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Firms' identification with technology clusters and knowledge sharing between firms

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Abstract

Research on clusters finds that the sharing of knowledge between member firms tends to enhance the innovativeness and attractiveness of a cluster for firms, newcomers, and investors, and contributes to the economic prosperity of regions. Yet co-location may not be enough and scholars disagree on the role that a firm's identification with a cluster plays in fostering knowledge sharing at the cluster level. While prior work investigated a range of structural factors shaping knowledge sharing in clusters, we lack an understanding of the propensity and types of knowledge sharing given firms' cluster identification. Based on a field study of two high-tech clusters, we inductively theorize interactions between perceived cluster knowledge properties, cluster logics, cluster identification, and inter-firm knowledge sharing. We find that firms with a positive cluster identification share cluster-unique knowledge, accessible only from within the cluster, with other member firms. Neutral cluster identification reduces the uniqueness of the shared knowledge in the cluster and, with cluster non-identification, knowledge sharing dwindles away. The study elaborates and contributes to the emerging knowledge-based theory of clusters by theorizing the role of firms' cluster identification.

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INTRODUCTION

A spatial cluster of organizations may offer extensive economic benefits to regions and firms within them, and cluster patterns and processes are of high interest to managers, policy makers, and scholars (Audretsch and Feldman, 1996; Whittington, Owen-Smith, and Powell, 2009; Ketels, 2013; Delgado, Porter, and Stern, 2014). A cluster consists of a set of organizations located within a bounded geographical region producing similar output products or services (Romanelli and Khessina, 2005; see McCann and Folta, 2008 for alternative definitions that extend beyond related firms). Scholars have observed that in high-tech and knowledge-intensive industries the economic benefit of clusters for regions and members depends on the intensity of knowledge flows and the stock of knowledge therein (Tallman et al., 2004; Arikan, 2009). Firms benefit from locating and remaining within clusters offering an abundance of state-of-the-art technical know-how or alternatively relocating when members move out or knowledge sharing is depleted (Duranton and Puga, 2001). Well-known examples of attractive knowledge-intensive clusters such as Information and Communication Technology in Silicon Valley, Life Sciences in Cambridge MA and Singapore, and Oil and Gas on Norway's west coast give credence to this argument.

It is well documented that location impacts the performance of firms in knowledge-intensive industries (Gambardella and Giarratana, 2010; Laursen, Masciarelli, and Prencipe, 2012). Knowledge sharing, voluntary or involuntary, plays a key role in linking cluster membership with its potential benefits, yet the presumed link between cluster membership and the antecedents and processes of knowledge sharing between organizations remains poorly understood (Bathelt and Cohendet, 2014; Funk, 2014). In an extensive review of the

cluster literature in management and economic geography, McCann and Folta (2008) show past research has predominantly investigated involuntary spillovers of technological knowledge between organizations, measured by patent citations, formal collaborations, or labor mobility patterns (e.g., Jaffe, Trajtenberg, and Henderson, 1993; Almeida and Kogut, 1999; Bell, 2005; Whittington, Owen-Smith, and Powell, 2009). While these studies offer considerable insights on both the demand-side benefits (heightened demand by reduction of consumer search cost) and supply-side benefits (knowledge spillover) of clusters, scholars have grown increasingly critical of the narrow focus on these - often involuntary - knowledge spillovers to explain cluster benefits (Arikan and Knoben, 2014: 478). For example, knowledge flows may hinge on tight relationships between firms in clusters, but count-based measures (e.g., employment figures capturing labor mobility) commonly applied in past studies prevent an understanding of why and how such relationships emerge and importantly, how they shape knowledge sharing (Martin and Sunley, 2003; cf., McCann and Folta, 2008). Furthermore, the relationships between firms and the cluster are dynamic and complex phenomena characterized by a "sense of belonging" (Staber and Sautter, 2011: 1351).

Lately, scholars have advanced a knowledge-based theory of clusters to explain their existence and internal organization (Malmberg and Maskell, 2002). Knowledge-based theory seeks to expound wider knowledge-related benefits for member firms (innovation and learning) and regions (highly qualified labor, increasing wealth) and stipulate how and under what conditions both constituents enable and profit from localized knowledge flows (Pouder and St. John, 1996; Maskell and Malmberg, 1999; Maskell, 2001; Tallman et al., 2004; Arikan, 2009). Firms benefit from being located in knowledge-intensive areas and can be expected to share explicit and tacit knowledge more intensively within than beyond clusters (Easterby-Smith, Lyles, and Tsang, 2008): Co-located firms accrue and create knowledge through idea and experience exchanges between their employees in informal settings,

observations of competitors' activities, and participation in professional networks (von Hippel, 1987; Saxenian, 1996; Bathelt and Cohendet, 2014).

In a review of the cluster literature, McCann and Folta (2008) address open issues pertinent to knowledge-based scholarship. Past studies have concluded that firms benefit unequally from cluster membership, but the causes for this phenomenon remain largely unknown (cf., Felin and Hesterly, 2007; Arikan and Knoben, 2014). Offering a tentative explanation, McCann and Folta suggest that firms may possess different knowledge stocks and absorptive capacity, which alter their ability to tap into knowledge flows in the cluster (cf., Tallman et al., 2004; McCann, Reuer, and Lahiri, 2015). They also suggest that a knowledge stock at the cluster level - and how individual firms perceive its value - could potentially impact a firm's knowledge sharing behavior (Arikan, 2009). Arikan and Knoben (2014) refer to this as "awareness of knowledge assets." In summary, knowledge-based scholars call for in-depth studies on explanatory factors for knowledge sharing of member firms within clusters (Breschi and Lissoni, 2001; Martin and Sunley, 2003). Such studies are much needed for theory and practice because they advance understanding of why firms locate in clusters, why they remain, or exit the cluster.

A separate research stream on spatial clusters focuses on firms' identification with clusters and its associated economic benefits. Theoretical accounts and case studies of clusters indicate that firms often develop a shared culture, community feeling, and identity in a cluster (e.g., Saxenian, 1996; Tallman et al., 2004; Romanelli & Khessina, 2005). Yet, with few exceptions (e.g., Beebe et al., 2013; Staber, 2010; Arikan, 2014), research focusing on firms' "sense of belonging to a cluster" have neither specified various benefits of "belonging" (Ozer and Zhang, 2015: 1106) nor explored the antecedents and differences between firms in their attachment to a cluster. Yet it is in this "place" that voluntary knowledge sharing may thrive,

which represents the more important and valuable potential benefit of cluster membership than involuntary spillovers (Aharonson, Baum, and Plunket, 2008).

Belussi, Gottardi, and Rullani (2003) call for work that utilizes ideas of collective identity in a cluster to explore the antecedents and processes of knowledge sharing (cf., Belussi and Sedita, 2012). Research on organizational behavior has examined this effect at the level of teams and divisions. Organizational members who identify more strongly with overarching groups, such as a corporation or division, share and generate more knowledge across divisional or team boundaries than those who identify more weakly with the group (Kane, 2010; Dokko, Kane, and Tortoriello, 2014; Lomi et al., 2013). Kane (2010) found that groups with a superordinate identity were more likely to transfer knowledge with concealed merits and low demonstrability between each other than groups that did not share any superordinate identity.

In a similar vein, Anand, Joshi, and O'Leary-Kelly (2013) conjectured that the manner in which a firm identifies with a strategic group influences its information-seeking behavior, which may ultimately relate to knowledge flows between firms in collective groups. While no evidence exists to theorize and support such links, we think conducting work on the intersection of the two streams holds great promise: while it is known that firms differ greatly in the benefits they derive from knowledge flows in clusters, the causes remain poorly understood. If it were possible to establish that firms differ in their identification with the cluster (cf., Peteraf and Shanley, 1997) and explain these differences and if a salient link were established between a firm's identification with the cluster and its knowledge sharing behavior, the knowledge-based theory of clusters may take an important step forward. A knowledge-based theory of clusters could disentangle the relationship between individual member firm behavior and overarching cluster dynamics. Motivated by this challenge, we elaborate on the knowledge-based theory of clusters by examining two pertinent questions:

What determines a firm's cluster identification? How, if at all, does a firm's cluster identification impact on knowledge sharing with other firms in the cluster?

