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Bahlmann, M.D.

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Ch.6

Discussion and conclusion: main research findings, implications, and future research directions

Abstract

In this chapter we take stock of the main research findings presented in this thesis, and discuss their implications. So doing, the basic findings of each of the four studies will come under discussion. Their consequent implications will be discussed in an integral manner. This chapter will end with an elaboration of potentially rewarding future research directions based on the findings from this dissertation.

6.1 | Introduction

The purpose of this thesis was to contribute to a better understanding of the knowledge-based theory of clusters, which explains the existence of clusters based on their assumed value as exclusive facilitators of entrepreneurial knowledge sharing and interactive learning (Arikan, 2009). This undertaking was conducted in conjunction with the notion of the cluster paradox, which recognizes the paradoxical

theoretical predispositions towards the spatial characteristics of knowledge in extant literature. Inspired by this notion, this thesis set out to explore the geographical spatiality of knowledge exchange in general and buzz exchange specifically in the face of additional forms of proximity: relational, cognitive, and epistemic proximity. As such, this thesis was additionally motivated by Boschma's notion that

“a key issue in economic geography is to determine the impact of geographical proximity on interactive learning and innovation. (...) (T)he importance of geographical proximity cannot be assessed in isolation, but should always be examined in relation to other dimensions of proximity (...)” (2005: 61).

This approach allowed for a more holistic understanding of entrepreneurial processes of learning and buzz exchange, both within and across cluster boundaries.

The goal of this chapter is to show how the results of the four studies, one being conceptual, the others empirical, contribute to a better understanding of buzz exchange and interactive learning in the face of regional specialization and the increasingly ubiquitous quality of ICTs. To achieve this objective, the results of each of the four studies will be elaborated on separately. This is followed by an integral discussion in which the theoretical implications of the results are identified. This chapter continues with the main limitations of this thesis, and ends with an elaboration of potentially rewarding future research opportunities. As such this chapter clarifies how the results of this thesis, both empirically and conceptually, contribute to a better understanding of the role of regional clusters in facilitating interactive learning and buzz exchange among entrepreneurs.

6.2 | Main research findings

The main research findings of this thesis will be discussed separately at first, by briefly focusing on the outcomes of each of the four studies referred to above.

6.2.1 Main findings chapter 2

Chapter 2 set out to research the advancement of cluster literature in the past century or so, with a particular interest in its development towards a knowledge-based

perspective of clusters. This conceptual journey involved the works of Marshall (1920), Jacobs (1969), Becattini (1990), and Porter (1990), amongst others. In each case, their works were reinterpreted from a knowledge-based perspective, leading to a better understanding of the rise of this latter perspective which has become so commonplace nowadays.

The main contribution of this study lies in comparing the rise of the knowledge-based perspective of the cluster to that of the knowledge-based view of the firm (KBVoF) (Barney, 1991; Grant, 1996; Spender, 1996; Kogut & Zander, 1992). This allowed for a critical examination of the current status quo in knowledge-based cluster literature, which was deemed necessary for a number of views seemed to have emerged that contrasted current thinking in knowledge-based organization literature. Furthermore, the rise of the knowledge-based perspective of clusters demonstrates the multidisciplinary nature of this field of study, resulting in “conceptual and empirical confusion” (Martin & Sunley, 2003: 10).

The study found the current status quo of the knowledge-based perspective of clusters to be subject to two liabilities known from the KBVoF. First, a managerial bias within organizations to intervene, engineer and impose structures to bring together dispersed knowledge can also be witnessed in regions where policymakers declare geographic areas as future commercial, industrial and/or economic hotspots. The prevailing assumption, inspired amongst others by Michael Porter and Richard Florida, is that clusters as knowledge repositories can be engineered. In line with this engineering approach, is the assumption that IT infrastructure will stimulate the flow of knowledge between the small and medium firms within a cluster. Especially, broadband technology is perceived as the promising technology that will spur the development of regions (Steinfeld & Scupola-Hugger, 2006).

