building is facilitated by proximity, co-location and frequent face-to-face interactions, one would expect unpaid knowledge exchange to be more sensitive to geographical proximity than paid mechanisms.

However, under certain conditions, spillovers can also take place across large geographical distances, for example via international mobility (Rosenkopf and Almeida 2003) or professional gatherings such as conferences, fairs or exhibitions (Maskell, Bathelt, and Malmberg 2006; Henn and Bathelt 2015; Comunian 2017). These international gatherings can create 'temporary geographical proximity' (Torre

2008; Ramírez-Pasillas 2010) which allows for knowledge exchange and face-to-face interaction between actors who are normally located far apart from one another. Furthermore, firms acquire knowledge globally through online platforms and virtual communities, encompassing internet fora such as social networking sites, blogs, open source development communities and shared interest sites (Miller, Fabian, and Lin 2009; Grabher and Ibert 2014, 2018). Virtual communities can span great distances, and typically centre on a certain interest field or technology. In addition, personally embedded, social networks between employees can facilitate inter-firm knowledge exchange from a distance, when skilled workers exchange ideas across organizational boundaries or seek help from former colleagues (Ebersberger and Herstad 2011).

What the existing literature shows is that there are multiple ways that firms can tap into GINs. While MNEs are more prone to global knowledge sourcing, by their very nature, SMEs with few resources and limited global reach are able to access knowledge globally, by drawing upon a range of different mechanisms. These include more formal ones such as R&D collaboration, hierarchies or FDI, but also less formal ones such as labour mobility, communities and online platforms or temporary professional gatherings.

With many economies transitioning from manufacturing to service, understanding how knowledge intensive service industries can become knowledge hubs in GINs, is of the utmost importance. While the local character and territorial embeddedness of symbolic industries is widely acknowledged, their international projection is still poorly understood (Power 2002; Scott 2004; Coe 2013). The hybrid nature of creative industries is sometimes referred to as a globalization paradox, where firms oscillate between a distinct local context for their professional practices and the necessity to access and be present on global markets (Lange 2011). Others stress the role of intermediate organizations in validating cultural and creative innovations and making them visible on global markets (Rekers 2016). From a policy perspective, it becomes crucial to understand how the region can facilitate firms' engagement in GINs and how local and global knowledge sources can complement one another. Furthermore, it is important to understand which channels facilitate knowledge sourcing and exchange with local and regional actors and which mechanisms are more appropriate to connect to global sources of knowledge.

This paper contributes to the existing literature in several ways. It departs from previous studies in that it takes into consideration both the formal and informal knowledge exchange mechanisms, as opposed to focusing solely on formalized mechanisms such as research and development and collaboration, which have been provided the foundation for analysis in previous studies. Given the particular characteristics of the video game industry, this study also goes beyond the distinction among analytical, synthetic and symbolic knowledge bases, by considering business knowledge (i.e. management & market knowledge) to also play an important role in innovation processes. This is in line with recent attempts by Pina and Tether (2016, 2018) to expand the knowledge base typology in order to better account for the diverse knowledge inputs needed in knowledge intensive business services (KIBS). In this paper, business knowledge has been included in order to account for the demands of specific knowledge on managerial practices and market characteristics, which have been engendered by industry globalization. Business knowledge should be understood as more than knowledge about markets for already existing products or services, but also as an input for innovation processes, which firms need in order to modify and develop new products or services. Including and analysing business knowledge allows us to understand how the firms' strategy and target market influence both the knowledge sourcing process and its geography.

3. Empirical analysis: global innovation networks in the video game industry in Southern Sweden

3.1. *The video game industry in Southern Sweden*

The RIS of southern Sweden can be seen as an organizationally thick and diversified RIS. It is divided into two administrative regions (i.e. counties), namely Scania and Blekinge. Major universities include Lund University, Malmö University and Blekinge Institute of Technology. Whilst Lund University acts

as a source of scientific knowledge, Malmö and Blekinge University act as sources of artistic and engineering knowledge respectively. Several cluster organizations support key industries such as ICT, new media, life sciences, environmental engineering, packaging, and food. One of the prominent new industries in the region is video game development (Miörner and Trippel 2017).

