

von Proff, Sidonia

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Sidonia von Proff

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Prof. Dr. Dr. Thomas Brenner
Deutschhausstraße 10
35032 Marburg
E-Mail: thomas.brenner@staff.uni-marburg.de

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The predominance of social proximity for innovation collaboration of SME

Sidonia von Proff¹

¹Chair of Economic Geography and Location Research,
Philipps-University Marburg, vonproff@geo.uni-marburg.de

Abstract:

The paper at hand contributes to the field of proximity studies with a focus on social proximity. The paper gives an in-depth discussion of a theoretical and empirical definition of social proximity. Based on this, an argumentation follows why social proximity is of particular importance when the decision for external innovation collaboration partners has to be made. This holds especially for SME and for firms with low or medium innovativeness. Furthermore, the paper presents two explorative case studies as a first support for the developed theory. The analysis of two firms shows how social proximity guides the search for collaboration partners.

Keywords: Social proximity, innovation collaboration, SME

JEL Classifications: L14, O39, O32

1 Introduction

There is a broad strand of literature investigating the existence and importance of different types of proximity for innovation collaboration. We know that most innovation co-operation projects consist of partners who are located at rather short distance and within organizational and cognitive boundaries (Singh 2005). This led for a long time to the consensus among geographers that spatial proximity is necessary for innovation in the sense that knowledge is more or less freely available among co-located actors resulting in a 'co-location premium' (see e.g. Boufaden and Plunket 2007; Jaffe et al. 1993). For example, Strambach and Klement (2012) find for several industries in Europe that only one fifth of knowledge interactions during innovation processes are distant ones. In line with that, Tödtling and Kaufmann (2001) find that SME in many European regions focus on regional collaboration. Among innovative small and medium-sized enterprises (SME) in Germany, the share of international collaboration partners is below 10% (Sternberg 1999). Regarding co-patenting (as a proxy for innovation collaboration), less than 10% of all patents in the OECD Regpat database (July 2014 edition) stem from international collaboration and nearly 50% of inventor teams are located entirely in the same NUTS3 region (own calculations). Several researchers tried to disentangle the effects of the individual types of proximity. From these studies we know that geographical proximity is neither a necessary nor a sufficient condition for innovation collaboration and knowledge diffusion. It often just coincides with other forms of proximity. There are some hints that social proximity is crucial and can substitute spatial proximity (Breschi and Lissoni 2009; Cassi and Plunket 2015; Hansen 2015; Trippel and Tödtling 2011). Furthermore, temporary spatial proximity facilitates collaboration over distance (Torre 2008) as does the overall increase of the professional mobility of individuals (Torre and Rallet 2005). Previous co-location furthermore helps to develop social proximity (Agrawal et al. 2006). In contrast, Mattes (2012) says that spatial and social proximity are supporting parameters and cognitive, organizational, and institutional proximity are decisive.

The paper at hand will elaborate why social proximity is the most important type of proximity for innovation collaboration, why it is more important for small and medium firms than for larger firms, and why it is the more important for innovation collaboration decisions, the less innovative a firm is. To these ends, I start with an in-depth discussion of the definition and operationalization of social proximity for empirical application before elaborating the theoretical considerations about the predominance of social proximity. In addition, the paper contains two case studies as explorative, supportive examples for the developed theory with a deliberate approach: two firms were interviewed who do not have (potential) collaboration partners at organizational or spatial proximity. Organizational proximate partners were not available, since the firms are independent and not belonging to a larger firm with several subsidiaries. Spatial proximity was minimized by choosing an

economically thin region. The advantage of this choice combined with interviews instead of patent analysis or something similar is that we could investigate how strong the social link between two collaborators was and which type of proximity was decisive for starting the collaboration. When there are only few (or no) spatially proximate collaboration partners, respondents are better able to distinguish between social and spatial proximity. In case both are existent, a person will often not be able to say whether the social or the spatial aspect was critical for the collaboration.

The remainder of the paper is as follows. The second section contains the theoretical considerations within four subsections. The first subsection reviews the literature on innovation collaboration behavior of SME. The second subsection defines social proximity and discusses its operationalization, followed by a subsection with a discussion of the trade-off between social, spatial, and cognitive proximity, which arises especially outside of clusters. Section 2.4 then elaborates why social proximity predominates for SME. As a short empirical contribution, the third section presents two German case studies and discusses how the empirical findings are related to the theory before the fourth section concludes.

