DON'T STAND SO CLOSE TO ME: COMPETITIVE PRESSURES, PROXIMITY AND INTERORGANIZATIONAL COLLABORATION

ABSTRACT

This paper investigates how geographical proximity moderates the nonmonotonic relation between niche overlap and the propensity of organizations to collaborate. The main prediction is that the strength of this relation is different for organizations with low versus high levels of geographical proximity. Proposed hypotheses are tested by using data collected within a community of hospital organizations serving more than five million residents in one of the largest Italian geographical regions. After controlling for internal resource complementarities and differences in organizational forms, behavioural orientations and institutional constraints among hospitals, this paper finds strong empirical support to the research hypotheses.

Keywords: Spatial proximity, Niche Overlap, Interorganizational relations, Hospitals, Competition

INTRODUCTION

Organizations establish network ties in order to access complementary or critical resources beyond their control (GULATI and GARGIULO, 1999), to learn from the experience of relevant others (BECKMAN and HAUNSCHILD, 2002), to share production costs and exploit economies of scale (GUGLAR and DUNNING, 1993), to boost innovation (e.g. AHUJA, 2000), to strengthen their legitimacy (STUART et al., 1999) and to improve their performance (BAUM et al., 2010). Different mechanisms have been proposed to explain the formation of collaborative network ties between organizations (GULATI, 1995; LAUMANN and MARSDEN, 1982; SORENSON and STUART, 2008). In particular, similarities and differences in resource requirements, dependencies and constraints are the most common explanations for differences in the propensity of organizations to establish collaborative relations (GULATI and GARGIULO, 1999; PFEFFER, 1985).

The concept of 'organizational niche' has been used in ecological theory to describe how market opportunities and constraints vary between organizations as functions of their environmental dependence patterns (INGRAM and QINGYUAN YUE, 2008; HANNAN and FREEMAN, 1989). The term 'niche overlap' has been coined specifically to characterize similarity in resource dependencies that organizations exhibit in their environment (BURT and TALMUD, 1993).

The propensity of organizations to establish collaborative relations has been posited to be a nonlinear function of niche overlap (PODOLNY et al., 1996). According to this argument, the propensity to collaborate is controlled by two opposing forces: opportunity for cooperation and rivalry. Opportunity for cooperation increases with niche overlap, because organizations that depend on similar resources tend to become more similar as they conform to the expectations expressed by similar audiences (DIMAGGIO and POWELL, 1983; ZUCKERMAN, 1999, 2000). Organizations that are more similar along relevant structural and behavioural dimensions might find it easier to exchange resources and information, and to coordinate their operations and plans (POWELL et al., 2005; STUART, 1998). However, rivalry also increases with niche overlap,

because similarities in patterns of resource dependence will elicit and intensify competitive interdependencies between organizations (BAUM and HAVEMAN, 1997; FREEMAN and HANNAN, 1983). As a result, the effect of niche overlap on the propensity of organizations to collaborate is not linear (ALTER and HAGE, 1993; TRAPIDO, 2007).

Despite a general agreement on the nonmonotonic relation between niche overlap and the propensity of organizations to collaborate, scant knowledge exists about the effect of geographical proximity on this relationship. The present paper is aimed to fill this gap in the literature by exploring whether and how geographical proximity moderates the effect of organizations' niche overlap on their propensity to collaborate. More specifically, assuming that niche overlap has an inverted U-shaped effect on the propensity to collaborate, this paper hypothesizes that the strength and shape of this effect will be different for organizations with low versus high levels of geographical proximity. Tension between competitive and collaborative triggers will be higher when geographical proximity is high (i.e. physical distance is low), thus decreasing the net effect of niche overlap on the overall propensity to collaborate. On the other hand, when geographical proximity is low (i.e. physical distance is high), niche overlap is likely to be more clearly and positively associated with propensity to collaborate, albeit at a decreasing rate.