Our theoretical model outlines cluster logics and perceived cluster knowledge properties associated with different types of cluster identification and stipulates that these patterns generate variance in knowledge sharing behavior. Based on a field study, we inductively theorize interactions between a firm's cluster logics, perceived cluster knowledge properties, its type of cluster identification, and knowledge sharing. Field data is drawn from the information and communication technology (ICT) and the biotechnology (Biotech) clusters in the Canton of Zurich in Switzerland. We conducted 70 interviews with CEOs and top executives in firms and gathered secondary data ranging from policy documents to firms' annual reports and media articles. Our examination reveals that cluster identification is a more complex phenomenon than only a "sense of belonging" (Staber and Sautter, 2011: 1351) and that the understanding of cluster membership impacts cluster identification and knowledge sharing amongst member firms.

KNOWLEDGE-BASED THEORY OF CLUSTERS

Scholars have argued that physical co-location enables firms to access and utilize knowledge through informal spillovers, face-to-face interactions, and labor mobility (Audretsch and Feldman, 1996; Dyer and Nobeoka, 2000; Maskell, 2001). Within clusters, firms benefit extensively from knowledge sharing and knowledge spillovers, e.g. in terms of their innovation activities (Jaffe, Trajtenberg, and Henderson, 1993; Maskell and Malmberg, 1999; Tallman et al., 2004). The knowledge-based theory conjectures that geographic proximity facilitates the transfer of tacit knowledge between firms and other actors and, thereby, augments a firm's innovation activities and performance (von Hippel, 1994; Pouder and St. John, 1996). Since employees across firms are physically close, they effortlessly share

information and knowledge in, sometimes overlapping, formal and informal networks, discuss ideas at chance encounters, jointly observe technology and process, and inquire and learn from each other's experiences (Dayasindhu, 2002; Reagans and McEvily, 2003; Whittington, Owen-Smith, and Powell, 2009). The transfer of explicit and tacit knowledge within a cluster can exert a major impact on the firm's productivity (Dyer and Nobeoka, 2000).

While there is evidence that clusters promote knowledge sharing between member firms, findings are mixed on the mechanisms and channels of local sharing (Boschma and Frenken, 2011). It was long believed that spatial proximity was sufficient for knowledge spillovers in clusters (cf., Audretsch and Feldman, 1996; Baptista, 2000), but recent findings show that firms do not profit equally from knowledge spillovers (Giuliani and Bell, 2005; Broekel and Boschma, 2012; Funk, 2014). For example, some biotech firms performed worse when located in proximity to competitors with regard to the hazard of IPO (Stuart and Sorenson, 2003). Few studies have targeted the causes of such differences (cf., McCann and Folta, 2008; Arikan and Schilling, 2011). A notable exception is Funk (2014) who found that employee network structures within firms moderate the relationship between cluster membership and innovation performance (measured as the citation-weighted count of patents and the count of new combinations of patents). Another one is McCann and Folta (2011), who find that younger firms and firms with higher knowledge stocks (patent stock, absorptive capacity) enjoy stronger clustering benefits. These firms outperform peers in terms of patent applications, reflecting an individual firm's ability to produce and protect knowledge. Such studies capture performance-related measures discoverable by "paper trails" (such as patents) and draw on them to infer knowledge sharing between firms at the cluster level. Alternatively, studies focus on unintentional knowledge spillovers (such as labor mobility) but do not seek to shed light on the heterogeneity among deliberate knowledge sharing activities of firms in clusters.

In order to understand firms' knowledge sharing activities at the cluster level, different types of interactions have been examined. For example, some work has distinguished unintentional knowledge sharing through observations and labor mobility and intentional sharing through projects with partners and personal interactions (Belussi and Sedita, 2012; Arikan & Knoben, 2014). Saxenian (1996) and Dahl and Pedersen (2004) argue that the local sharing of technical knowledge occurs predominantly through informal interaction between cluster members. Conversely, other authors show that in some clusters knowledge sharing remains limited (e.g., Stuart and Sorenson, 2003; Huber, 2012) and counter to prevailing assumptions in the knowledge-based theory, rather the formal and planned and not the spontaneous interactions of firms in clusters, precede knowledge sharing (Moodysson, 2008).

Cluster identity and cluster identification

The notion of cluster-belonging or -attachment has repeatedly been used to explain how member firms may benefit from knowledge sharing (Saxenian, 1996; Maskell, 2001). Tallman et al. (2004) circumscribed the attachment phenomenon as a "tacit, cluster-level understanding" (p. 266), which a firm needs to acquire in order to become an effective member of the cluster. Repeated informal interactions and strong social relationships between members foster a unique collective identity in a cluster, similar to the shared identity others have ascribed to communities of practice (Brown and Duguid, 2001). A "communal social culture" (Maskell, 2001: 929), including common values, beliefs, conventions, and language, support knowledge sharing in a cluster (Maskell, 2001). Since knowledge sharing is a collective act between firms and other organizations, the presence of a strong collective identity may be a necessary condition, even if individual firm goals and interests may differ (Rowley and Moldoveanu, 2003).

Yet, a collective identity of a group of organizations is significantly different from the identity of a single organization (Patvardhan, Gioia, and Hamilton, 2015): in an organization, a collective identity presupposes shared meaning negotiated among members. A collective of firms can exist with transactional independence and detached of formal hierarchy, nor does it require an agreement on shared meaning. A collective requires coherence around broader interests and a common problem domain, which provides the basis for a workable identity, which is at best coherent but not consensual. It is "unclear whether identity at the collective-of-organizations level is appropriately viewed as merely an extension of the organizational-level construct" (Patvardhan, Gioia, and Hamilton, 2015: 409). To avoid possible pitfalls from presupposing a single cluster identity for all firms, we examine in our further work a firm's identification with the cluster as a unique feature for each firm in the cluster (see also Arikan, 2014).

A collective identity shared by firms is fundamentally linked to common opportunities (e.g., market growth) and challenges (e.g., regulation), common practice, problem solving, and integration of information. For example, in her study of Silicon Valley, Saxenian (1996) described how a collective identity of founders grew out of the shared challenges of working with a new technology to tackle complex tasks and was facilitated by their similar educational backgrounds (engineering studies at the same universities). A strong community bonding led to frequent informal interactions and collaboration.

While the above-mentioned study and similar past studies primarily draw on a cluster's collective identity to distinguish cluster members from non-members - and so demonstrate that firms display attachment to a cluster - they offer limited theoretical and empirical insights on the links between firm- and cluster-level constructs to explain cluster identity or cluster identification. A few recent and notable exceptions examine how both

internal and external actors form and enact a cluster collective identity (Romanelli and Khessina, 2005; Staber, 2010; Arikan, 2014).

A seminal paper by Romanelli and Khessina (2005) developed the notion of "regional industrial identity" as the degree of shared understanding of the industry clusters populating a region. A regional industrial identity concerns external features of the regional industry as observed by both outside audiences and residents. Their overlapping agreement on these features determines the dominant clusters in the region. The reputational benefits of identity for cluster members emerge when many firms conduct similar activities in the same place (McKendrick et al., 2003). The regional industrial identity signals towards investors and other outsiders that a place is suitable for the respective industrial activity and, thereby, supports the survival and the growth of the cluster (Wang, Madhok, and Li, 2014).

Studies such as Romanelli and Khessina's (2005) are crucially important because they demonstrate the tangible benefits of clusters including reputation and attraction of financial investment in addition to labor inputs or supplier networks. In a similar vein as Felin and Hesterly (2007), who criticize past work on clusters for assuming homogeneity at the level of firms in the cluster and translating cluster-level findings to the firm level without empirically testing them, the usefulness of Romanelli and Khessina's study pertains mainly to the regional level, and less to the behavior of members in the cluster, e.g., the members' propensity to share knowledge. Going one step further, inter-firm differences in reaping the reputational benefits of a regional industrial identity may advance our understanding of how and why such identity-related benefits accrue and impact on firm behavior.