2 Theory

2.1 SME innovation collaboration and the degree of innovativeness

SME face partly different problems compared to large firms when engaging in innovation. Lack of financial resources is for all firms the innovation barrier which is stated most frequently (Kaufmann and Tödtling 2002). Nevertheless, regarding the absolute amount of financing resources, SME will have lower financial capabilities and have a lower chance to outweigh losses from a failed innovation project with gains from other projects or with availability of cash-flow. The lack of adequately qualified personnel and, if personnel are available, their lack of time for innovation activities is slightly more often a significant problem for SME than for larger firms (Kaufmann and Tödtling 2002). Hence, in order to be innovative, SME have to collaborate. This is especially the case for 'new to the market' (compared to 'new to the firm') innovations (Tether 2002). SME spend relatively more money on R&D co-operation than large firms (Narula 2004), even though the maximum capable amount of collaboration partners increases with firm size (Lechner and Dowling 2003). In-house R&D, a sufficient amount of tertiary educated employees, and being embedded in a network increase the probability of collaboration (Muscio 2007; Powell and Grodal 2005). SME benefit particularly from partners within the region, while large firms benefit more often from inter-regional collaboration (Arndt and Sternberg 2000; Freel 2003; Virkkala 2007). Fitjar and Rodríguez-Pose (2011) as well as Grillitsch and Nilsson (2015) found evidence that firms compensate the low level of knowledge spill-overs in peripheral regions by increased collaboration behavior if the firms are not too small. Successful high-technology SME have disproportionately high level of international collaboration partners, since some technological

niches are too small to constrain to local or national partners (de Jong and Freel 2010; Freel 2003; Keeble et al. 1998; Virkkala 2007). These firms rely more heavily on the optimal cognitive / technological proximity than on close social or spatial proximity, since often there is a trade-off between these two types of proximity (Cowan et al. 2006; Hansen 2015). Less innovative SME prefer socially close partners (Kaufmann and Tödtling 2002; Tödtling and Kaufmann 2001). The collaboration behavior is path-dependent, i.e. evolves over time from existing business contacts (Sternberg 1999) and links are often persistent. Since the majority of firms is not highly innovative, it is not surprising that among innovative SME in Germany the share of international collaboration partners is still below 10% (Sternberg 1999).

What is the essence of this strand of research? Often, firms try to innovate on their own, but for higher level innovations they have to collaborate with external partners. Collaboration is the more important the lower the level of local knowledge spill-overs is, i.e. in economically thin regions. With increasing innovativeness, firms rely more strongly on the optimal cognitive / technological proximity, which can often be found at non-local firms, and they rely less strongly on social or spatial proximity. In the following subsection, I will illuminate social proximity in more detail and afterwards how it is related to spatial and cognitive proximity for SME innovation collaboration.

2.2 Social proximity

The term 'social proximity' has become very common in (innovation) collaboration studies and elsewhere. While it is easy to get a rough understanding what it means and that we are socially proximate to our friends and colleagues, it becomes more intricate when going into detail. Let us start with the theoretical definition. Boschma (2005) and Mattes (2012) defined social proximity in comparable ways as follows. To the author's knowledge, no further study proposes a theoretical definition that does not cite Ron Boschma.

'Social proximity is defined here in terms of socially embedded relations between agents at the micro-level. Relations between actors are socially embedded when they involve trust based on friendship, kinship and experience. Accordingly, the definition of social proximity does not include situations in which people share sets of values, such as ethnic and religious values.' (Boschma 2005, p.66)

'Social proximity comes about as a result of shared personality characteristics, personal interaction and a sense of familiarity between individual actors. In its mode of creating mutuality among actors, it is closely related to institutional proximity, but takes place at the microlevel and occurs in the form of friendship or kinship or also based on past interactions. More than any of the other dimensions of proximity, social proximity relies on trust and in this manner encourages actors to engage in communication (BOSCHMA, 2005).' (Mattes 2012, p. 1089)