The present paper empirically addresses this argument by considering data on patient-transfer relations collected within a community of hospital organizations serving more than five million residents in one of the largest Italian geographical regions. As with most organizations, hospitals face multiple audiences, or sets of agents who control access to symbolic and material resources affecting organizational performance and, ultimately, survival (HANNAN, PÓLOS and CARROLL, 2007). One audience of particular relevance for hospitals is patients, whose expectations are used to evaluate the quality of healthcare services. Patient transfers require high levels of coordination and communication between partner hospitals. For this reason, this paper treats the presence of patient transfer relations as the observable counterpart of the latent propensity

of hospitals to collaborate via the creation of network ties (LEE et al., 2011; IWASHYNA et al., 2009; LOMI and PALLOTTI, 2012).

Hospitals provide an almost ideal setting to conduct this research, for two main reasons. First, competition and collaboration are particularly meaningful processes for hospitals, which operate in technical and institutional environments that affect collaborative and competitive dynamics (RUEF and SCOTT, 1998; SCOTT and MEYER, 1991[1983]). Second, a wave of reforms implemented in many Western healthcare systems (COSTA-FONT and RICO, 2006; ROSS and TOMANEY, 2001) stressed competitive forces, potentially altering the collaboration-competition interorganizational scenario (BARRETTA, 2008; LOMI and PALLOTTI, 2012; MASCIA and DI VINCENZO, 2011; MASCIA et al., 2012).

The rest of the paper is structured as follows. After discussing the theoretical background, the next section proposes hypotheses about the relation between niche overlap and the propensity of organizations to collaborate, and the moderating role of geographical proximity in this relation. The third section provides information on the research design and the model specification and estimation. The fourth section presents results of the empirical analysis. A final discussion section concludes the paper.

THEORETICAL BACKGROUND

Niche overlap and the propensity to collaborate

Contemporary organizational theories converge on the view that collaborative opportunities and competitive constraints depend on the position that organizations occupy in relevant resource spaces (BURT, 1992; DOBREV et al., 2001; HANNAN and FREEMAN, 1989). The main theoretical construct employed to capture this position is the ‘organizational niche’, which refers to the position that an organization occupies in a multidimensional space of environmental resources (HANNAN and FREEMAN, 1989). Organizations differ in their resource dependence patterns;

thus, organizational niches may be defined with reference to different resource dependencies (PODOLNY et al., 1996).

The niche concept has proven insightful in the study of various organizational communities, ranging from day-care centres (BAUM and SINGH, 1994) to automobile manufacturers (DOBREV et al., 2001), investment banks (PARK and PODOLNY, 2000) and semiconductor producers (PODOLNY et al., 1996). Of particular relevance to this paper is the application of the niche concept to hospital organizations (SOHN, 2001; 2002). The notion of organizational niche is frequently used to summarize the link between environmental dependencies and competitive conditions (POPIELARZ and NEAL, 2007). Two organizations compete to the extent that they rely on the same resources (i.e. that their niches overlap) (BAUM and SINGH, 1994; BURT and TALMUD, 1993).

Extant theories of organization seem to agree only partially about the precise implications of niche overlap for interorganizational collaborative relations (INGRAM and QINGYUAN YUE, 2008). A first theoretical vision suggests that niche overlap increases competitive constraints (BAUM and HAVEMAN, 1997; FREEMAN and HANNAN, 1983). According to this perspective, the more two organizations depend on similar resources, the more intense their rivalry will be (ALDRICH and RUEF, 2006; BAUM and SHIPILOV, 2006). As competition erodes social ties (BURT, 1992), the propensity of rival organizations to collaborate will be lower. Studies of organizational founding, mortality, growth and internal activities (BAUM and SINGH, 1994; PODOLNY et al., 1996; POPIELARZ and MCPHERSON, 1995) have consistently reported empirical evidence of a positive relation between niche overlap and rivalry.

An alternative vision builds on the observation that organizations which depend on similar resources will tend to become more similar in their structure, climate and behavioural focus (DI MAGGIO and POWELL, 1983). Organizations whose access to material and symbolic resources depends on evaluations by the same audience will adjust their structures and behavioural orientations to conform to the audience's expectations (ZUCKERMAN, 1999, 2000). However,

organizations that are more similar along relevant structural and behavioural dimensions might find it easier, rather than more difficult, to exchange resources and information (INGRAM and RAO, 2004; TRAPIDO, 2007). This principle of interorganizational attachment based on homophily has received considerable support from empirical studies of interorganizational relations (BAKER and FAULKNER, 1993; PODOLNY, 1994; POWELL et al., 2005; STUART, 1998). Coordination, knowledge transfer, information sharing and the capacity to absorb knowledge become easier to manage as the similarity of potential partners increases (COHEN and LEVINTHAL, 1990; REAGANS and MCEVILY, 2003).