The start of consistent growth in the video game industry in Sweden can be traced back to the foundation of the two landmark companies EA Dice and Massive Studios in the nineties, around Stockholm. With blockbusters like *Minecraft* and *Candy Crush*, Swedish video game developers began to have an influential global presence in the early 2000s. In the period 2010 to 2015, the number of people employed in the video game industry tripled. During this period, *Minecraft*, currently the biggest selling video game of all time, was released by Mojang, and *Candy Crush*, one of the most played mobile video games worldwide, was released by King. The success of these two games put Swedish video game development on the international map and saw the increase of video game developers in the country, with Stockholm and southern Sweden being the centres of video game development.

The growth of the video game industry in southern Sweden has been bolstered by regional policy support for ICT and new media, as well as higher education institutes that offer courses in media, design, and computer engineering, which complement the needs of video game developers. The video game companies are primarily located in the regional capital city Malmö, which acts as the main hub of the industry, whereas Karlshamn acts as a secondary hub. The agglomeration of video game companies in Karlshamn can be attributed to a local business incubator as well as and Blekinge Institute of Technology, which offers courses in media technology and computer science.

The video game development scene in southern Sweden is rather diversified; with companies developing games for the mobile/tablet, video console, educational & cultural, personal computer and virtual reality markets. The empirical analysis focuses on the knowledge sourcing activities of companies that actively develop video games in the region, including both stand-alone companies and local offices of companies with headquarters in other regions (McKeever 2017).

3.2. Data and method

The analysis is based on data collected through a survey and interviews with firms developing video games in southern Sweden in spring 2017. The sample consists of all standalone firms with at least one employee. The sample was composed using reports from a national industry association (Swedish Games Industry) and a regional cluster support initiative (Game City). Once a video game company was identified, the company was cross-referenced using national business statistics and company websites to ensure that they were still registered as a video game developer and were actively developing video games in the region. The final stage of the analysis identified a total population of 21 game developing firms.

Data collection consisted of two stages, 1) an online survey for the collection of quantitative network data and 2) face-to-face interviews to gather qualitative information about the firms' knowledge sourcing activities. The response rate for the online survey was 85% (18 firms) and the response rate for the interview phase was 71% (15 firms).

The collection of network data followed a roster-recall approach (Giuliani and Pietrobello 2014). The companies were provided with a list (i.e. roster) of 55 potentially relevant collaborations partners (including game publishers, game-related IT companies, public support organizations, etc.). This list was assembled with the help of a key informant from a cluster support initiative. Further, each firm was asked to add relevant organizations, which were not yet on the list (i.e. recall). The interview partners were then asked whether they had been in contact with either of these organizations over the previous three years in order to acquire new knowledge relevant for the development of new products or services. In addition to this, they were asked about the importance of this relationship, the nature of the knowledge connection, and the type of knowledge acquired through this association. The collected relational data was processed and analysed with SNA.

3.3. How do firms engage in global innovation networks? Diversity of knowledge sourcing mechanisms

Firms use a variety of different mechanisms to source knowledge for innovation, from formal and paid inter-firm collaborations to less formal and unpaid knowledge exchange via personal relationships. Table 1 summarizes the spatial distribution of knowledge sourcing mechanisms used by video game companies.

Whilst unpaid knowledge exchange is a clearly localized phenomenon, paid knowledge exchange and acquisition, as well as unpaid knowledge exchange, take place to a similar extent on both the regional and global levels. As it became apparent in the interviews, global paid knowledge acquisition typically refers to obtaining licences for game development tools (i.e. game engines), but also to buying consultancy services such as marketing and quality assurance. Regional paid knowledge acquisition involves firms that outsource some aspects of their product development to regional specialists such as local artists and software engineers. Global paid knowledge exchange typically consists of firms engaging with large international publishers and other companies operating in the IT and media industry. Regional paid knowledge exchange primarily involves firms engaging with local organizations in the new media industry to develop business solutions. Unpaid knowledge acquisition involves firms monitoring each other via the internet and media, and occurs at similar levels on both the global and regional scales. Unpaid knowledge exchange takes place primarily on the regional level, as these unpaid relations require a level of trust and reciprocity, which is generally facilitated by geographical proximity, respectively by a common regional institutional framework.