The core seems to be (1) that two persons have a relation, (2) that there is friendship or kinship, (3) that they have experience or a sense of familiarity with each other and (4) this results in trust. The first point is intuitive, because without any type of relationship we do not need to talk about proximity. The second point refers to friendly feelings. When talking about (innovation) collaboration it is clear that people without friendly feelings will not collaborate and hence friendly feelings are a necessary precondition. The terms ‘experience’ as well as ‘a sense of familiarity’ need further investigation. Does these solely refer to prior personal contact or can two individuals be socially proximate if they have not met yet? In my view, the latter is the case. Even if individuals are not acquainted with each other, they may have one or more common acquaintances. If two individuals have sufficient common acquaintances, they have heard about each other and may feel a little trust in advance. This is the “I have heard so much about you” effect of people meeting the first time and being happy about that meeting. Hence, the third point can be summarized as knowledge about each other which can be gained directly or indirectly. Figure 1 shows how social proximity can be understood continuously including indirect as well as direct acquaintance. In Figure 1, the section from A to B shows increasing social proximity of two individuals who have not yet met. B is then the point where they meet for the first time personally. The section from B to C shows further increasing social proximity, comparable to an increase from loose acquaintances to close friends.

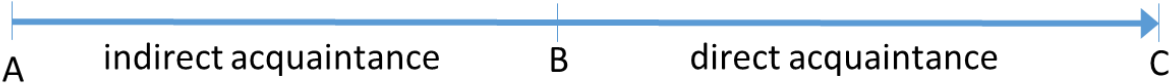


Figure 1: Range of social proximity from lowest (A) to highest (C) value

The fourth point now is trust, which cannot be separated sensibly from friendly feelings and knowledge, i.e. all three have to be existent to a certain degree in order to talk about social proximity. A minimum level of trust in advance of a first meeting arises to a certain extent from prior knowledge about the partner. If only friendly feelings exist without any knowledge about the person itself, it is rather cultural proximity, because the individual has either positive feelings towards everyone or deduces positive characteristics from shared sets of values like language, homeland or religion. If knowledge about each other exists but no friendly feelings and trust, two individuals will not feel close and it would be problematic to speak of social proximity. Based on this reasoning, I propose the following definition:

Social proximity measures how strongly a relation between actors is based on knowledge about each other and mutual friendship both resulting in trust.

This definition suggests that social proximity reaches from no knowledge about each other (zero social proximity) to high levels of trust based on both good knowledge and close friendship (highest social proximity). This is important for the empirical definition of social proximity.

Here, many examples exist from diverse studies. Table 1 shows a selection of studies where social proximity or distance was operationalized.

empirical definition	part of social proximity which is included	authors using this definition
level of familiarity (as indicated in a survey), arm-length versus embedded ties	from B to C (direct acquaintance)	Huber 2012, Uzzi 1997
number of former collaborations of two firms	from B to C (direct acquaintance)	Broekel 2015, Balland et al. 2015
dichotomous variable: having a certain relationship or not (having a common acquaintance, being a member of the same family, having worked at the same company, or similar)	two points from the whole range	Balland 2012, Balland et al. 2016, Broekel and Hartog 2013
(inverse of) geodesic distance in a network (sometimes including direct connections)	from A to B (indirect acquaintance)	Autant-Bernard et al. 2007, Balconi et al. 2004, Breschi and Lissoni 2005, Cassi and Plunket 2014/2015, Crescenzi et al 2016, Singh 2005
four-level ordinal measure (no acquaintance, mutual acq., direct acq., personal relationship)	whole range from A to C	Hansen 2015

Table 1: Operationalization of social proximity in a selection of studies.

The empirical definitions show that it is common to use the ‘indirect acquaintance’ part of social proximity. In patent studies, the indirect part of social proximity is used for explaining e.g. the probability of a collaboration (closure ties in networks). In particular, social proximity is measured either dichotomously (having a common acquaintance or not) or calculated as the geodesic distance between two links in a network, i.e. whether two persons are linked directly or indirectly in the second, third etc. grade. The highest level of acquaintance is knowing each other already. This means, the whole section between B and C in Figure 1 is lumped together. Some authors have gone into more detail within the section B to C. Uzzi (1997) distinguished between arm’s-length ties and embedded ties. Huber (2012) asked not only whether the individuals knew each other but also how close they feel emotionally and whether they feel personally obliged and built a composed indicator of that. These approaches lump the area left of B together: as soon as two persons are not personally acquainted, social proximity is zero. Only few papers use the full range of social proximity. Of course, it depends strongly of the aim of investigation how social proximity is measured in empirical studies. There is certainly no universally applicable operationalization. Instead, it has to be adjusted for the purposes of each study. However, most authors refrain from justifying the choice how they measure social proximity. Probably there are more studies where the full range of social proximity would be appropriate.