Examining perspectives on clusters held by managers in member firms, Staber (2010) adopted an inside-out view on cluster collective identity, identifying processes that lead firms to identify more or less strongly with a cluster. Establishing that firms show different degrees of strength in their cluster identification, Staber isolated two underlying mechanisms:

frequency-based imitation and trait-based imitation, which refer to copying others and their beliefs based on either the number of others holding them or based on others having a particular trait. While the study is a highly important contribution to the theories on clusters, it measures cluster identification as the degree of strength of individual perceptions held by business owners and uses survey items originally designed to measure individuals' organizational identification (Ashforth and Mael, 1989). In this manner, cluster identification derives from an individual-level construct built closely on social identity theory. Hence, Staber's findings remain of limited use for describing various forms and processes of how firms identify with clusters.

Moreover, Staber (2010) drew data from firms with mostly one or no employee in mature textile clusters. Most firms originated in the cluster, have only few interpersonal relationships, and exhibit a high degree of distrust among managers. Because of limited interaction among firms in the clusters, the data cannot unveil any relation of cluster identification and knowledge sharing between firms. The context may limit the extension of the findings to other types of clusters, for example, those that draw extensively on scientific and deep technical know-how. Such technology clusters possibly display greater firm heterogeneity regarding size and business activity, more intense and trustful inter-firm relationships, and contain foreign and local firms (cf., Felin and Hesterly, 2007).

Linking cluster identification with knowledge sharing in clusters

A collective identity as a property of the collective offers answers to the question "who are we as a collective or as a group?" (Ashforth, Rogers, and Corley, 2011; Patvardhan, Gioia, and Hamilton, 2015). On a level of groups of organizations, it characterizes a collective such as an industry, strategic group, or market. Collective identities may cross various levels of analysis and can become embedded and deeply rooted within organizational identities (Gioia et al., 2010). Insofar as organizational identities may shape the knowledge sharing

behavior of firms, groups and individuals (Daskalaki, 2010), the cross-level role of collective identity remains an important insight for our current study. Collective identity and collective identification are inherently interwoven: a member's identification with a collective reflects how the member organization internalizes the collective identity as a valid definition of self and perceives oneness and overlap with the collective (Ashforth, Rogers, and Corley, 2011).

Building on established work about organizational identity (Albert and Whetten, 1985; for a review, see Gioia et al., 2013), scholars have investigated the identity of collectives, such as entrepreneurial groups (Wry, Lounsbury, and Glynn, 2011), industries (Dhalla and Oliver, 2013), inter-organizational networks (Daskalaki, 2010), inter-organizational collaborations (Hardy, Lawrence, and Grant, 2005), or strategic groups (Peteraf and Shanley, 1997). Work on co-located collectives and identity remains predominantly abstract and has not focused on antecedents or the peculiarities of members' identification with a collective.

The understanding of collective cluster identification and its various outcomes such as knowledge sharing at the level of firms and clusters is limited. In effect, prior work cannot adequately explain if and how top managers of member (and non-member) firms perceive belonging (or not) to a cluster and how this may relate to knowledge sharing in the cluster. This state of understanding is particularly troublesome since one of the benefits of clusters proclaimed by the knowledge-based theory would be that when firms identify with a cluster, their propensity to share knowledge might also increase.

Prior work on types of groups of organizations examined how collective identities affect members' organizational behavior. For example, past work has concluded that the extent to which firms identify with a strategic group in an industry impacts their competitive strategy and shapes performance outcomes (Porac, Thomas, and Baden-Fuller, 1989; Peteraf and Shanley, 1997; cf., Anand, Joshi, and O'Leary-Kelly, 2013). Peteraf and Shanley (1997) argue that a strong strategic group identity increases collective action and information sharing

among firms and ultimately the innovativeness of firms in the strategic group. Expanding on Peteraf and Shanley's study, Anand, Joshi, and O'Leary-Kelly (2013) argue that a firm can form different types of identification with multiple strategic groups, each of which affects the information-seeking behavior of the member firms' executives. We surmise that such different *types* of identification among firms could be a reason for the inconclusive evidence on cluster collective identity and identification in past work. First, cluster identification needs to be understood in novel ways that extend beyond a scale of one-dimensional identification strength (Staber, 2010; cf., Elsbach, 1999). Second, it needs to explain more than social relationships and the logics of exchange between firms (Saxenian, 1996; Arikan, 2014). Particular attention in theory and research should, therefore, be given to managers' varying understanding of their firms' local business environment, supported by additional empirical evidence.

Recent research suggests that collective identity should not be considered a discrete "either – or" alternative and calls for more theory and research on other meanings that underlie claims to membership in a collective (Patvardhan, Gioia, and Hamilton, 2015). This research on the fine-grained aspects of top manager's accounts of their firms' identification with collectives offers promising ground to explore questions of knowledge sharing in clusters and, thereby, to elaborate on the knowledge-based theory of clusters. Our review indicates a rich field research strategy may be beneficial - one that explores how top managers of firms make sense of clusters and the knowledge embedded therein, related mechanisms of identification, and firms' propensity to share knowledge with the cluster. As becomes clear from past work on collective identity and studies guided by the knowledge-based theory of clusters, exploring the variety of executives' perceptions of cluster membership are beneficial for addressing this complex phenomenon.

METHODS

Sample and Research setting

We studied two clusters located in the Canton of Zurich[1], Switzerland: information and communication technologies (ICT) and biotechnology (biotech). Firms in the ICT and biotech industries invest a significant portion of their revenues in innovation; they are technology-intensive and tend to geographically cluster (Bresnahan, Gambardella, and Saxenian, 2001; Stuart and Sorenson, 2003). The ICT and biotech clusters are appropriate for mapping out and advancing the linkages among the concerned key constructs (Eisenhardt, 1989). Examining the two high-tech clusters in the Canton of Zurich is interesting for several reasons: in recent years, Switzerland has been ranked among the top innovative countries worldwide in terms of company spending on R&D, patenting per capita, and the quality of scientific research institutions (World Economic Forum, 2013). The Canton of Zurich is one of the most innovative cantons in Switzerland according to the recent Swiss Innovation Survey by the Swiss Center of Business Cycle Research, the equivalent to the European Community Innovation Survey (CIS) conducted in most European countries. Even though the current study will not compare the actual innovation performance of firms, the regional innovation indicators substantiate our assumption that we sample firms where past work leads us to expect knowledge sharing in clusters to be abundant (Saxenian, 1996). We answer the call for more research on the industry- and region-specific characteristics of knowledge sharing interactions (Howells and Bessant, 2012) by studying two clusters with a strong focus on innovation and research, and incorporating both the region of the clusters and the

[1] A canton is a member state of Switzerland with its own constitution, legislature, and government.

associated industries. Our study of two clusters in the same region also eliminates the need to consider regional-institutional or cultural differences.

While sampling firms within two clusters is designed to minimize variety on the type of knowledge needed for business activities, we also sought to maximize variety on firm characteristics, size, age, business activities, and place of foundation of all firms in the clusters.

The ICT cluster in Zurich. In 2011, 4,931 ICT firms existed in the Canton of Zurich according to the Statistical Office of the Canton of Zurich (Canton of Zurich, 2014). 82.7 percent are IT services firms, 8 percent trade and commerce firms, and the rest consists of IT hardware and telecommunication firms. In our sample, around 70 percent of the firms are active in software sales, development, or services. A majority of firms in the cluster are "one-man businesses," with an average of around 10 employees per firm. The ICT cluster originally evolved around ICT services and software development firms catering to the financial services industry in the region. More than half of all employees in the regional ICT industry still work for IT services firms (58.6 percent of total employees in the ICT cluster), but the recent influx of R&D, sales departments, and headquarters of international corporations (e.g., Google) combined with the increase in the number of start-up firms have begun to alter the composition of the cluster by making it increasingly heterogeneous in terms of business activities. Currently, Zurich is the national center of ICT activities and government officials and policy makers frequently state publicly that the ICT cluster is one of the canton's main drivers of regional economic development (Canton of Zurich, 2014). The majority of firms in our sample are located in the urban center of Zurich (one fifth is located outside the center). Around one fourth of all firms in the sample were founded at locations outside the cluster.