A compounded consideration of the abovementioned contrasting viewpoints envisages a complex, nonlinear relation between niche overlap and the propensity of organizations to collaborate. As similarities in their resource constraints increase, organizations will tend to become more aware of each other (WHITE, 1981), and their abilities to collaborate, benefit and learn from each other will increase (COHEN and LEVINTHAL, 1990). However, similarities in resource dependence profiles among niche residents will increase the potential for competition (MCPHERSON, 1983). If organizational niches overlap completely, then the potential for competition will be fierce; if they do not overlap at all, then there will be no potential for competition, as the organizations will require entirely different resources (BAUM and HAVEMAN, 1997). Studies have produced direct evidence that overlapping resource dependencies increase the propensity to cooperate among potentially competing organizations through a nonlinear effect. In their analysis of Web-based data for 225 U.S. colleges and universities, Kovács and Macy (2008) reported that interorganizational similarity increases the probability of observing a link between web pages. After such point, the effect of similarity switches from cooperative to competitive with the consequence of reducing the likelihood of observing web links between universities that are too similar. The main qualitative implication of their study is that the possibilities of interorganizational connections are precluded only at very high levels of similarity.

In summary, opportunities for collaboration and competition vary as functions of similarity in resource dependencies. As similarity increases, organizations will exhibit an increased propensity to collaborate, although at a decreasing rate. However, as similarity increases organizations will be more likely to compete for the same resources, and the competitive pressure will increase at an increasing rate. In the limit where two organizations rely on exactly the same resources, competition will be unavoidable. This argument suggests an inverted U-shaped relation between niche overlap and the propensity of organizations to collaborate. Therefore, the first hypothesis is as follows:

H1. Niche overlap has an inverted U-shaped effect on the propensity of organizations to collaborate. At low levels of niche overlap, the effect of opportunities for collaboration dominates the effect of competition, making interorganizational collaboration more likely. At high levels of niche overlap, the strength of competitive constraints becomes progressively dominant, thus reducing the propensity of organizations to collaborate.

The moderating effect of geographical proximity

The likelihood of observing interorganizational exchange relations is strongly influenced by the geographical proximity of potential partners (AUDRETSCH and FELDMAN, 1996; BALLAND, 2012; BOSCHMA and FRENKEN, 2010; BROEKEL and BOSCHMA, 2012; GERTLER, 2003; KNOBEN and OERLEMANS, 2012; SORENSON and STUART, 2008; TER WAL, 2014). However, answers to many related questions have remained elusive. For example, how does the geographical distance between organizations influence the effects of niche overlap on their propensity to collaborate? And, to what extent does geographical proximity modify the degree of attraction or repulsion between organizations with similar resource requirements?

Geographical proximity – intended here as spatial vicinity between actors (BALLAND, 2012; TORRE and GILLY, 2000) – likely moderates the effects of niche overlap on the formation

of interorganizational relations for several reasons. First, proximity can influence the propensity of organizations to benefit from coordination and resource exchange (BALLAND, 2012). Knowledge transfer between organizations, for example, is strongly conditioned by the organizations' spatial proximity, especially for tacit knowledge involving organizational routines (GERTLER, 2003; HOWELLS, 2002; MASKELL and MALMBERG, 1999). Furthermore, geographical distance introduces higher coordination costs related to the management of long-distance activities, as well as costs aimed at contrasting opportunistic behaviours that are more likely when organizations are located far apart (BOSCHMA, 2005; CUMMINGS and KIESLER, 2007). Given a certain degree of similarity in their resource dependence profiles, distant partners are more likely to sustain higher coordination costs and to face difficulties in knowledge transfer and exchange.