With this detailed concept of social proximity in mind, we have to ask what level of social proximity is necessary for two persons to start an innovation collaboration, especially when taking into account further dimensions of proximity.

2.3 The trade-off between spatial, social, and cognitive proximity

Geographical proximity is more important when individuals have no or low social proximity, i.e. the two forms of proximity are at least partly substitutes (Autant-Bernard et al. 2007; Cassi and Plunket 2015; Maggioni et al. 2007; Ter Wal 2013). As soon as actors are part of a network and, thus, indirectly linked, spatial proximity is of lower relevance. However, spatial and social proximity coincide very often and are thus difficult to entangle (Breschi and Lissoni 2009). As Torre und Rallet (2005) and Torre (2008) found out, temporary spatial proximity is able to increase social proximity on a level high enough to continue collaboration over distance afterwards.

Regarding cognitive proximity, we know from Nooteboom (2000) that the optimal cognitive distance is medium, since high cognitive proximity leads to redundant knowledge while too low cognitive proximity leads to problems in integrating the almost unrelated knowledge. Usually, we have to deal with a trade-off between social and cognitive proximity. The better a person is known, the higher the cognitive proximity becomes, because knowledge is exchanged and joint learning processes take place. Imagine, a person which an inventor does not know at all, or only very superficially, has exact the complementary knowledge to a certain innovation problem. Another person has not exactly the right knowledge but knows the inventor well. Then the trade-off between social and cognitive proximity comes up.

Taking spatial proximity in account in addition to social and cognitive proximity, the situation is similar: in a cluster, there may be firms with the right amount of cognitive proximity close-by, but in less agglomerated regions, the probability is low that the optimal partner is at spatial proximity. For finding the right partner, a firm has to reduce its reliance on (at least) one of the proximity dimensions. That means, outside of clusters, innovative firms will often face the decision whether they want to collaborate with a socially and (more or less) spatially proximate firm which has a sub-optimal (too low) cognitive distance for bearing an innovation challenge or whether they prefer a partner at better cognitive proximity which is spatially and probably socially rather distant. Bjerke and Johansson (2015) as well as Virkkala (2007) showed for SME outside of clusters that extra-regional linkages are crucial for successful innovation. These empirical studies show that a highly innovative firm (rather risk-neutral) will give larger emphasis to the optimal cognitive distance while a less innovative firm (rather risk-averse) will feel more secure with an embedded tie of sub-optimal cognitive distance. This decision has to be made anew for each innovation idea and may be answered differently from time to time. Uzzi (1997) said that a balance has to be found between arm's-length ties and embedded ties and this is what holds also for innovators: they need close-by and distant contacts, in a spatial and cognitive sense (see also Bathelt et al. 2004; Broekel and Meder 2012).

For some SME this trade-off leads to an abandonment of collaboration. If the horizon of a firm is very local, innovation projects may be not pursued (Tödtling and Kaufmann 2001). According to the logic

presented here, it is not the lacking spatial proximity which leads to this abandonment, but the attitude, that only spatially proximate partners can be socially close. To find evidence for this, it would be necessary to analyze firms who say there are regional partners lacking and who abandon innovation projects because of this reasons: do they have a sufficiently large business network?

2.4 The predominance of social proximity for innovative SME

If spatial and social proximity coincides, collaboration is easy to organize. The difficulties arise when there is no spatial or social proximity given, because SME have lower resources. Large firms have more financial resources to organize temporal spatial proximity for their employees as a basis for establishing social proximity (Tripl and Tödtling 2011). If an employee is temporally somewhere else, it is easier to distribute tasks to other staff if there is more staff available. For very large distances, the barriers for collaboration may become aggravated even if the cognitive distance is optimal. It is not only intricate to overcome long spatial distance temporarily, but if national borders are crossed, additional types of distance arise stemming from cultural differences (language, time, education, and knowledge bases). Hence, domestic partners usually have a greater positive impact on innovation performance than international ones (Vinding 2002, cited from Powell and Grodal 2005). Large firms with subsidiaries in different countries and diverse R&D staff have more possibilities to reduce institutional, cultural, or cognitive distance as substitutes for spatial and social proximity. They may collaborate internationally within the own firm. They may have cultural diversity and, hence, more experience in dealing with cultural differences. They can choose among a larger R&D team to find a concrete person for a project which may have the knowledge background necessary for collaborating with a certain person from another firm (sufficient absorptive capacity, optimal cognitive distance). Therefore, partners of larger firms are on average proximate along non-spatial types of proximity (Hansen 2015). SME, instead, have to rely more on social and/or spatial proximity. For SME in rather fragmented economic regions, spatial proximity may not be an option and hence a focus on social proximity exists.