Table 2 summarizes the variety of knowledge sourcing mechanisms on the regional and the global levels.

The interviews indicate that the mechanisms used by the video game firms are contingent on the firms' target market. Firms aiming for international markets generally engage in paid knowledge exchange in order to establish relationships with international publishers, whereas firms targeting the domestic market have less of a need to do so. This is in line with the arguments made in the conceptual framework, namely that unpaid knowledge exchange tends to be more regionally embedded whilst paid knowledge sourcing appears to be both regional and globally sourced. The analysis of knowledge sourcing mechanisms shows that firms are both locally and globally oriented, which is contingent on their business strategy. Knowledge is sourced regionally first, due to lower transaction costs. Once outside their own region, the exchange takes place globally as opposed to nationally, due to the globalized nature of the industry and because transactions for national and global knowledge sourcing do not differ considerably.

3.4. Where and why do firms engage in global innovation networks? A deeper look into strategies and markets

The GIN of the video games industry in southern Sweden is not equally distributed throughout the world. Figure 1 maps the geography of the knowledge network whilst Table 3 presents the number of network connections by continent and country.

Table 1. Spatial distribution of knowledge connections by mechanisms.

Type of mechanism	Regional	National	Global	Sum
Paid knowledge acquisition (e.g. buying of consulting services, licences, software, recruitment of specialists, etc.)	52% (46)	3% (3)	45% (40)	100% (89)
Paid knowledge exchange (e.g. contract-based collaboration for innovation)	41% (33)	5% (4)	54% (43)	100% (80)
Unpaid knowledge acquisition (e.g. monitoring of companies via internet and media)	51% (31)	2% (1)	48% (29)	100% (61)
Unpaid knowledge exchange (e.g. personal and friendship-based relations, discussions at conferences and fairs)	90% (225)	2% (5)	8% (20)	100% (250)

percentages, absolute numbers in parentheses. Source: own survey.

Table 2. The regional and global diversity of knowledge sourcing mechanisms.

Type of mechanism	Regional	Global
Paid knowledge acquisition	Outsourcing of some parts of product development	Licences for game development tools and consultancy services
Paid knowledge exchange	Development of business solutions	Networks with large international publishers
Unpaid knowledge acquisition	Monitoring Firms	Monitoring Firms
Unpaid knowledge exchange	Meetings with regional actors via formal events (Nordic Game Conference), regional associations (Media City, Game Habitat), and through informal meetings	

Source: own draft.

**Figure 1.** The spatial concentration of global innovation networks.

Source: own draft.

On a global scale, the video game industry has traditionally been located in Japan, the United States and, to some extent, the United Kingdom, which is reflected in the number of knowledge connections with these countries (for a study on the Japanese video game industry, see Ernkvist and Ström 2018). As of 2018, the biggest video game markets by revenue were China, the US, Japan, South Korea, Germany, the UK, France, Canada, and Spain (Newzoo 2018). The number of global knowledge connections per country echoes the top global markets (with the exception of China). The global network connections by country mirror most firms' internationalization strategies, namely to target English-speaking markets first, followed by markets with the largest revenue share. Overall, the findings show that the local industry connects to four of the top five markets of the global video game industry, with the exception of China. In the face-to-face interviews, several firms stated that it is difficult to engage in networking with China, due to institutional barriers in the country: *'China is difficult as it's both very culturally different and also very much regulated.'*

Table 3. Global distribution of knowledge connections by continent and country.