Nevertheless, engaging in interorganizational relations with distant partners also entails advantages. Geographical distance may reduce organizations' competitive constraints, because firms with the same degree of resource similarity but located further apart will likely cater to different sets of customers and, hence, experience less fierce rivalry (e.g. POUDER and JOHN, 1996). This description is true for hospital services, whose demand is geographically determined (GOWRISANKARAN and TOWN, 2003; KESSLER and MCCLELLAN, 2000; WONG et al., 2005). Moreover, collaborative ties across wide geographical boundaries are likely to fuel a greater variety of knowledge than local linkages, thus enhancing the learning potential of such relations (OWEN-SMITH and POWELL, 2004; ZAHEER and GEORGE, 2004). Finally, ties between proximal firms may be redundant with respect to other channels of knowledge access (DAHL and PEDERSEN, 2004; MCCANN and SIMONEN, 2005; SAXENIAN, 1994). Hence, the need for formal ties to co-located partners is often less compelling (ANGELI et al., 2013; CORREDOIRA and ROSENKOPF, 2010). When too embedded, local collaborative networks may even be harmful (BROEKEL and BOSCHMA, 2012; UZZI, 1997).

Compounding these arguments, expectations about the moderating role of geographical proximity can be formulated. When geographical proximity is low, organisations with low levels

of niche overlap will be less likely to cooperate when located far apart. Information exchange challenges related to knowledge stickiness, and high coordination costs associated with geographical distance, will be exacerbated by the limited degree of resource similarity and reciprocal absorptive capacity, resulting in a low propensity to collaborate. Organizational commonalities will mitigate these disadvantages for partners with higher levels of niche overlap. Furthermore, the reduced competitive pressures experienced by distant partners will trigger cooperation. Niche overlap will increase the propensity of distant organizations to collaborate, up to a point. Extremely high levels of commonality in resource dependencies will likely exacerbate competitive constraints, despite the mitigating effect of distance. Hence, intermediate levels of niche overlap will most beneficially affect collaboration propensity among geographically distant partners.

When geographical proximity is high, collaboration is strongly favoured. This relation is especially true in the case of hospitals, for which the need to find a partner for joint problem-solving arrangements may favour the choice of a co-located rather than a distant partner. However, when geographical proximity is high, competitive constraints are also likely to be more pressing (KESSLER and MCCLELLAN, 2000; POUDER and JOHN, 1996), which should depress cooperative efforts. Due to the counteracting effects of collaborative and competitive drives, a nonlinear effect of niche overlap on propensity to collaborate is expected, as is the case for distant partners, albeit with a different strength due to the higher tendencies to both collaborate and compete. For low to moderate levels of niche overlap between co-located organizations, the possibility of enjoying complementarities might dominate over the however strong competitive pressures, and collaboration could be possible and desired. As niche overlap increases, the competitive pressures are likely to counteract cooperative benefits more strongly, thereby depressing the propensity to collaborate, which remains however high because of high geographical proximity.

Given these arguments, the following hypothesis can be made:

H2. Geographical proximity moderates the inverted U-shaped relationship between niche overlap and the propensity to collaborate, such that the magnitude of the effect of niche overlap on propensity to collaborate will be stronger for geographically distant organisations.

RESEARCH DESIGN

Institutional setting

Empirical merits of the two hypotheses were tested by using data on patient-transfer relations collected within a community of hospital organizations in Lazio. This large Italian geographical region has a resident population of about five million inhabitants, more than 60% of whom live in the capital city of Rome. Patient transfers represent a key form of interhospital collaboration (IWASHYNA et al., 2009; LEE et al., 2011; LOMI et al., 2014; LOMI and PALLOTTI, 2012). Hospitals provide an ideal setting to examine the interdependencies of competitive and collaborative processes, because hospitals' technical and institutional environments are inextricably interrelated (RUEF and SCOTT, 1998; SCOTT and MEYER, 1991[1983]). As organizations operating in a technical environment, hospitals are rewarded for the 'effective and efficient control of their production system[s]' (SCOTT and MEYER, 1991:123). As organizations operating in an institutional environment, they are subjected to 'institutional rules and requirements to which they have to conform if they are to receive support and legitimacy' (SCOTT and MEYER, 1991:123). Owing to the interwoven nature of the institutional and technical environments, opportunities for competition and collaboration between hospitals can be understood only through the association of each with the other.