The biotech cluster in Zurich. In 2002, the first ”home” for the Swiss biotechnology industry aimed at organizations doing applied research was provided with the opening of the “bio-technopark” close to the city center of Zurich. The canton hosts research institutions, university hospitals, and universities offering a rich research environment for young biotechnology firms. In addition, several large, established firms in the global pharmaceutical industry are located within an hour’s drive (Basel). In our sampling, we considered all organizations located in the bio-technopark as members of the cluster, and all firms in our sample were founded locally (no firm located outside). The cluster is spread out over several buildings within walking distance, and firms sometimes work physically only a few meters apart from each other. Although its infrastructure is rather small compared to other biotechnology clusters (e.g. the “Research Triangle Park” in North Carolina, “Medicon Valley” in Boston, Cambridge), the cluster has been growing steadily since 2002. The surrounding area of the bio-technopark is mostly known for its numerous car dealers and garages. The private owner of the bio-technopark intends to build a campus-like environment with common spaces and has recently built a new site with space for biotech firms. Several more buildings have been planned for the coming years.

Data collection

We applied an embedded multiple case study design (Eisenhardt, 1989; Yin, 2013) and combined and compared data from the member firms in the two case clusters. For this contrasting study, two clusters represent a sufficient number of cases (Yin, 2013). We investigate firms as the embedded unit of analysis, also called “mini-cases” within the cases (Eisenhardt, 1989: 545). Since we examine units on two different levels of analysis, the firm and the cluster, we collected and examined data on both, using semi-structured interviews and

a broad selection of archival documents. As primary data, we relied on accounts narrated during our interviews with top managers who are engaged in identity work (to establish a sense of identity for their organization) and whose beliefs and aspirations shape strategic decisions (Clegg, Rhodes, and Kornberger, 2007). We initially identified informants through suggestions from cluster experts and via archival search in public reports on the two clusters (e.g., Canton of Zurich, 2014). We subsequently recruited many informants through suggestions from informants on whom to further interview. The objective of the sampling was to reach a representative cross-section of firms in both clusters along firm size, age, origin (local or foreign foundation) and active markets.

We conducted 70 open-ended interviews with knowledgeable top management members: 20 informants from 18 biotech firms and 50 informants from 36 ICT firms. In nine ICT and two biotech firms, we interviewed two to four managers, because they were either recommended to us or because we wanted to gain a deeper and more differentiated understanding of their firms' activities. Most informants were senior executives and/or members of the executive board. The interviews lasted between 30 and 90 minutes, with the majority around 60 minutes. We conducted 64 on-site (at the firm's location), three off-site, and three phone interviews. The interview protocol commenced as a diversified question set aiming for an understanding of the clusters, firms, and knowledge sharing between firms. The interview protocol became increasingly focused with the surfacing of reoccurring topics during the interviews. All interviews were audio-recorded and transcribed verbatim and, in addition, we wrote extensive memos capturing our impressions and reflections, the most important topics covered during the interview, and any other salient and striking features of the interview.

Data analysis

For data analysis, we focused on how informants described their daily interactions with different external actors and their firm-defining narratives related to cluster membership. All transcriptions were entered into a qualitative analysis database (Nvivo 10). In the first round of coding, we openly coded the interviews to map their full content. These preliminary thematic first-order codes included various subjects and were grouped into more abstract categories, while we considered the context of the study, our memos, and the results from prior research (Strauss and Corbin, 1990; Miles, Huberman, and Saldaña, 2013). After building individual case studies for each firm, we examined cross-case similarities and differences and continually iterated between the literature and our transcripts. All the authors frequently discussed and adjusted the emerging themes accordingly, through which our understanding of the phenomenon of knowledge interactions in the clusters evolved. One author carried out the first round of coding the interviews.

The data showed that cluster logics, perceived cluster knowledge properties and identification played an important role to explain interactions between firms in the cluster. We, therefore, coded the interviews more systematically in a second round with additional and refined first-order codes and further explored the literature on collective identity and identification in depth. One author and a research assistant conducted the second round of coding. Through discussion among all the authors and consulting previous theoretical reflections on the knowledge-based theory of clusters, collective identification, and other types of identification, we grouped the first-order codes into second-order, more theoretically informed constructs and developed an understanding of the relationships among the constructs. Through this interpretive approach, we inductively elaborated a theoretical model explaining the role of cluster logics, perceived cluster knowledge properties, and identification for knowledge sharing pathways of firms in a cluster.

FINDINGS

Overview

The analysis of the firms in the two clusters revealed three major findings. First, there are marked differences across the firms in their beliefs about the salient features of the cluster and their own attachment to it. We grouped these beliefs into what we term three comprehensive "cluster logics," familiarity, similarity, and benefits, and two "perceived cluster knowledge properties," cluster knowledge idiosyncrasy and cluster knowledge relatedness. Second, we found three types of identification a firm can have with the cluster consequential to its cluster logics and perceived cluster knowledge properties: positive cluster identification, neutral cluster identification, or low cluster identification. Third, the firms in the clusters displayed patterns of variation in their knowledge sharing behavior with other firms in the cluster, depending on their type of cluster identification and perceived cluster knowledge properties: they either shared cluster-unique knowledge, generic knowledge, or little knowledge with other firms in the cluster.

figures 1 and 2

Cluster logics

Notions on individuals' sensemaking logics about their membership in organizations, practice groups, or professions distinguish between the logics of familiarity, similarity, benefits, and investment (Vough, 2012). Our data affirmed that the first three logics exist as well in our context on a firm level, as deduced from top managers' understandings about their firms' relationship with the cluster.

Benefits. The first logic that emerged from the data was *benefits*. Pecuniary or non-pecuniary benefits describe the support and prestige that managers perceive as their firms'

advantage from being located within the cluster. For example, firms can enjoy reputational benefits, which can lead to an enhanced reputation towards potential customers, talent, or investors. A successful "cluster image" attracts employees and investors. In particular, local start-up firms are found to be looking for investors and skilled employees and, therefore, emphasize the cluster image as important to reap the benefits from their cluster membership. Other often mentioned benefits include locational advantages such as a strong customer base in the region, local partner networks, and regional research institutes and universities. For example, the CEO of biotech firm Z describes some of these benefits:

> "It's somehow a great thing to be part of the biotech cluster to recruit people and achieve a critical mass. It's easier to start collaborations internationally and to get new people."

On the other hand, some informants see notably fewer benefits for their firms stemming from their cluster membership. For example, the CTO of ICT firm B when asked about the importance of being located where they are, responds:

> "To be totally frank, it is not a really decisive topic. Of course, there is a strong banking location here in Eastern Switzerland. That's clear. And that's why we have one or two representatives from the banking world in the Canton of Zurich. But we are quite broadly represented in Switzerland. So the question for us is more to be everywhere, than specifically to be in Zurich."

Familiarity. The second logic, *familiarity* refers to the knowledge and understanding a firm has of other cluster members. Often familiarity grows through personal relationships between top managers or other employees of firms in the cluster but also through partnering in common projects, participating in initiatives organized by cluster associations, or attending other events. The CEO of ICT firm JJ explains: "People that work at our firm are married to or friends with people that work there (competitors in cluster) and so on." On the other hand, some firms report low familiarity with other cluster members and higher familiarity with other firms outside the cluster: "We have stronger relationships to firms in the US (than to firms in the region)" (CEO, biotech firm II).

Similarity. *Similarity*, the third logic, refers to the firm's shared characteristics and values with cluster members. Common principles such as "craftsmanship," "openness," "curiosity in scientific questions," or "quality consciousness" provide a strong sense of similarity with other firms in the cluster. For example, the CEO of ICT firm UU describes how he sees the ICT cluster in Zurich:

> "The values are pretty similar, we are all people with a wide interest and very healthy common sense, even though you might have the feeling that some are quite some nerds and funky. I think, we all have a pretty cool worldview and there are not some kinds of weird groups that I cannot get along with. I have the feeling that you can get along with everybody pretty fast."

Sometimes, shared values or features are used to describe only a subset of all cluster firms, such as only software development firms with local origin in the ICT cluster. Since the biotech cluster is smaller and more homogenous than the ICT cluster, the logic of similarity was more often applied to the whole cluster and linked to having the same size, same business model, same financing conditions, or being spin-offs from the same universities. Some managers see their firms as rather different from other cluster members, and do not mention similarities or even emphasize the firm characteristics discriminating them from other firms and the divergent values between them:

> "I don't think at all that there are shared values here. Already on our floor, the cultures are completely different. So I don't think that is the case. It's very different. Well, you except maybe, you can say that maybe there are Swiss similarities or European similarities. But I wouldn't say there are somehow cultural similarities, oriented towards us (firms in bio-technopark). Firms are, to be honest, worlds apart." (CEO, biotech firm KKK)

Perceived cluster knowledge properties

The analysis revealed perceived cluster knowledge properties as another relevant aspect impacting on cluster identification and knowledge sharing behavior within the cluster. Cluster knowledge properties subsume two separate second-order subthemes in the analysis: idiosyncrasy and relatedness.