Second, the local learning trap that marked the first generation of KM, wherein managers looked at local pockets of knowledge instead of adopting a broader collective lens, can also be recognized in the strategies of regional policy makers. The focus is merely on bringing together small firms in a particular geographic area instead of posing the question whether the firms indeed are willing and in need to learn with and from each other. As we have learned from KM history in organizations,

ignoring this (potential) social capital of clusters will most likely hamper the development of intellectual capital (Nahapiet & Ghoshal, 1998).

Analogue to developments taken place in business research, the study proposes that policy-makers and scholars alike should develop a better appreciation for the micro-foundations of localized and non-localized knowledge exchange. “Governing” knowledge, both in organizations and clusters, involves at the very least a well developed understanding of the rich social dynamics to which knowledge exchange is subject to.

6.2.2 Main findings chapter 3

The main purpose of chapter 3 was to deepen our knowledge of the micro-foundations of knowledge exchange, given the nascent debate on the proclivity of knowledge exchange to manifest locally. As such, this chapter builds on the conclusion drawn in chapter 2, namely that a better understanding of the micro-foundations of localized and non-localized knowledge exchange is required. Specifically, the concept of inter-cluster knowledge linkages is brought to the forefront with the aim of deepening our understanding of the actual flow of content it facilitates and the characteristics these linkages exhibit in terms of tie strength. This chapter intends to move beyond our present conceptual understanding of intra- and inter-cluster knowledge flows and to enrich our empirical comprehension of the phenomenon in question

The evidence for the existence and significance of cross-cluster knowledge exchange is abundant. The entrepreneurs interviewed for this study provide plenty accounts of knowledge interactions with entrepreneurs outside their cluster of origin. Interestingly, these accounts provide tentative evidence for complex and highly tacit knowledge exchange. More specifically, the knowledge transfer process involves the exchange of visions and opinions with regard to major developments taking place in the industry. Intriguingly, this discussion is taking place at an ideological level, involving questions like what role technology and the Internet should fulfill in people’s life, and how technology and the Internet could or should change the world (for the better, that is). This discussion seems to be strongly embedded in a shared

worldview, namely that society as a whole could benefit from technological progression (i.e. progression in the realm of the Internet, IT, and new media).

The interview results presented in this study, and the conclusions drawn from them, are naturally far from conclusive. They do, however, allow for speculation on the actual importance of clusters in facilitating entrepreneurial knowledge exchange. Translating this to a proximity framework (Boschma, 2005), one might question the assumed dominance of geographical proximity in the process of knowledge exchange and interactive learning. It appears that other forms of proximity, such as relational (Saxenian, 2006), cognitive (Amin & Roberts, 2008; Boschma, 2005; Nooteboom, 2000), and epistemic proximity have a facilitative role as well. Chapter 3 therefore concludes with the notion that the role of geographical proximity as facilitator of entrepreneurial knowledge exchange needs to be assessed relative to the effects of additional forms of proximity.

6.2.3 *Main findings chapter 4*

With the main conclusions of chapter 3 in mind, chapter 4 set out to explore the effect of geographical proximity relative to the potential influence of additional forms of proximity. The study departs from the following main research question: *under what conditions of proximity can knowledge transfer successfully take place both within and across cluster boundaries?* This question is explored by distinguishing four types of proximity, namely geographical, relational, cognitive, and epistemic proximity. As such, this study deliberately moves away from what has been called the 'bounded region'-metaphor, and instead adopts a social network or flow metaphor (Thrift & Olds, 1996). This allows for a critical approach of the knowledge-based theory of clusters, which holds clusters as valuable and exclusive domains of knowledge.

Identifying the effects of relational, cognitive, and epistemic proximity allows for a re-evaluation of the importance of geographical proximity as facilitator of interactive learning and knowledge transfer. By making use of ego-network data, this study found no evidence to suggest that interactive learning and knowledge transfer are directly enhanced because of mechanisms related to spatial proximity. Geographical proximity does not directly influence interactive learning and ease of knowledge transfer, nor does it play a dominant role by strengthening other forms of proximity,

as suggested by Boschma (2005) (see figure 4.5b in chapter 4, or table 6.2.3 below). The study does corroborate the view that geographical proximity plays a role by enhancing relational proximity ($b = .151$, $p < .01$). This effect is smaller than was expected based on extant literature.