The regional health system in Lazio is part of the Italian National Health System (NHS). Established in 1978 following a model similar to the British NHS, the Italian NHS provides universal coverage through a single payer. The health budget is funded mainly by general tax revenues, especially income taxes. The 21 regions (similar to states in the U.S.) allocate resources

to approximately 200 Local Health Units (LHUs), local administrative units responsible for the organization and delivery of healthcare services to their resident populations. Organization of the regional health system in Lazio is entrusted to twelve LHUs. All of the geographical areas in the region are characterized by a homogeneous distribution of providers offering a broad range of services (Fig. 1).

Insert Figure 1 about here

The healthcare system in Lazio is characterized by a 'quasi-market' institutional framework, designed to sustain the equity benefits of traditional systems of public healthcare management and financing, while reaping the potential efficiency gains allowed by market competition (BARRETTA, 2008). This framework is the result of institutional reforms enacted in the 1990s with the purpose of improving the performances of single hospitals and the whole system. The institutional regime constructed through the introduction of managed care has progressively increased competition among healthcare providers. Owing to several characteristics (e.g. the obligations of hospitals to reach a financial equilibrium and of their Chief Executive Officers (CEOs) to meet relative assessment criteria, the freedom for patients to choose their healthcare providers and the introduction of diagnosis-related groupings as the reimbursement system for services), this framework has required hospitals to attract greater numbers of patients from their local markets. The hybrid nature of this arrangement makes collaborative and competitive processes equally important for understanding the forces that shape the field in which hospitals operate (LOMI and PALLOTTI, 2012; MASCIA and DI VINCENZO, 2011; MASCIA et al., 2012). Hospitals do compete for patients as their basic resource; however, they are also required to

coordinate their actions, operations and plans to serve the public interest and promote the patient's health.

Data

The empirical part of this paper relies on both primary and secondary data sources. Primary data were collected through a questionnaire-based survey administered to all hospitals in Lazio. This survey was used to collect information about regional hospitals and their activities. Designed to elicit attributional information on individual healthcare providers, the questionnaire focused on four main themes: (i) Institutional typology of providers, (ii) Human resources employed, (iii) Range of services rendered and (iv) Structural resources available. A pilot questionnaire was pretested on five hospitals. Feedback received on the pilot questionnaire and the experience in administering it proved extremely valuable in designing the final version.

The questionnaire was administered by mail to the CEOs of all regional hospitals (excluding non-accredited private hospitals that are not entitled to a refund mechanism for patients from the NHS). The covering letter stressed that the purpose of the research was to provide baseline information; that hospitals would not be individually evaluated on their responses; and that a partial response to the questionnaire would be more useful than no response. Hospitals that did not respond during the first survey round were contacted, sometimes with several follow-up calls. At the end of this process, 91 (73%) organizations returned the questionnaire.

Secondary data were obtained from archival sources in the Hospital Information System (SIO) database. The SIO records and manages analytical information on every hospitalization event at every hospital in the region. The SIO releases yearly reports on admissions of patients in the hospitals, representing an important data source for epidemiology research and for the planning, production and assessment of healthcare services. The SIO database reports information on staffed beds, arranged by medical specialty and treatment type.

The institutional forms of hospital organizations included in the sample are representative of the overall composition of institutional forms in the target population. As such, there is no reason to believe that certain organizational forms were systematically over- or undersampled.

Variables and measures

Dependent variable. The dependent variable of this study represents patient-transfer relations between hospitals in the sample. Although one of the most important forms of interhospital collaboration, patient transfers have only recently been investigated by research on interorganizational networks in healthcare (IWASHYNA et al., 2009; LEE et al., 2011; LOMI and PALLOTTI, 2012; LOMI et al., 2014; MASCIA et al., 2015; PALLOTTI et al., 2015). A patient transfer occurs when a hospital directly transfers one or more patients to another hospital during the same calendar day. To be sure, patient transfers are ostensibly intended to promote the patient's health. A transfer may occur when a hospital has physical capacity constraints, or when the transferred patient has a pathology that can be treated more efficiently and effectively elsewhere (e.g. due to technological or clinical competence inadequacies). There are no exogenous constraints (i.e. legal constraints, superimposed models and structures, etc.) that limit the freedom of hospitals to choose recipients of patient transfer relations. In other words, hospitals may choose freely from any number of 'receiver' hospitals for the same patient. Patient transfers reflect underlying discretionary organizational decisions to involve a partner hospital in the search for a common solution to specific clinical and therapeutic problems (IWASHYNA et al., 2009). Patients are not transferred as a solution to contingent one-off problems. Rather, patient transfers occur in a highly structured social context that facilitates and actively promotes collaboration, communication and information sharing between sender and receiver hospitals (KITTS et al., 2013). Lack of adequate coordination between hospitals may have adverse consequences for transferred patients. Recent research has emphasized the relevance of interhospital patient transfers as an informal mechanism of integration in regional healthcare systems (IWASHYNA et al., 2009; MASCIA and DI