Idiosyncrasy. *Idiosyncrasy* describes the value that a firm attributes to the knowledge available in the cluster, i.e., the knowledge in possession of other organizations in the cluster, which does not exist anywhere else except in their cluster. Informants varied in their accounts on the idiosyncrasy of knowledge. Some managers valued the particular knowledge in the cluster highly and believed it was not replaceable with knowledge found through other channels connecting to knowledge sources in regions outside the cluster or online sources. Such idiosyncratic knowledge covered technical expertise, ideas, experiences with new tools and technologies, or experiences with local customers. It can also be shared with other organizations than competitors, such as customers or universities: "It's very interesting here because there are highly specialized research centers and universities. They work on incredible things" (ICT firm A). Other informants expressed that the knowledge in the cluster doesn't have any idiosyncratic traits, such as the CEO of biotech firm ZZ: "We could talk about what kind of machines we use, but that's about it."

Relatedness. *Relatedness* refers to reported beliefs about whether knowledge available in the cluster is mostly problem- or solution-related, or both. Solution-related knowledge consists of knowledge needed to develop technologies and products (von Hippel, 1988; Alexy, George, and Salter, 2013), such as technological know-how or scientific research in relevant fields. Problem-related knowledge refers to knowledge on the needs in current and future markets including insights into customer behavior and their local market buzz. Firms that seek to innovate need to possess both types of knowledge (Fabrizio and Thomas, 2012; Alexy, George, and Salter, 2013). Some informants stated that the knowledge in the cluster was mostly either problem- or solution-related, while others thought that both types were present in the cluster.

For both biotech and ICT firms, the acquisition and application of solution-related knowledge belongs to their main priorities, but the occurrence of solution-related knowledge

within the cluster was believed to be abundant to different extents. The following comment illustrates that solution-related knowledge could be related to technology, management, or their intersection:

> "For example, at the beginning, you know, let's say the guys from (name of firm) started just giving a service and then they moved on like us to develop their own drugs. And they were asking: How did you organize your drug discovery team?" (CEO, biotech firm WW)

Because of its nature, problem-related knowledge often originates from customers themselves in the cluster, but can also be transferred through competitors or advisors in the cluster. Some firms find problem-related knowledge in the cluster highly relevant for their innovation activities:

> "We need to find out what the customers really want. So what does a firm locally want? We need to understand their problem and what innovation fits the problem." (CEO, ICT firm J)

Cluster Identification

To capture all statements related to cluster identification, we coded the data based on how the informants talked about their membership in a cluster or regional group of ICT, respectively biotech, firms. During coding, we observed that the statements fell into different scales or categories of cluster identification. As discussed in the literature review, past work on identification of employees with organizations, professions, or project groups distinguish between identification categories (e.g., Elsbach and Bhattacharya, 2001; Kreiner and Ashforth, 2004). The past study of an organization's identification categories with a collective was limited to the strength of identification (Peteraf and Shanley, 1997; Staber, 2010). An exception is Anand, Joshi, and O'Leary-Kelly (2013), who separate three identification types of a firm with a strategic group: identification, disidentification, and ambivalent identification. A firm can identify with not only one strategic group but with different strategic groups that may not even be direct competitors. Besides the identification with a

strategic group, disidentification and ambivalent identification matter to compare and benchmark with other firms (Anand, Joshi, and O'Leary-Kelly, 2013).

Similarly, besides (positive) identification, we found two additional types of firm identification with the cluster: neutral identification (cf., Vough, 2012; Elsbach, 1999) and non-identification. We call identification positive identification to distinguish it better from the other types of identification. The third type, non-identification, indicated that our negative cases are more relaxed than "disidentification" as in Anand, Joshi, and O'Leary-Kelly (2013). Our notion includes evidence on managers not consciously feeling their firms are attached to a cluster and not necessarily the explicit distancing from the cluster. Diverging from Anand, Joshi, and O'Leary-Kelly's set of identification types, no instances of ambivalent identification appeared in our sample.

Positive cluster identification. Informants stated that their firms are part of the cluster and feel attached such that the cluster membership matters to a certain degree for their own firm's identity. For example, to the question if the CEO of biotech firm AAA counts his firm as part of a regional industry, he replied:

> "Yes, yes, of course. In principle, we do feel at home here in Zurich. But it's not like an association in Zurich that has a lot of things going on. … The bio-technopark has gotten on massively. … And I think Schlieren as a cluster of biotech firms has become established."

The following informant's statement shows an instance of positive identification with the ICT cluster:

> "We (the firm) became big here and grew up here, so we are completely rooted in Zurich. … Our headquarters are here, too. We are a firm native of Zurich. Period. … Together with our competitors, we form a certain cluster in the area of Zurich with our similar offerings. We are also very open towards our competitors." (Divisional Manager, ICT firm XX).

Neutral cluster identification. Some informants acknowledge the cluster's existence, but perceive their firms to be only weakly affiliated with it. We call this type

neutral cluster identification. While the firms' identity is not linked to cluster membership, managers do not perceive their firms actively distance themselves from the cluster either. Firms are seen as part of the cluster, but their membership in the cluster "doesn't matter" to the firm's own identity according to informants.

For example, the CTO of biotech firm OO in the biotech cluster reports the firm "could be anywhere else" and the cluster "doesn't play a role" for them. The cluster membership exerts no or limited impact on critical aspects of their firm such as performance or identity. Firms strongly linked to another industry, such as the one of their main target market, also displayed a neutral identification with the cluster:

> "I would say it is really the fiduciary services industry if you will. … And then also software; we are kind of dichotomous. … (Being a part of regional ICT cluster) is not so important. We are just what we are and that is simply something in between." (CEO, ICT firm HHH)

Cluster non-identification. Some informants stress that their firms are autonomous and not part of a cluster, which shows their deliberate avoidance of building attachment to the cluster. Some managers also rejected the existence of the cluster altogether. We call this occurrence *cluster non-identification,* or simply no cluster identification. For example, the CEO of ICT firm BBB does not acknowledge any regional cluster whatsoever. When we mentioned the idea of regional communities or groups of organizations during the interview, he first discarded the idea by commenting with "whatever you mean with that (regional communities)", then referred to innovation prizes and startup communities respectively as another irrelevant example, and finally mentions the open source community as the collective they feel part of:

> "One day, we more or less won an innovation award (mentions name of innovation award by a bank), but I mean that was rather event-based. Those things are not communities that I would consider as vital. … But we definitely belong to many of those open source stories."

The CEO of biotech firm YY acknowledges there is a biotech cluster, given the Bio-Technopark and its members. He has even been involved in the creation of the Bio-Technopark and maintains many relationships with other firms in the cluster. Because of their employees coming from the region and regional business network, relocation to another region is not considered. Nevertheless, the informant does not see the firm as belonging to the cluster and considers their location choice as follows:

> "We are of course regionally bound through the employees who are here, so I couldn't just go somewhere else. Many of them have been with us for five to ten years and we have a stable team. Our network that we work with is also very regional. It is simply convenient to be so close. So that does tie us in, in some ways. On the other hand, if this firm is here or, let's say in Aargau, Zug, or Schaffhausen (cantons in Switzerland), the parent company wouldn't care. The Bio-Technopark has really just been an opportunity because I have known about it. It is a pure coincidence that we are here."

To summarize, the findings demonstrate that key informants from firms co-located in clusters display different types of cluster identification. Next, we explore knowledge sharing behavior in our embedded cases.