A further point is that large firms are more likely to be able to absorb losses from an unsuccessful innovation project. While it is hard for every firm to lose money in a dysfunctional collaboration, this may be threaten the means of existence for SME. Now social proximity reduces the risk of being exploited and increases the likelihood that suddenly emerging problems are solved jointly instead of breaking up the collaboration (Uzzi 1997).

Hence, for several reasons we can expect that there is a predominance of social proximity for SME in innovation collaboration, especially when the innovativeness of a firm is only medium or low. That does not mean that it is impossible to establish innovation relationships with socially distant partners but that it happens rarely. The following section will present two case studies as tentative empirical support.

3 Case studies

3.1 The focused interviews

In order to investigate empirically which types of proximity SME rely on preferably, focused interviews (see Merton and Kendall 1979) were conducted that investigated recent innovation processes of the firms in detail. By giving the interviewees open space to recall how interaction with external partners took place during an innovation process it was possible to find out how socially proximate partners were. A broad definition of innovation was used, where everything that is new to a firm was defined as an innovation. This is sensible for investigating knowledge sourcing activities because the firm needs additional knowledge which is not yet available in the firm and has to be gained from external sources. Whether this knowledge leads to an innovation new to the whole market or only new to the firm does not make a difference for the firm's knowledge sourcing process.

At the beginning, the interviewer asked broadly with whom they collaborate for innovations. Regarding further possible types of collaboration partners (the list comprised: universities, competitors, customers, suppliers, technical consultancies, intermediaries, others, as well as purely internal development), the interviewees should then tell why they did not use these types of partners. This information was then used to check whether it matched the following answers on concrete innovation events (it did). In particular, the interviewees were asked to recall a recent, concrete innovation event and who was the initiator of the innovation idea. Then they explained the interactions with persons external to the firm. For each person they were asked why there was interaction with this person, how they met the person for the first time and (if applicable) how intensive the contact with this person was in prior to the innovation event. Then it was clarified whether there were more interactions and if yes, information about the relationship about these persons were asked as before. At the end, the interviewer summarized the interactions and the information about the collaborators, i.e. why the person was involved, how they met originally, and how intensive the contact was (if applicable). This summary gave the interviewee the chance to correct or add things. This procedure was done for each type of innovation, namely product, process, and organizational innovation. The focus on specific innovation events made the statements as reliable as possible (Merton and Kendall 1979). Here, no categories were preselected, i.e. all questions were formulated open-ended in order to avoid exercise of influence leading to desirable answers (Bortz and Döring 2006, Ch. 5). In addition to these core parts of the interview the firms were asked whether they abandoned innovation processes in the past and if yes what the reasons were. They were able to add everything they wanted to say about their innovation processes.

The topic of the interview with the central questions was sent to the interviewees in advance. The interviews took place personally in rooms of the firms and lasted 1.5 to 2 hours. Next to the questions

in the manual there was time to freely explain how innovation in the firm takes place. Both interviews took place in Winter 2014/2015.