Both relational and epistemic proximity appear especially crucial in facilitating interactive learning and knowledge exchange among entrepreneurs, irrespective of the presence of specific spatial arrangements. The data, as presented by the empirical model (figure 4.5b, chapter 4), suggest an interesting and significant role for the concept of epistemic proximity indeed. At the very least, the concept of epistemic proximity should become a part of the vocabulary of the knowledge-based theory of clusters, for it clearly influences both ease of knowledge transfer and interactive learning.

Table 6.2.3: Findings chapter 4

Hypothesis	Beta	Support
R1: higher relational proximity between ego and alter increases the amount of interactive learning taking place in that relationship.	.610, $p < .01$	Full
R2: higher relational proximity between ego and alter increases the ease with which knowledge is being transferred between ego and alter.	-	No
C1: the amount of interactive learning taking place in a given ego-alter relationship has an inverted U-shaped relation with the level of cognitive proximity between ego and alter.	-	No
C2: higher cognitive proximity between ego and alter increases the ease with which knowledge is being transferred between ego and alter.	.341, $p < .01$	Full
E1: the level of epistemic proximity between ego and alter is directly and positively related to the amount of interactive learning taking place in a given ego-alter relationship.	.095, $p < .10$	Full
E2: higher epistemic proximity between ego and alter increases the ease with which knowledge is being transferred between ego and alter.	.529, $p < .01$	Full
G1: The degree of geographical proximity in a given ego-alter relationship positively effects the degree of relational, cognitive, and epistemic proximity of that relationship.	.151, $p < .01$	Partial, only relational proximity

One of the main contributions of this chapter, thus, lies in the introduction and measurement of the concept of epistemic proximity. A second main contribution lies in the assessment of geographical proximity relative to the role of additional forms of proximity as facilitators of interactive learning and knowledge exchange. As such, this chapter successfully combines multiple theoretical streams, resulting in a more advanced understanding of interactive learning and knowledge exchange.

6.2.4 Main findings chapter 5

Although chapter 4 finds the concept of epistemic proximity to be of importance in facilitating interactive learning and ease of knowledge transfer, our understanding of why and how epistemic proximity matters is still underdeveloped. Building on the main findings of chapter 4, chapter 5 continues with a deeper examination of the concept of epistemic proximity as to its workings and relevance. It does so by combining both interview- and ego-network data.

The qualitative findings lead to the conclusion that organizing visions are deemed important institutional mechanisms through which innovations are created and promulgated (Swanson & Ramiller, 1997). Organizing visions allow for the “application of the same interpretative schemes and mutual understanding of new knowledge and technologies, as well as shared cultural traditions and habits within a particular technology field, which stimulate the establishment of conventions and other institutional arrangements” (Bathelt *et al.*, 2004: 38). As such, we find organizing visions to be powerful sensemaking mechanisms, allowing actors to make sense of complex information and knowledge, and are especially prominent in IT-related branches. Organizing visions such as the ones revolving around the idea of the semantic web, OpenID, and the like, allow a global context to arise that surpasses the assumed contextual boundaries of the cluster. Organizing visions allow entrepreneurs to grow more proximate to one another in the epistemic sense.

Interestingly, buzz interactions represent a prominent mode of promulgation. Organizing visions are partly diffused through gossip and rumors, thus acting as a very powerful mechanism for the adoption of grand ideas concerning the web. This suggests that buzz actually aids the development of an epistemological context surpassing that of the level of the cluster. Whereas buzz interactions thus far are

considered inherently a local form of exchange, the qualitative findings suggest that they actually facilitate inter-local knowledge exchange.