Knowledge Sharing

We found patterns of variation in how firms share knowledge with other organizations in the cluster, both with and without market transactions involved. Based on the data and analysis, we define knowledge sharing as a firm's practices and actions of receiving and giving knowledge critical for innovation to other organizations in the cluster. Our informants usually emphasized the receiving part of their knowledge sharing practices more than the giving of knowledge (receiving knowledge is their ultimate goal in such interactions). Informants are aware of the benefits of giving knowledge, such as building trust and reciprocity, but if they failed to receive knowledge all interactions with cluster members would be negligible for their firm's innovation activities. Throughout the interview quotes and vignettes, we therefore find more statements about receiving than giving knowledge, while we acknowledge that such interactions between firms involve both. The CTO of ICT

firm A describes a collaboration with a start-up that entails both intensive knowledge receiving and giving between their firm and the start-up:

> "We are setting up a collaboration with (name of start-up). We provide resources and further software developments. We will form joint teams and we can look into the technology a bit, and they can profit from our resources. We will also coach them; we were only 30 people (in our firm) at some point and even started only with five, so we can help them in management, to push them forward. … They learn the craft from us, how to build software. I think we have a very innovative approach to hand compared to others. … I think that is the point. . "

He then explains that people from start-ups are often from a generation that "just do it", compared to employees of their own, more established firm. The collaborating start-ups are always local. Asked about if it could hurt their firm if a collaboration partner learns about and copies their software development methodology by watching them, he defends their approach by saying:

> "But that's good. I mean what should they copy from us? That is exactly the meaning: a collaboration is a give and take. And if it were only a give, then it would be intentional sponsoring. We want to teach them how you produce software in an agile and sustainable way. That's great, (that they learn from you) is the best thing that can happen to you. In this regard, we are extremely open."

Firms make conscious choices to share knowledge, based on competitive advantage and confidentiality. For example, the CEO of biotech firm NN shares knowledge about their strategy and business, but not about their technology:

> "We are very open regarding business-strategy topics, but not regarding details on technology, of course. But product details of my neighbor firms are anyways only marginally interesting to me unless it concerns a potential collaboration."

Our findings centered on two main forms of knowledge sharing relevant for innovation: cluster-unique knowledge sharing and generic knowledge sharing.

Cluster-unique knowledge sharing. Knowledge can be confined to the cluster, such that no actors outside the cluster possess the same knowledge, and no firms in the cluster could receive the same knowledge from any actors outside the cluster. Such knowledge is usually tied to specific organizations or individuals and has a large tacit component.

Biotech firm AAA had a patented technology being tested in a proof of concept and worked frequently with local universities. Its CEO co-founded other biotech firms in the cluster and views exclusive licensing from a local university as key for innovation in their firm. In addition, he unveiled an example of how the firm receives cluster-unique knowledge from other firms in the biotech cluster:

> "When we have a scientific problem, sometimes we just provocatively ask the question: "So what would you do?" And we can discuss it without having to fear that things will be 'patented away' from us. For example one firm showed us how they apply a certain technique because we asked what they do that their application of this technique works so well."

Labor mobility and personal relationships are widely used channels of cluster-unique knowledge sharing practices. One informant states the firm relies on employees who previously worked for local competitors and events with external speakers in their own offices:

> "We need knowledge from people coming from competitors to us. If somebody has worked for (local competitor's name) for ten years, and then he comes to us, he's bringing a lot of knowledge. ... During our techtalks, we see more inside a firm, because the people come to our office and present their internal affairs, as a matter of fact." (CEO, ICT firm D).

Furthermore, the informant values his personal relationships with other founders:

> "My most important contacts are the other young founders, because they have the same problems and questions. It is very unorchestrated and not organized through anybody, and I just go have lunch with this CEO or that technical leader of an ICT company."

Generic knowledge sharing. A second form of knowledge sharing we observed is generic knowledge sharing. Compared to instances of cluster-unique knowledge sharing, informants think they would be able to access the same knowledge outside the cluster through other organizations or through online channels. For example, the CEO of ICT firm K recounts a case of receiving and giving generic knowledge:

> "We have exchanged knowledge on such general aspects like, how do you start up something like that, how do you introduce a product step by step into the market, what are the criteria when looking for investors, and so on."

The informant of biotech firm Z recounts several knowledge sharing practices within the cluster but equates the opportunities of knowledge sharing in the cluster to anything already known to the public and not "unique" to the cluster:

> "We discuss doing projects together or have meetings. The exchange is not a standard in the industry. You don't talk to everybody about everything. … But you can talk about things that have been published or are already publicly known." (CSO, biotech firm Z)

TOWARDS A THEORETICAL MODEL OF CLUSTER IDENTIFICATION AND KNOWLEDGE SHARING

Insert figures 3, 4, and 5

Neutral identification with the cluster stemmed from an understanding of the logics of familiarity, similarity of characteristics, and benefits of mainly the cluster's prestige. These firms felt they had similar characteristics as other cluster firms, but did not necessarily see shared values as a meaningful similarity within the cluster. In addition, top managers perceived knowledge in the cluster to be mainly solution-related and not idiosyncratic. We found a neutral identification of those firms with the cluster, which combined with their perceptions on cluster knowledge properties, enabled them to share generic knowledge with other organizations in the cluster.

When informants understood their cluster membership through familiarity, similarity based on values and characteristics, and the benefits of support and prestige from the cluster, they identified positively with the cluster. These informants also perceived cluster knowledge to be idiosyncratic and problem- and solution-related. Firms identifying positively with a cluster exhibited cluster-unique knowledge sharing practices and activities with other cluster members: they shared diverse types of knowledge in multiple settings, which was only present inside their cluster. The first-hand knowledge about the cluster clarifies and details the

meaning of cluster membership. Sometimes, the informal setting appears tightly interlinked with the private lives of employees. They have husbands, wives, and friends working for competitors and their personalized interactions offer them a good sense of how their competitors work. Not surprisingly, these tight personal connections also facilitate the flow of cluster-unique knowledge between firms in the cluster.

Cluster-unique knowledge sharing between firms benefits their innovation for two reasons. First, frequent interactions in various settings enhance the sharing and discussion of ideas, some of which result in innovation. Second, firms share various types such as market, managerial and technological knowledge, which, when combined, aid innovation. Newly combined knowledge enables the firm to further develop ongoing ideas and technologies, or bring entirely new ideas to fruitful commercialization (cf., Rodan and Galunic, 2004). The variety of settings, formality, and levels of interaction all contribute to an innovation capacity of firms in the cluster that rests on cluster-unique knowledge being shared between them on a regular basis. Moreover, the findings show cluster-uniqueness of the knowledge is a condition for positive identification to emerge and be sustained.

DISCUSSION

The study makes three distinct contributions to the knowledge-based theory of clusters and collective identity theory. First, our cluster identification perspective explains differences in the knowledge sharing behavior of firms in two different high-technology clusters, highlighting the role of cluster identification in explaining such interactions. While it is well understood that firms share knowledge in clusters in order to innovate and that cluster identity is sometimes posited as a necessary condition for such sharing (Tallman et al., 2004), prior work assumed the presence of a collective identity without differentiating between firm-specific types of identification as antecedents of the specific nature of knowledge sharing.

Our study offers a differentiated view of both core constructs and sheds new light on the dynamic interactions between them. Cluster scholars often treated knowledge sharing as a positive externality available to all firms in a cluster, leaving aside the more subtle and challenging issue of managers' perceptions of the firm's relationship with the cluster. We empirically document the *voluntary and intentional knowledge interactions* between firms in clusters. We find such knowledge sharing tends to unfold in informal settings without explicit negotiation of exchange terms, and our findings contrast those of most previous studies on knowledge spillovers in clusters (McCann and Folta, 2008). The knowledge sharing between firms in the cluster varied between tapping into and providing cluster-unique knowledge, generic knowledge not unique to the cluster and omitting such knowledge interactions.

Our field data enable the identification of cluster logics and perceived cluster knowledge properties underlying cluster identification, thereby helping to gain insights into the antecedents of knowledge sharing in clusters on a firm-level (Arikan and Knoben, 2014). While past work examined the link between cluster membership on knowledge sharing based on location (Almeida and Kogut, 1999; Whittington, Owen-Smith, and Powell, 2009), the current study demonstrates it is not only the physical presence in a cluster that enables firms to access valuable knowledge better than outside firms but that presence is merely a starting point: firms share cluster-unique knowledge when they identify positively with the cluster and they share generic knowledge when they identify neutrally with the cluster. Conversely, firms with no cluster identification, despite sharing the same location, share only limited or no knowledge with other firms in the cluster. All types of identification occurred in both the ICT and biotech cluster and across the entire sample of embedded cases within the clusters.