3.2 The firms

Two firms in the same German municipality (Waldbröl) were interviewed. A rather rural region was chosen in order to exclude to a large extent the spatial dimension: local partners are hardly available in a rural area and hence, the focus of the investigation can be laid on further forms of proximity. The region under observation can be viewed as rural, because there is only one city of around 50,000 inhabitants within 30 min of traveling and the next large cities (>100,000 inhabitants) are at around 45-50 min travel time. It is, however, not a peripheral region, since it is not close to the German country border and there is a motorway relatively close by. Both firms are manufacturing firms and of comparable size when correcting for the amount of production staff (production is outsourced in one of the firms). Direct competitors are for both firms at first place firms which are not located in the same region and which are of medium or large size. Both CEO have university degrees and have worked for other firms before becoming self-employed. They say that the location of the firm in this rural region is given from the history of the founders and no special advantage or disadvantage for the firm. Firm 1 is directed and owned by the founder's grandson. It has 120 employees including production, two persons involved regularly in R&D and the firm sells its products worldwide (60% international – Europe, China, Brazil; 30% national; 10% regional). Interview partners were the CEO, the Chief Technology Officer (CTO) and one R&D employee. Firm 2 was at the time of the interview owned by its founder but shortly afterwards acquired by a larger family-owned company. It has 35 employees, but the production is outsourced. Again two employees are mainly responsible for R&D; the sales go to the largest extent to Europe. The CEO was the only interview partner. Even though the two firms have some commonalities, their approach to innovation is strongly varying, as will be seen in the following.

3.3 Innovation at Firm 1

The firm had a self-conception of being moderately innovative: most innovations were customer-driven and only few patents were held. This was partly due to the risk aversion of the director who attaches greater importance to continuity of revenues than to firm growth. The large majority of innovation ideas stemmed from customers. The CTO said that too little resources for market observation and the difficulty to get enough adequate staff led to this passive attitude. In addition, the lack of financial resources was a large problem. Governmental funding was not used currently because “only the large firms get funded” and it needed too much time in advance with all the bureaucracy. Hence, the barriers to innovation were in line with earlier findings in the literature regarding SME.

Product innovation

Since ideas for product innovation usually came from customers, they were developed jointly with the respective customers if it was not possible to solve the problem alone, e.g. with the help of publicly available knowledge. Joint projects with customers were independent of the age of the connection or the spatial distance and were sufficiently often successful. In case the knowledge of the customer firm and Firm 1 did not suffice, joint projects with universities were started. As partner universities only such universities were selected with whom one of the 10 employees with university degree had stayed in contact after graduation, particularly the university where the CTO got his degree. The CTO said clearly, that they would not start collaboration with an unknown partner because of lacking trust and the wish to keep the investment low. The fear of losses was high. For all partners, social proximity was rather high.

Very recently, a first attempt was made to start a formal collaboration with a research institute and governmental funding, because the firm wanted to become more innovative. An employee had contact to the research institute from the years of study. Here, social proximity was medium, but still direct acquaintance existing.

Process innovation

Firm 1 had one production site at the location of the firm administration and sales partners in several other countries. Process improvements were smaller innovations which were developed without external help. Hence, when employees had suggestions for process innovations which could be implemented, this was done internally. There was no example of a large process innovation.

Organizational innovation: expansion of the sales markets

A few years ago, the firm expanded sales to Brazil. The starting point was a Brazilian customer, who met Firm 1 initially on a trade fair in Germany, i.e. the contact was not built by Firm 1, but by the Brazilian firm who wanted to buy products from Firm 1. Via this contact Firm 1 got information about fairs in Brazil, which the CEO first visited in order to expand the network and to find customers and sales partners. Later, i.e. when sales to Brazil grew, Firm 1 exhibited itself on Brazilian fairs.

The expansion to China was carried out similarly. The CEO got information about such an expansion from the regional chamber of industry and commerce. The first contact was made at a general information event, after which the CEO contacted the expert and invited him to the company for general advice. Afterwards, Firm 1 continued on its own with the expansion, first by visiting fairs, then by exhibiting with an own stand on fairs in China. Overall, expansion was carried out as soon as an appropriate partner was known, i.e. social proximity was at level 'B' in terms of the theory above.

Summary

For Firm 1, which was only moderately innovative, social proximity was by far the most important factor influencing collaboration decision. They tried at first to develop innovations in-house and sought

collaboration partners only when this was not successful. This is in line with the findings of Tödting and Kaufmann (2001) who said that a lack of spatially proximate partners sometimes leads to an abandonment of collaboration at all. Spatial proximity to innovation partners was of low importance, because social proximity was existent, and in case of the universities, spatial proximity was given rather by chance: the universities where the employees graduated were not too far away. The strength of technological proximity was of minor relevance. In the case of the organizational innovation, social proximity was of lower importance, since the investment in this relationship was low, i.e. the risk of losses was lower. This shows that risk aversion guided the partner search.