The findings from the interviews, although tentative, provide sufficient ground for further quantitative inquiry of the relative importance of epistemic proximity. As such, the concept of epistemic proximity was scrutinized in relation to its facilitative role towards buzz exchange. We found the concept of epistemic proximity, which is the dyadic translation of the concept of organizing visions, to have a distinctly facilitating role in relation to buzz exchange. The concept of relational proximity proves dominant in facilitating buzz exchange as well. The buzz-theorem, which can be regarded a critical component of the knowledge-based theory of clusters, appears to overemphasize the geographical dimension, given the absence of the geographical proximity-variable in the empirical model (see figure 5.5.1 in chapter 5, or the table below).

Table 6.2.4: Findings chapter 5

Hypothesis	Beta	Support
Hypothesis 1: relational proximity is positively and linearly related to buzz exchange.	.651, p < .01	Full
Hypothesis 2: epistemic proximity is positively and linearly related to buzz exchange.	.245, p < .01	Full
Hypothesis 3a/b: Geographical proximity positively and linearly effects the degree of relational (H3a) and epistemic proximity (H3b).	-	No

6.3 | Implications of this study

In the previous section the main findings of the four studies were discussed, showing how the four chapters relate to one another conceptually and empirically. In this section, the more broader theoretical implications of the empirical findings are explored

6.3.1 *The knowledge-based theory of clusters*

The knowledge-based theory of clusters maintains an exclusive role for clusters in facilitating local knowledge dynamics and, in relation to that, innovation performance (Arikan, 2009). As explained earlier, the basic rationale is straightforward and persuasive: tacit knowledge exchange is assumed to be spatially sticky due to its context specific nature, implying that tacit knowledge is only to be shared effectively when taking place inside a specific social context. Or, as Rutten (2003: 58) puts it, “tacit knowledge is meaningful only within its social context. (...) To refer to tacit knowledge is to refer to a certain social context.” This social context is assumed to be defined locally. It is this final contention that does not seem to hold when confronted with the findings from the empirical chapters in this thesis.

The studies presented in this thesis are the first to examine this claim at the micro-level of analysis by means of ego-network and interview data. The findings suggest that a distinct part of the social context that is deemed so important for the transmittal of tacit knowledge is actually constructed outside the boundaries of the clusters, hinting at the presence of a cross-cluster or inter-cluster contextual environment. This conclusion carries implications both in favor of and against the knowledge-based theory of clusters.

One implication in favor of the knowledge-based theory of clusters lies in the fact that the data show an important role for the contextual factor in facilitating knowledge flows among entrepreneurs. The significant role of epistemic proximity can be regarded an indication of this claim. Specifically, both cognitive and epistemic proximity appear to exist irrespective of specific cluster boundaries, casting their effect on knowledge transfer and interactive learning in a convincing and thought provoking manner. The role of epistemic proximity especially can be regarded a lacunae in the present status quo regarding the knowledge-based theory of clusters.

This insight, that is, the role of epistemic proximity, sheds a new yet familiar light on Marshall's initial observations with respect to the localization of industries, and specifically on his remark that “the mysteries of the trade become no mysteries, but are as it were in the air” (Marshall, 1920: 225). In Marshall's era, as Brown & Duguid (2000) point out, the phrase *mystery* had a different connotation than nowadays is customary. Currently the phrase usually is applied to denote occult or religious

phenomena. In Marshall's days, however, the phrase 'mystery' had a different meaning (*ibid.*), as the Webster's New International Dictionary of the English Language (1920) clearly states:

Mys'tery, n. A trade; handicraft; art; craft; occupation; calling; office; also, a body of persons engaged in a particular trade, handicraft, or the like.³⁹

According to Brown & Duguid (2000) this evidently shows that Marshall was referring to tacit forms of knowledge, i.e. knowledge that is inherently associated with specific forms of arts or crafts, i.e. with guilds. If the phrase 'mysteries' relates to the concept of tacit knowledge, than surely the phrase 'in the air' relates to the concept of epistemic proximity or organizing visions (Swanson & Ramiller, 1997), as people engaged into a particular discipline (trade, handicraft, or occupation, i.e. mysteries) find themselves engaged in or influenced by broader visions (i.e. the air) shaping the markets and industries in which they are engaged and contributing to the development of a similar social context. This view remains when zooming in on one particular mode of exchange, namely buzz. Epistemic proximity proves to be particularly important with respect to facilitating buzz exchange, despite the inherently tacit nature of the knowledge involved in the exchange.