Continent	North America 46.2% (30)	Europe 40.0% (26)	Asia 13.9% (9)
Country	USA 44.6% (29) CAN 1.5% (1)	GBR 15.4% (10) DEU 7.7% (5) DNK 4.6% (3) IRL 3.1% (2) FRA 3.1% (2) FIN 1.5% (1) NOR 1.5% (1) CYP 1.5% (1) ESP 1.5% (1)	JYP 9.2% (6) KOR 1.5% (1) CHN 1.5% (1) IDN 1.5% (1)

percentages, absolute numbers in parentheses. Source: own survey.

When video game companies internationalize, they usually do so via strategic partnerships with international publishers. In these partnerships, the developers offer their products and the publisher takes care of marketing and adaptation to the local markets and local languages. As there is only a small number internationally recognized publishers, game developers who attempt to permeate an international market typically collaborate with these publishers. On the role of international publishers, one firm stated: *'We do not release games unless we have a strong brand partner'*. Firms' access to international publishers is contingent on their internal capabilities, business strategies and networking potential. Some firms stated that they do not have the resources to translate their products and release them on markets outside of Europe, without the help of publishers. For smaller developers, translating and adjusting their games to foreign markets is time-consuming and costly. Larger developers with more software engineering skills are able to circumvent this by developing scripts that automate the process. One of these companies stated: *'Once you have two or three languages, you might as well have a bunch, because you're going to do the work anyway because the game needs to support all the language stuff anyway'*. The interviews suggest that many firms feel that the financial return on translating a game on their own is often not worth the effort. Translating a game does not imply that the product will be a success, as international success often relies on a powerful marketing strategy pushed by an international publisher, who helps to feature the game in various online marketplaces.

The type of knowledge sourced by firms via GINs is contingent on the size of the video game market in the country. In the case of the large historically established markets (North America, Western Europe, and Japan) and growing global markets (China, South Korea, and Eastern Europe), firms feel the need to acquire business knowledge in these countries, so they can attempt to penetrate these markets. Business knowledge pertaining to business models and market trends is more important in the larger markets, whereas business knowledge pertaining to the legislative and regulatory processes (Pina and Tether 2018) is needed in the growing markets, which are seen as riskier and more volatile markets to break into. The successful penetration of these growing markets is also contingent upon the institutional distance between markets. The interviews suggest that Swedish companies find it difficult to collaborate with Asian counterparts: *'When working with people from the UK or US, it's no problem, really. In Asia, it has ... been a bit more complicated'*. In the case of China, this is in particular due to difficulties in the formal institutional setting: *'Yeah, that's what we found in a lot of projects. China seems to be a very hard market, a lot of regulations and red tape.'* Breaking into these growing markets involves either sourcing international knowledge and then trying to break into these markets independently or teaming up with a large publisher in the target country. Whilst the former is more difficult to successfully achieve, the latter can mean losing control over certain business functions and/or intellectual property. The market size also has an impact on the mechanisms of how firms source knowledge globally. In the case of growing or large markets, firms tend to engage in paid knowledge exchange (formalized collaboration), whereas in the smaller markets, firms tend to engage in paid knowledge acquisition (e.g. consultancy services), in particular by outsourcing non-core business activities such as translation services or simple coding (McKeever 2017).

The industry segment in which the firms operate also plays an important role in their propensity to engage in global knowledge sourcing. Video game developers in southern Sweden operate in different segments: mobile/tablet, console (Indie and AAA), educational & cultural, personal computer and virtual reality markets, with some overlap. These different types of segments affect the geography of these knowledge exchanges. In developing video games for the console market, the primary goal of the developers is to make a product for the global market. This means that knowledge would need to be sourced globally to retain competitiveness in the global market. This is evident from the data, in which six firms in the network (console developers) accounted for roughly 44% of all global knowledge connections. Firms producing educational and cultural games tend to source knowledge locally, due to the cultural component attributed to their products. Firms that targeted the domestic market also tend to require global knowledge to retain market competitiveness on the domestic level, which is contingent on their market strategy. The market type influences the marketing strategy (and vice-versa) of a company, which affects whether the company sources knowledge locally and/or globally.