3.4 Innovation at Firm 2

Firm 2 had a self-conception of being extremely innovative: there were much more ideas given than could be pursued and financed at once. Several patents were held in stock, i.e. not all were in use currently. The CEO clearly said that around 90% of the innovation ideas came from himself. A barrier to innovation was scarcity of money and – related to that – the long duration until an innovation product generated returns. This is in line with the expectations from the theory. In contrast, finding adequate staff was not seen as a problem in spite of the rural location (“You will find good employees, if you simply trust them”) and employees had access to advanced training regularly.

He actively maintained and enlarged his business network, the latter mainly by participating at fairs. An innovation idea was usually presented in an internal team meeting and afterwards suitable cooperation partners were searched. A technology consultant accompanied innovation processes, searched for potential government funding and subsidies, and helped with intellectual property issues, i.e. patent applications. Hence many product innovation projects were pursued in parallel.

Product innovation

The CEO distinguished between regulated products and unregulated products. For the first group of products, many legal rules have to be complied with. These products are always developed with external help. Most often, contacts to a University of Technology (at 150km distance) were used and to a spin-off from this university. The contact was initially formed via a student from the university who worked in the firm as intern. Since several cooperation projects had been successful, the university and its spin-off were now preferred partners for further innovation projects. Many of these joint projects were formal in nature. Unregulated products were developed without external help. These are usually minor innovations, e.g. regarding design.

For a very recent innovative idea of the CEO, a firm within the CEO’s network (a customer) was contacted as the ideal partner for the project. That means, a partner was searched with at least medium social proximity and high technological proximity. In spite of intense talks with different persons from the other firm, the project was not successful because the other CEO rejected the idea and Firm 1 did not pursue the project further due to the lack of an optimal partner. The existence of

technological proximity was viewed as very important for Firm 2: the CEO said that in most cases there was only one adequate customer/supplier for each innovation idea. Hence, spatial proximity was hardly relevant.

Firm 2 had outsourced the production and hence, the CEO could not give an example for a process innovation in manufacturing.

Organizational innovation: new corporate design, new catalogues

Some years ago, the founder wanted to improve the marketing of the firm and started from scratch: he asked a psychology professor to investigate how colors and messages affect people with a magnetic resonance tomography. The firm paid for this study and built a complete corporate design from the bottom up. For example, they used colors which are untypical for his industry in order to differentiate from competitors. There was little prior contact to this professor, i.e. social proximity was close to point 'B' in the theory above, and neither were geographical proximity strong nor organizational or institutional proximity existent. Mainly cognitive proximity was decisive, i.e. the professor was chosen because he was an expert in this field of research. In spite of low social and spatial proximity, the organizational innovation resulting from the collaboration was very successful – customers liked the catalogues and told the company so and for many years, sales and return increased strongly (which is of course not solely based on the new corporate and catalogue design).

A further organizational innovation was the expansion of the sales to the US. A German customer firm having a subsidiary there was approached for organizing sales in the US. Since taxes and tariffs were too high for large sales, after some years the partner company helped to find a firm in the US who produced Firm 2's products under license. Without contacts to the German firm with the subsidiary in the US the expansion would not have taken place.

Summary

Firm 2 relied heavily on cognitive/technological distance, i.e. searched for partners who were adequate for each innovation project. Nevertheless, partners were only searched among the CEO's business network, i.e. social proximity was highly important, too. The reason was the lack of trust towards other firms or persons. In order to have a large pool of potential partners, the firm actively maintained and enlarged the network and used the support of a technology consultant. Spatial proximity was of minor relevance and did not have an influence on the success of the projects.

3.5 Discussion

Both firms indicated to search only among their own business networks for innovation collaborators. In terms of the developed concept of social proximity in section two, the search took place in the area of social proximity between B and C, i.e. only among those actors who are already personally known to the firms. They did not use technological online fairs, did not use technology transfer intermediaries (e.g. from universities), and did not search for a partner with complementary technological knowledge with whom the firm did not yet have any contact. These latter possibilities seem to be of relevance only for larger firms, if they are used at all from many firms. Both firms did not have the possibility to collaborate spatially or organizationally proximate, because they were not located in a cluster or near to suppliers and customers and because they were SME with only one location. Hence, social proximity had to substitute these two forms of proximity.