The previously suggested prominent role of relational proximity in facilitating knowledge transfer among entrepreneurs within and across cluster boundaries (Saxenian, 2006) is confirmed by this study. This findings also confirm the prevalent notion that geography matters to building social ties, as geographical proximity positively effects relational proximity. This effect is, however, limited ($b = .151$, $p < .01$), implying a further diminishing role for the concept of geographical proximity as main facilitator of knowledge exchange among entrepreneurs.

In light of the above expressed considerations the main question to be answered now becomes what role remains for geographical proximity in facilitating knowledge exchange among entrepreneurs. Or more specifically, how should its effect be valued and understood. As mentioned in chapter 4, this study didn't examine possible

³⁹ In the Webster's dictionary of English language (1920) a reference is made to a specific play by Shakespeare in order to provide an example: "Fie upon him, he will discredit our *mystery*" (Shakespeare, 1965 [1623]: 101).

monitoring or labor market effects, that might be related to or dependent on specific spatial arrangements. As such, certain knowledge dynamics might very well be dependent on localized monitoring or labor market effects. The implications of the results from this study therefore extend to the interpersonal level of analysis specifically. Apart from slightly enhancing relational proximity, an important role for geographical proximity, thus, might still remain by enhancing monitoring and labor market effects.

6.3.2 *Reflecting on the cluster paradox*

In the introduction chapter of this thesis, reference was made to the so-called cluster paradox, which was identified as one of the main issues characterizing this field of study. This paradox can be defined as follows: on the one hand, (tacit) knowledge is conceptualized as a form of exchange essentially not affected by any physical boundary (Amin & Roberts, 2008). On the other hand, however, a dominant stream of literature stresses the spatial stickiness of tacit, non-codified knowledge, assigning a dominant role to regional clusters as lubricators of the knowledge sharing and innovation process (Bathelt *et al.*, 2004).

This thesis has contributed to resolving this paradox in two unique ways: first by adopting an ego-network approach, second by conceptually distinguishing and empirically measuring multiple forms of proximity. The analysis of the data reveals a more nuanced image of the role of geographical proximity than proposed by the agglomeration paradox. Instead of either discarding or adopting one of both perspectives, the analysis reveals the exact role of geographical proximity in facilitating knowledge exchange among entrepreneurs when contrasted to the influence of relational, cognitive, and epistemic proximity. Whereas the cluster paradox phrases the theoretical dilemma in terms of 'either ... or', the analysis of the data presented in this thesis suggests to rearticulate the dilemma in terms of 'both ... and'. When adopting a 'both and' perspective of the cluster paradox, a more nuanced view of entrepreneurial knowledge transfer is allowed to arise. Rather than treating both perspectives as opposing ends of a continuum, as the cluster paradox appears to suggest, the analyses in this thesis proposes a more constructive way of regarding the phenomena of local and non-local knowledge transfer.

In particular, this thesis advances a theory of entrepreneurial buzz exchange and interactive learning that goes beyond the mere role of geographical proximity. By assessing the role of geographical proximity relative to other forms of proximity, this key issue is allowed to be viewed independently of the earlier mentioned 'either ... or' articulation. At the very least, future studies focusing on the role of geographical proximity should, based on the findings presented in this thesis, control for other dimensions of proximity.

6.3.3 Implications for the sociology of learning

In essence, the findings presented in this thesis touch upon the core of the knowledge-based theory of clusters. The exchange of buzz and interactive learning involves much more than 'being there' in terms of geographical proclivity in the form of face-to-face contact, local relationships, and the home base. Based on the findings of this thesis, the issue put forward by Amin & Cohendet (2004) with respect to the territorial or spatial nature of the sociology of learning appears all the more relevant. Indeed,

“if the sociology of learning is not reducible to territorial ties, there is no compelling reason to assume that ‘community’ implies spatially contiguous community, or that local ties are stronger than interaction at a distance” (ibid. 93).