Finally, firms also engage in global knowledge sourcing in order to access talent. Most interviewed firms noted a lack of available senior talent in the region, and stated that they had to go outside of their own region in order to source senior talent. This can be problematic at times, due to the time-consuming process of hiring people from abroad, especially outside of the European Union. Some firms operate on short-term contracts, which mean that when they get a big client, they need to hire employees and start developing immediately. On the topic of trying to source international talent, one firm representative stated: *'There are many talented people who sent their CVs, but if they are not from the EU, I find it too difficult to go through that whole process and it's such a shame, because I'm sure we could get so much talent from abroad, if the rules were easier'*. With regards to what is lacking on the regional level, another firm stated *'It's ... senior talent ... in foremost engineering, I would say, and also production and managerial'*. Firms located in the periphery of the region (e.g. in Helsingborg and Karlshamn), find that they are in an even more difficult position in terms of attracting both regional and international talent; as their locations are further from Malmö, which is where most of the industry activity occurs.

3.5. Enablers for global knowledge sourcing – the role of the regional innovation system

The engagement of firms in GINs is partly enabled by features of the RIS. The interviews showed that regional policy support, as well as the level of trust between local firms, in addition to local key organizations and individuals were conducive to firms engaging in GIN. Indeed, the findings display intense knowledge exchange between local organizations, in addition to their engagement in GIN. [Figure 2](#) illustrates the knowledge sourcing network of video game developers in southern Sweden. It demonstrates the high level of interaction between local actors.

Regional policy initiatives play an important role in supporting networking between firms, both regionally and globally. As the interviews revealed, a key role of the regional policy support system is to facilitate the organization of and participation in international conferences and generating temporary proximities (Ramírez-Pasillas 2010; Bathelt, Golfetto, and Rinallo 2014; Henn and Bathelt 2015). This includes the Nordic Game Conference in Malmö, as well as travel grants awarded to game developers in order to attend conferences abroad. Regional policy also supports industry growth with cluster initiatives and business incubators, which provide financing, business knowledge, and office space for start-ups in the ICT and new media industry, which subsumes video game development. Local (higher) education organizations also play a pivotal role, as universities and colleges offer niche programmes such as media and computer game development (Miörner and Trippel 2017). Regional policy support organizations and educational organizations are mentioned as key sources of knowledge by many of the interviewed firms, and therefore constitute central nodes in the knowledge sourcing network.