Second, we contribute to the study of clusters by examining the phenomenon of cluster identification empirically and expand on work on cluster identity. Prior work tended to be conceptual, based on historical case studies, or empirically disregarded important

understandings about cluster membership on the level of the firm (e.g., Saxenian, 1996; Romanelli and Khessina, 2005; Arikan, 2014). Scholars often assumed cluster identification when conceptualizing the relationships between the sense of belonging to a cluster and knowledge sharing (Saxenian, 1996; Tallman et al., 2004). However, cluster identification is clearly a multifaceted phenomenon and varies with cluster logics and perceived cluster knowledge properties. Our results show how geographical proximity, or co-location, impacts differentially on firms' knowledge sharing through identification with the cluster. We enrich the idea of cluster identity (Staber, 2010) (which here resembles the condition of firms with positive cluster identification) by uncovering firms with neutral cluster identification and non-identification and corresponding knowledge sharing pathways.

Third, our findings also extend meta-level collective identity theory. To date, scholars have recognized the influence of collective identity on interactions within groups of organizations and more generally on their organizational behavior and outcomes (e.g., Peteraf and Shanley, 1997; Gioia et al., 2013). However, empirical investigations of how firms identify with collectives and its implications on actions have been lacking (Patvardhan, Gioia, and Hamilton, 2015). The current study contributes to the emerging research stream on collective identification with regards to groups of organizations by studying two groups of firms co-located in clusters in the same region. Based on prior theoretical contributions (Staber, 2010; Anand, Joshi, and O'Leary-Kelly, 2013), we empirically examine how positive, neutral, or non-identification with one specific type of collective, namely the cluster, emerges and impacts on interfirm knowledge sharing with members of the collective. We also consider cluster logics and perceived cluster knowledge properties of firms as an antecedent of identification establishment with a collective. In contrast to other studies, we show that not only the most often reasoned logic of similarity, but also the logics of familiarity and benefits

matter to establish identification with the cluster. In addition, perceived cluster knowledge properties, influence the type of cluster identification and the knowledge sharing pathway.