However, this strong predominance of social proximity has to be differentiated. The medium innovative firm did not really search for a collaborator, but chose as partners either the firm that had proposed the innovative idea (in most cases: a customer firm) or the university with which Firm 1 had experience in collaboration. Expansion to Brazil took place just because of an existent Brazilian customer. Social proximity was very high in these cases. Considerations about optimal cognitive distance did hardly play a role. Firm 1 was risk averse and preferred higher security to the potential of higher growth. It was a 'reactive' form of innovation.

In the other firm, most innovative ideas came from the CEO and a suitable partner was searched within the business network, i.e. also with socially more distant partners as long as they were superficially known to the firm (direct acquaintance part of social proximity). However, this network was continuously maintained and enlarged by the CEO, so that the amount of potential partners was large enough to find a partner with optimally complementary technological knowledge. Regarding actual relationships, the firm more often collaborated with a university than did Firm 1, i.e. it accepted institutional distance. Firm 2 wanted to be innovative, organized actively the innovation processes, e.g. by involving a technology consultant, by applying for grants and subsidies, by caring for continuous education for the employees, and by accepting higher risks. The firm pursued a 'proactive' form of innovation. The higher risks combined with the recent European economic recession led to a financial crisis after many years of high growth and the firm had to be sold shortly after the interview. Hence, it is difficult to say, which firm was more successful – Firm 1 did hardly grow but did not come into solvency problems.

The findings of the two case studies give additional insights regarding the interplay between spatial and social proximity: as said in section 2.2, spatial proximity loses importance when actors are indirectly linked (Cassi and Plunket 2015; Ter Wal 2013). However, both SME of the case studies said they did not search outside the direct network. I can think of two explanations for this discrepancy:

either the firms overestimate their own reliance on social proximity by saying they search only among direct acquaintances even though statistically also indirect acquaintance increases collaboration probability; or being indirectly linked in studies using formal collaboration measures (like co-patenting) often means that these persons know each other already even though they might not have started a formal collaboration yet.

In sum, spatial proximity did not play an important role for collaboration, but the location in a rural region restricted the search for collaboration partners to partners within the network. The restriction to well-known partners limited innovativeness because these partners are cognitively too proximate (see Broekel and Boschma 2012). Hence, the strategy to develop further the network proactively may have helped to avoid a cognitive lock-in and to stay a highly innovative firm. Overall, the case studies confirm earlier findings and the presented concept of the predominance of social proximity for SME and smaller innovations.

4 Conclusion

The paper at hand contributes to the literature on the diverse forms of proximity which play a role for innovation collaboration. Within this broad research area, a focus was set on the concept of social proximity which was further developed in theoretical and practical terms and applied on SME innovation collaboration afterwards. I showed that social proximity is not only applicable on individuals personally known with each other but is also existent when two individuals know something about each other without having met and this knowledge results in a certain level of trust. Based on these theoretical considerations followed a discussion why SMEs rely predominantly on social proximity for innovation collaboration. In particular, small firms have weak possibilities to reduce other forms of proximity and therefore have to rely on social proximity if they are rather risk-averse. The less innovative a firm is and the stronger its risk aversion, the more this firm will rely on social proximity which gives security for hold-up but sub-optimal innovation results. Often, social and spatial proximity coincide, this is why existing studies find that local collaboration prevails heavily.

The empirical approach of the study at hand analyzed two firms in a rural region where spatial proximity was not given for potential collaboration partners. The case studies showed that spatial proximity did not play an important role for collaboration, but the location in a rural region restricted the search for collaboration partners to partners within the network. If the network was not actively managed this resulted in low innovativeness of the firms.

From a policy perspective, rural innovation policy should foster SME networking to enhance the networks. However, this networking approach should not be restricted to regional collaboration but rather enable SMEs to get into contact with actors outside the home region. With increasing network size the pool of potential innovation collaboration partners of a SME will increase.

Of course, the paper at hand raises many new research questions and it is not without limitations. Having interviewed only two firms gives tentative results but in order to confirm the theoretical considerations more empirical investigations are necessary. Empirical investigations of abandoned innovation projects are necessary, in order to find out in how far these are related to insufficient business networks as an alternative explanation to lacking spatial proximity. It would be of special interest to compare the collaboration partner search with data from large firms and from SME in further rural regions.

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