This is not to say that learning and tacit knowledge exchange may not be local. Rather, it allows for the recognition of distanced knowledge spaces as highly relevant, perhaps even crucial, platforms for learning and knowledge or buzz exchange. As such, it appears outdated to look upon such learning interactions as being inferior to their localized equivalent because of the lack of geographical proximity and associated mechanisms for tacit knowledge exchange. Accounts of rich and successful non-localized learning environments are plentiful (e.g. Benkler, 2006, see introduction chapter).

As Allen (2000) notes, what matters in such distanced learning interactions “is not the fact of local embeddedness but the existence of relationships in which people

are able to internalize shared understandings or are able to translate particular performances on the basis of their own tacit and codified understandings” (cited in Amin & Cohendet, 2004: 93). This thesis adds to this notion the concept of epistemic proximity, being a dyadic translation of the concept of organizing visions (Swanson & Ramiller, 1997). The positive effect of epistemic proximity on interactive learning, ease of knowledge transfer (see chapter 4, or table 6.2.3), and buzz exchange (chapter 5, or table 6.2.4) further stress the diminishing role of local embeddedness in the sociology of learning. The presence of organizing visions indeed are found to facilitate interactive learning and buzz exchange by providing a common context that surpasses the level of the cluster. As such, the concept of epistemic proximity adds to the sociology of learning in that it provides an additional argument for the diminishing role of local embeddedness/ geographical proximity.

Some caution is in order, however, when engaged in the process of fully diminishing the role of geographical proximity. As chapter 4 shows, geographical proximity was found to exert an effect on relational proximity, thereby still fulfilling a part in the process of facilitating interactive learning among entrepreneurs. Although less dominant than could be expected based on extant literature, the presence of this effect shows that fully neglecting or denying the potential role of geographical proximity or ‘being there’ is unsubstantiated and presupposed. This finding calls for further inquiry into *when* rather than *if* geographical proximity matters.

6.4 | Research limitations

Although this research yields interesting results, they should be considered against several potential limitations. These limitations, however, imply interesting future research directions. First, the data applied in this thesis is cross-sectional of nature. This aspect of the research setup disregards the effect that the various dimensions of proximity may exert on each other over time. The role of geographical proximity as facilitator of knowledge exchange may change over time as other forms of proximity characterizing a given ego-alter relationship grow stronger or weaker. A longitudinal approach to this issue may possibly change our current valuation of each of the dimensions of proximity.

The second potential limitation is related to the idiosyncrasy of this study, as this study has examined the Amsterdam IT and new media-cluster only, thereby possibly limiting the extent to which the findings can be generalized to service-based clusters only (Von Nordenflycht, 2010). This implies that the generalizability of this dissertation is limited to service-based clusters primarily and does not, for instance, extend to so-called science-based clusters or regions (such as biotechnology). With this consideration in mind, it is suggested that the results obtained through studying the AINM-cluster are to be perceived in the context of professional service-based clusters instead, to which industries such as IT consulting and design, advertising, marketing, software development, media production, et cetera, are allocated (Von Nordenflycht, 2010).

Third, and related to the previous limitation, the role of epistemic proximity in facilitating knowledge exchange and interactive learning has been verified in one type of industry only, namely IT and new media. This industry appears to be particularly ideologically inclined given the various ongoing discourses related to web 2.0, semantic web, open source, et cetera (Benkler, 2006). It is by no means certain that the concept of epistemic proximity can be extended to any other industry or related cluster, especially those less ideologically inclined. Thus, the concept of epistemic proximity appears to be valid in the context of the Amsterdam IT and new media cluster in particular, and is likely to extend to related clusters like Silicon Valley.

Fourth, the direction of causality – although a standard issue in social sciences – is another issue to take into consideration when interpreting the results from this study. Due to the cross-sectional nature of the data generation process, the issue of reverse causality cannot be completely ruled out. However, the currently established causal order of the variables presented in tables 6.2.3 and 6.2.4 make sense when viewed against theories of social capital, agglomeration economies, and knowledge exchange.