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FIGURE 1
Data Structure

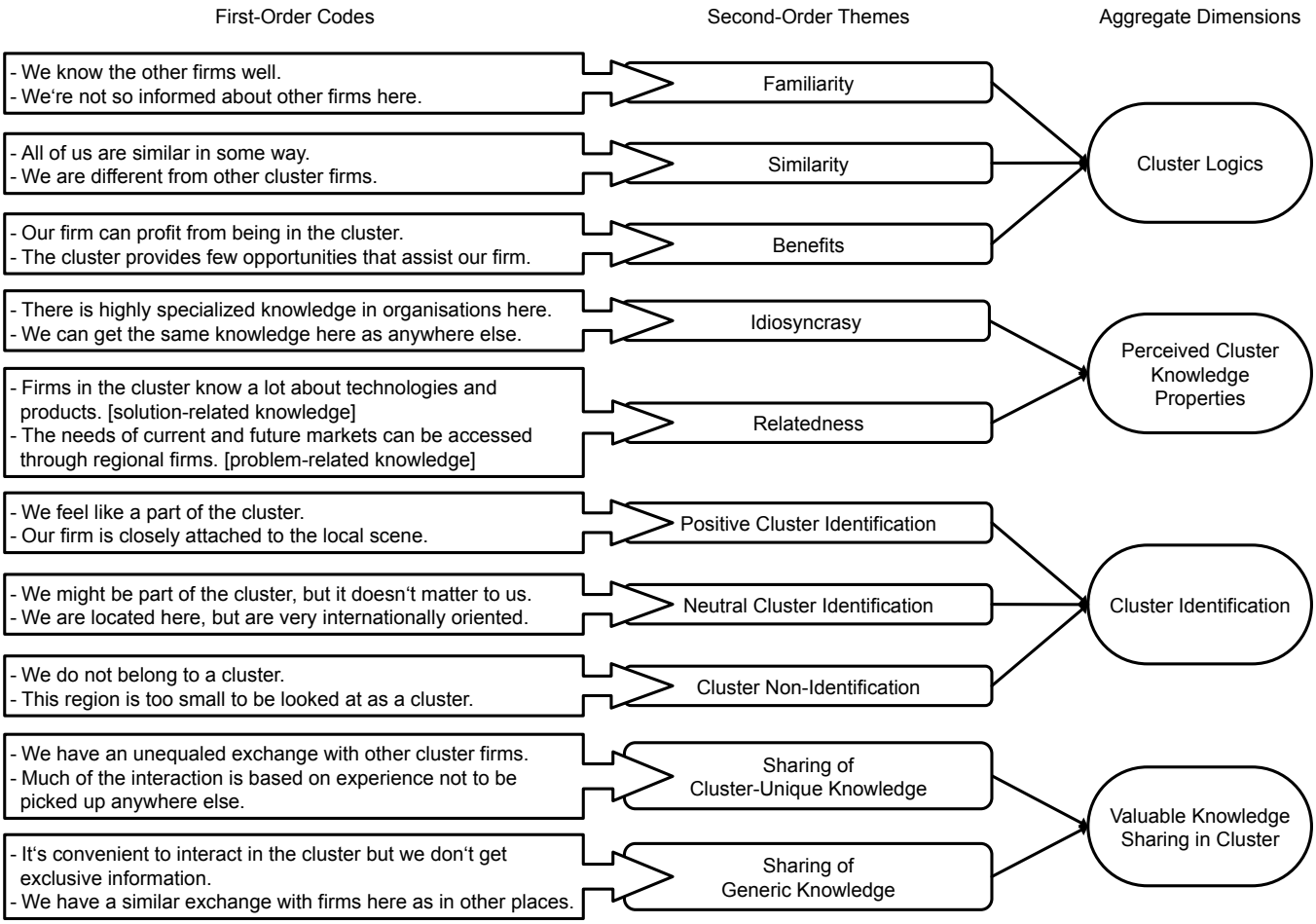

FIGURE 2
Emergent Organizing Framework of the Linkages among Constructs

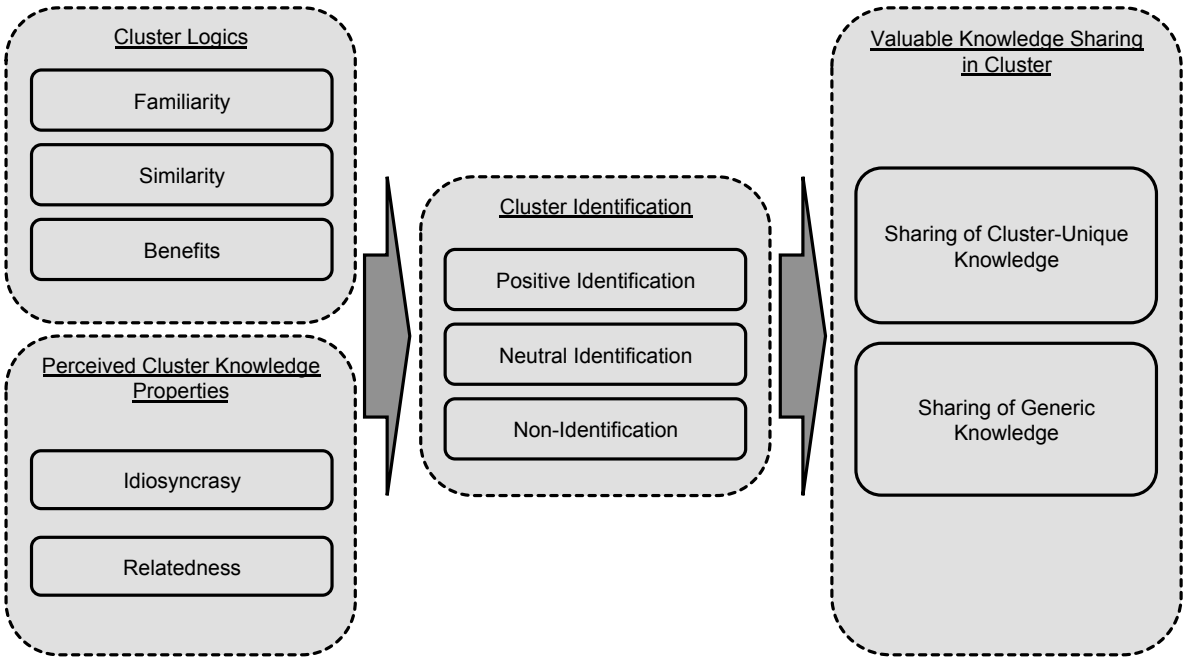

FIGURE 3
Cluster-unique knowledge-sharing pathways

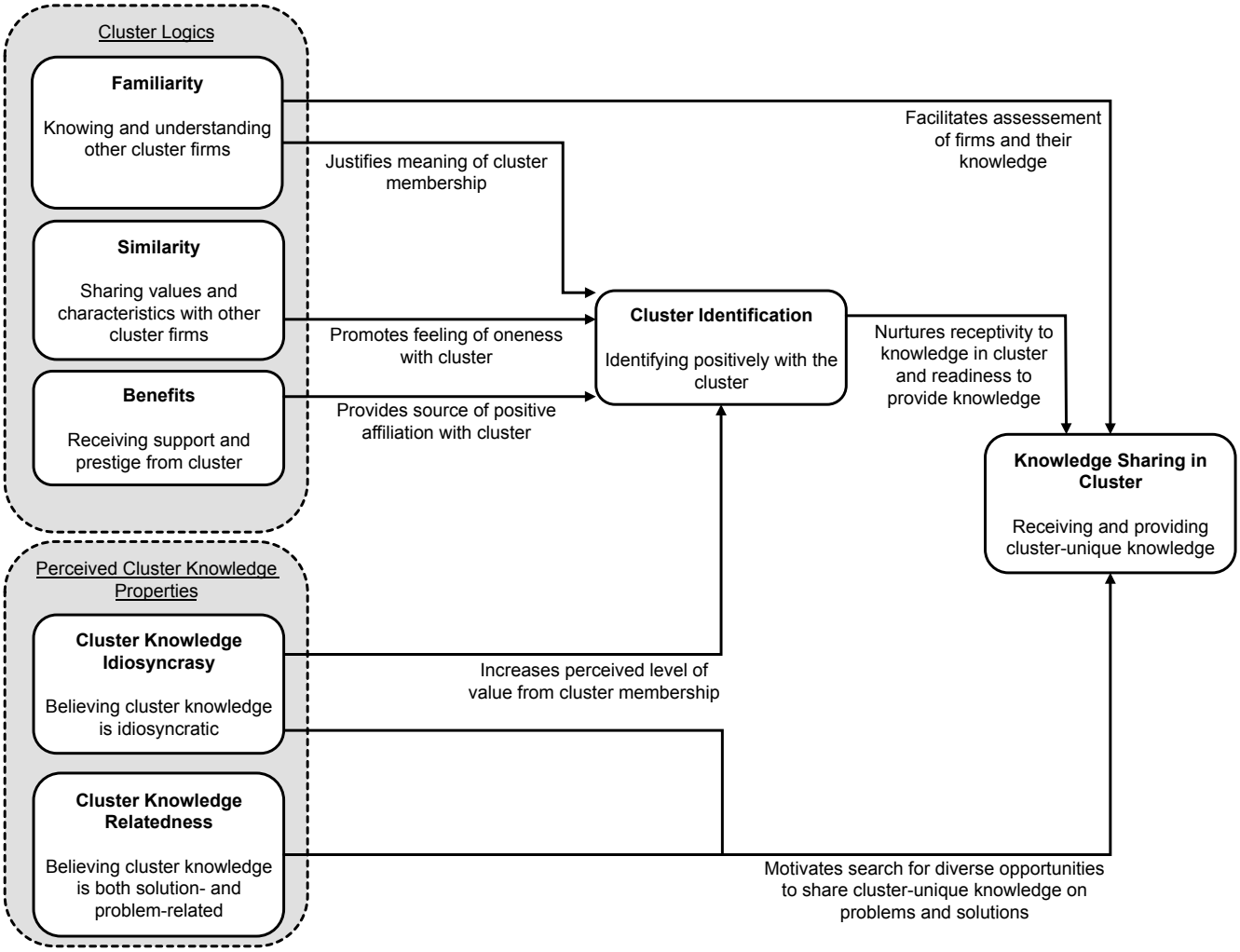

FIGURE 4
Generic knowledge-sharing pathways

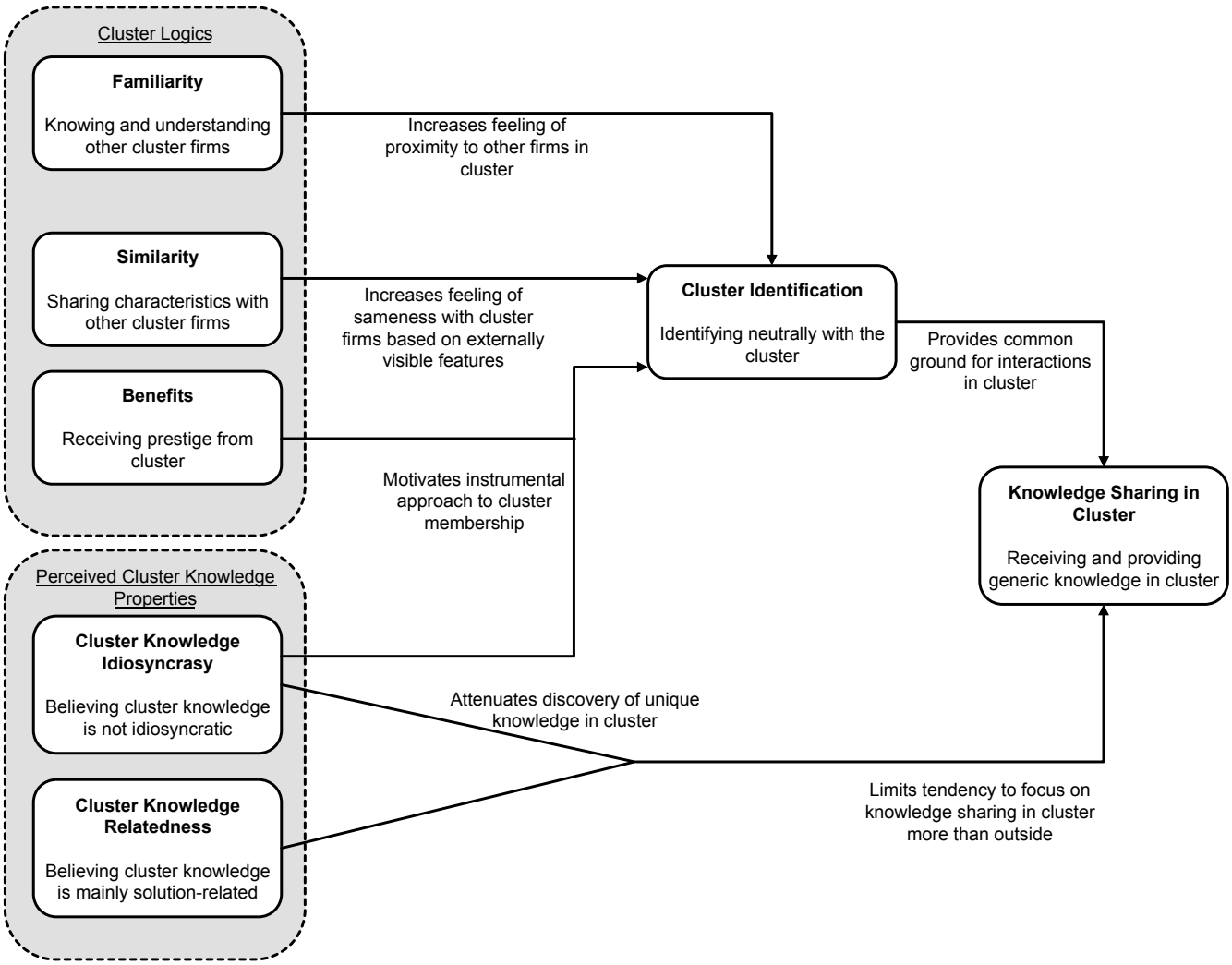

FIGURE 5
Limited knowledge-sharing pathways