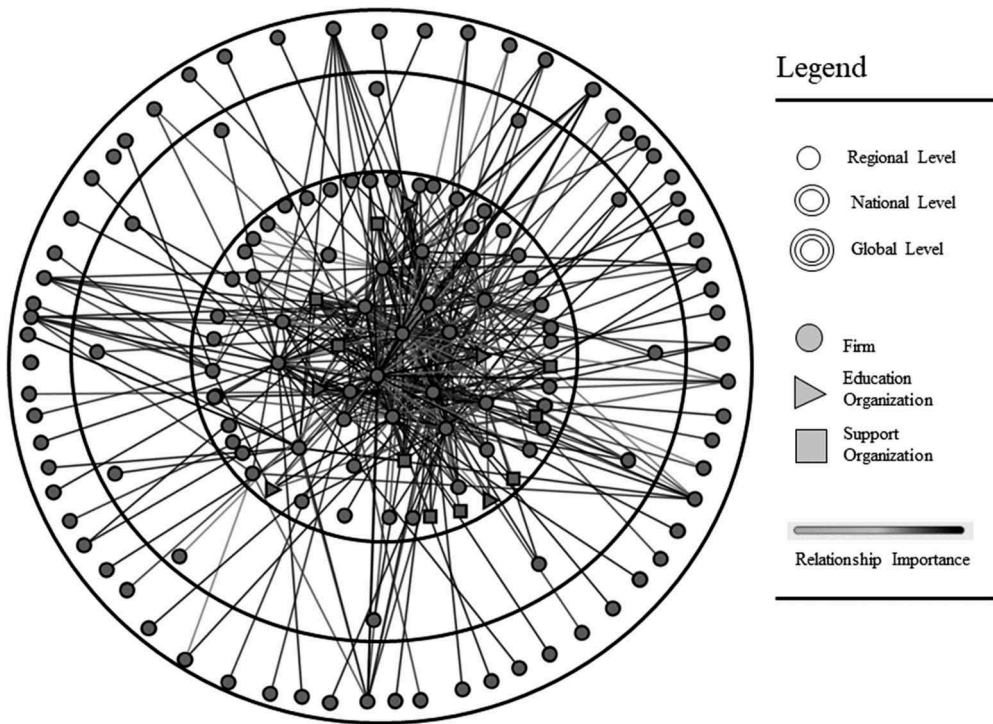


Figure 2. Knowledge sourcing network of video game developers in southern Sweden.

The graph consists of nodes (actors) and lines (knowledge connections). The node shape indicates the type of actor (firm, education organization, or support organization) and the node position indicates the geographical scale (regional, national, or global). The darkness of the line represents the importance of the knowledge connection as expressed by the interview partners. Source: own draft.

As the interviews suggest, the video game cluster is marked by a high degree of trust and reciprocity between regional actors, which facilitates local collaboration. As one interview partner puts it: *'there's a good climate here among the game companies, with Game City, and everybody's open to sharing and collaborating, and it doesn't matter if you are a one man company or if you are massive, you're all meeting at the same place, and sort of sharing what you know'*. The level of trust between local actors and the dynamism between both market diversification and labour mobility has proven auspicious for regional firms expanding their global networks, as knowledge about global markets and business opportunities is exchanged between local firms. In other words, local networks can portend the expansion of global networks through the provision of contacts and information about global markets and business opportunities or through the establishment of networks with international actors located in the region.

Furthermore, firms can source knowledge globally by engaging in virtual communities (Bathelt and Henn 2014; Grabher and Ibert 2014). These communities range from online fora to mailing lists where knowledge is sourced and exchanged. In one example, an interviewee described the usefulness of a mailing list for their internationalization: *'That is incredibly useful, (...) it's just like, "Oh, to publish your game in China you need to read this law, and it's in Chinese!" (...) Then, having a mailing list of people who know what they're doing, there's bound to be someone who worked with China before (...) Maybe someone actually got the law translated and they could share that'*. Often, these virtual communities are not open to the public, and admission requires a personal connection to introduce and approve a new member: *'It's reasonably secretive. For it to work, it also needs to be a bit restrictive with who gets on the list (...) Thus, you nominate someone, like "I would like to nominate this and this person". Then, you are kind of responsible for this person.'*

Temporary proximity in the form of game development conferences has been successful for firms wanting to increase their GIN. Firms indicated that major global conferences and fairs such as the Game Developers Conference (GDC), Gamescom, and Electronic Entertainment Expo (E3) were conferences deemed important for gaining access to GINs. Whilst these major conferences were seen as significant for some of the firms, not all firms have the opportunity to attend these events in person. Many firms lack the financial resources and/or knowledge of local grants to attend these global conferences. The most important professional gathering for all firms is the Nordic Game Conference, a conference organized annually in Malmö: *'Of course, there are events that we go to, like the Nordic Game Conference in Malmö. This is hugely important to connect and get to [know] what's going on.'* Many interviewed firms cited this as their most important occasion for global knowledge sourcing, due to the low cost of attending without needing to travel. Whilst temporary professional gatherings are thought of as important source of global knowledge, geographical proximity still has an impact on conference attendance. The Nordic Game Conference is not important because of its degree of international prestige, but because of its ease of accessibility and geographical proximity to the firms. This once again shows how global knowledge sources can be accessed through local and regional networks (McKeever 2017).