Fifth, this research has focused on knowledge exchange through social ties only, thus neglecting knowledge exchange through computer-mediated-communication not supported by any degree of relational proximity. The concepts of epistemic and cognitive proximity are expected to have greater impact in such interactions.

Sixth and final, the effect of so-called knowledge externalities through labor market effects, mechanisms of monitoring, and spin-off activities are not taken into account in this thesis (Dahl *et al.*, 2005; Dahl & Pedersen, 2004). This type of learning effect has also been termed the horizontal dimension of spatial proximity (Malmberg & Maskell, 2005), and relates to learning processes taking place among firms or entrepreneurs active in the same industry producing the same or similar products and services, i.e. learning among rivals and competitors. Such processes are mainly supported by mechanisms of observation and comparability (*ibid.*). Again, when taking into account such processes, a different understanding of the relative role of each of the dimensions of proximity may emerge.

6.5 | Future research directions

The empirical and conceptual results from this study, combined with the limiting considerations expressed above, expose a number of interesting future research opportunities.

First, the empirical results presented in this thesis (i.e., chapters 3, 4, and 5) imply the need for an increased attention to the micro- or interpersonal level of analysis, especially when engaged in the study of local and non-local knowledge dynamics. Our current understanding of the facilitative role of knowledge exchange

Cluster research has predominantly adopted a rather atomistic approach towards clusters

among economic agents in general and entrepreneurs specifically is limited by theories developed based on macro-level and meso-level data primarily. It is not yet clear to what extent these theories hold when tested using micro-level data. Our understanding of how geographical proximity effects local and non-local knowledge exchange based on micro-level data is only beginning to emerge. The present study can be considered one of few recent studies that is beginning to explore this issue by making use of micro-level data.

Second, cluster research has predominantly adopted a rather atomistic approach towards clusters, researching clusters as isolated entities. Although the research design of the current thesis also departs from an atomistic design (by taking the

Amsterdam IT and new media-cluster as point of departure), the results clearly show that clusters can hardly be considered standalone phenomena. Future research needs to take this into account, and partly does so already by means of the distinction between global pipelines and local buzz (Owen-Smith & Powell, 2004). This does not suffice, however. The results of this study reveal more complex local and non-local cluster dynamics that go beyond the crude distinction between global pipelines and local buzz. A more developed vocabulary needs to be developed in order to grasp the subtleties of both cluster-based and cross-cluster knowledge exchange. This thesis can be regarded a first explorative undertaking in this direction.

Third, this study revealed the influence of other dimensions of proximity in addition to the role of geographical proximity. As suggested by Boschma (2005), however, additional forms of proximity are conceivable that are not taken into account in this thesis. Most notably, cultural, institutional, and organizational proximity may potentially prove to be powerful determinants of knowledge exchange among entrepreneurs. Future research may incorporate additional dimensions of proximity to the proximity framework presented in this thesis to provide a more complete and holistic understanding of local and non-local knowledge exchange.

Fourth, this research requires replication in other industries, both service-based and high-tech or science-based, in order to establish its degree of generalization. As mentioned in the limitations section, the results are currently valid for the Amsterdam IT and new media-cluster only. It is conceivable that other clusters, whether similar or different to the Amsterdam IT and new media-cluster, render different combinations of proximity with respect to entrepreneurial knowledge exchange. For instance, the role of epistemic proximity may be limited to ideologically inclined industries specifically, as is the case in the Amsterdam IT and new media-cluster.

Fifth, this thesis calls upon future work to adopt a contingency approach towards determining the exact role of geographical proximity, like in case of Sorenson *et al.*'s (2006) adoption of the knowledge complexity-approach. The general tendency now appears to be that geographical space always matters. The results of this thesis suggest that the role of geographical proximity may be contingent on the presence and effect of other forms of proximity. Future research may invest time in developing

a better understanding of *when* geographical proximity matters most, and equally important, when not.

These future research venues, along with the results of this thesis, advances the knowledge-based theory of clusters as an exciting area of research with ample opportunities for future exploration.

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