4. Conclusions – neither local nor global

The analysis provides novel insights into the hybrid nature of the video game industry, characterized by strong regional embeddedness and significant global network engagement. A deeper look into the types of knowledge acquired, the mechanisms used and the nature of product development and distribution to the market proves to be useful to understanding how regional and global sources of knowledge are combined in this industry.

Video games are developed for domestic and international markets over a variety of market types. This analysis has focused on how firms use both regional and global innovation networks to complement the development of their products and services. The findings provide a more nuanced view on the complementarities between regional and global innovation networks. Indeed, firms draw upon various regional and global networks in order to develop more efficient, cost effective, and innovative products and services. Conversely, localized interactions and knowledge exchange can also act as a catalyst and enabler for GIN engagement. In both scenarios, we move away from the binary of regional vs global and into the globalized reality of these hybrid interactions. In the case of the video game industry in southern Sweden, the regional and global networks are significantly intertwined on an industrial level.

This paper contributes to a more detailed and balanced understanding of the ways that the regional and global networks interact with each other. The analysis of the knowledge sourcing mechanisms reveals that both paid and unpaid knowledge acquisition, as well as paid knowledge exchange, as in the case of contract-based collaboration or the recruitment of skilled specialists, takes place on the local and on the global scale. The region remains the prime locus for unpaid and trust-based knowledge exchange. However, knowledge exchange also takes place in the virtual space, i.e. in online communities or tech platforms, and in temporary proximity, i.e. at global conferences, fairs and exhibitions. Understanding the role of virtual spaces in the geography of knowledge sourcing is a promising future research avenue (Aslesen, Martin, and Sardo 2018; Grabher and Ibert 2014).

Our data clearly shows that not all variance in GIN engagement can be explained by differences among industrial knowledge bases (Martin and Moodysson 2013; Plum and Hassink 2014), in RIS configurations (Chaminade and Plechero 2015; Trippl, Grillitsch, and Isaksen 2017) or by the type of knowledge sourcing mechanism (Martin et al. 2018). Rather, the target market and the nature and geography of demand seem to be additional important explanatory factors, which will require more attention in future research on GINs.

Our data confirms that the geography of the global networks can be strongly explained by the location of the demand. Swedish firms most often connect to the main markets for video games,

namely North America, Western Europe and Japan, whereas emerging markets such as China are perceived as challenging, mostly due to institutional distance. The firms consequently orient themselves towards those geographical areas where there is strong expertise within the sector, but also where there is a large and promising market for new video game products. We find that the degree and nature of GIN engagement is also contingent upon the market segment targeted by the game developing firms. Firms that develop educational or cultural games mostly create products for the local or national market, and are consequently less in need of international contacts or global knowledge sources. In contrast, firms that target the video console market, which is global by nature, are more inclined to reach out to international knowledge providers. This finding calls for a stronger consideration of markets and demand characteristics in research on GINs. Up to this point, the focus of GIN research has been primarily on the upper stream activities of the innovation process, as opposed to the knowledge needed in the development and commercialization of the innovations, and consequently an understanding of the market and distribution.

The regional support infrastructure not only facilitates the firm's network embeddedness locally, but also globally, by providing game developers with travel grants and by organizing international conferences. This leads to temporary proximities and allows the firms to gain access to industry actors, regardless of their geographical distance.

Finally, a high degree of local network engagement is an important enabler for global knowledge sourcing. This has important implications in terms of future research venues. It suggests that most previous research, which implicitly assumed that a local link meant access to local knowledge, is flawed. Future research should de-couple the geography of the knowledge channel with the source of knowledge. Our evidence suggests that local connections can be used to access both local and global knowledge, depending on the partner. The distinction between channels and sources of knowledge is particularly important in thick and diversified regions where international actors are present and established. In these regions, the high density of local and regional networks has been occasionally interpreted as lowering the importance of global sources of knowledge. Our paper provides an alternative explanation, in which the local networks in fact facilitate access to global knowledge sources.

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