VINCENZO, 2011; MASCIA et al., 2012). The present analysis focuses specifically on the transfer of inpatients, defined as admitted patients who have consented to follow the clinical and therapeutic paths proposed by professional medical staff. Patients retain the right to refuse a transfer, but they cannot choose where they will be transferred.

On the basis of the SIO data for the year 2004, an adjacency socio-matrix (WASSERMAN and FAUST, 1994) of interhospital patient transfers was constructed. The matrix contains the hospital sending/receiving patients in each row/column, and the number of patients transferred from the 'row hospital' to the 'column hospital' in the intersection cells. Because the interorganizational network induced by patient transfer relations is asymmetric, the final sample consists of 8,190 dyadic observations. Figure 2 provides a graphical representation of the network of patient transfer relations.

Insert Figure 2 about here

Independent variables. The first independent variable of theoretical interest is similarity in resource dependence profiles. An accepted approach to operationalizing this variable involves measuring the *Niche overlap* among all possible pairs of organizations in a community (BAUM and SINGH, 1994; PODOLNY et al., 1996). Operational measures of niche overlap are context-dependent (e.g. MCPHERSON, 1983) and may be defined with reference to various kinds of resource dependencies. Prior research considered service offerings to be the most critical dimension of a hospital's niche (SOHN, 2001; 2002; SUCCI et al., 1997). Competition between hospitals directly relates to the extent that they offer the same range of services. Patients generally consider two hospitals that provide a similar range of services as substitutable, which will result in an overall increased level of hospital competition. As emphasized by Sohn (2002, p. 464):

To detect true overlap, one needs to stratify patients into service groups that tend to be offered at the same hospital. This stratification scheme will allow one to detect correctly a competitive relationship that involves a small specialty hospital outcompeting a larger one in the narrow range of services the former specializes in.

Consistent with Sohn, niche overlap coefficients were computed by considering the types of services, or 'service groups', offered by each hospital. Operationally, niche overlap was measured by using Sohn's (2001; 2002) relational measure, which was developed specifically for the analysis of competition between hospitals. This measure allows for asymmetric niche overlap. Given a generic pair of organizations *i* and *j*, two distinct measures of niche overlap, C_{ij} and C_{ji}, are computed, which measure the intensity of competition that *i* receives from *j* and that *i* produces toward *j*, respectively. As a starting point, the calculation of niche overlap coefficients considers a rectangular array of dimensions $n \times m$, whose rows contain hospitals and columns contain 25 hospital service categories, or Major Diagnostic Categories (MDCs). Once admitted to a hospital, a patient is routinely assigned an ICD9-CM code, which indicates his or her pathology. MDCs represent homogeneous groups of pathologies (i.e. groups of ICD9-CM codes) used by hospitals for reimbursement purposes. MDCs are internationally coded and formed by dividing all possible principal diagnoses into 25 mutually exclusive diagnosis groups (i.e. categories). For example, the category MDC4 identifies 'Respiratory System' and groups all pathologies that affect the respiratory system of patients.

Row vectors in the aforementioned array report the aggregate number of patients within each MDC. The amount of competition between two hospitals will be directly proportional to their similarity in patient admission patterns (e.g. two hospitals are competitors if they offer the same services to patients). The level of competition C_{ij} between hospitals *i* and *j* is computed as:

$$C_{ij} = \frac{\sum_k x_{ij} \min\left(x_{ik}, x_{jk}\right)}{\sum_k x_{ik}^2}$$

where $\min(x_{ik}, x_{jk})$ indicates the overlap (or 'intersection') in patient pools between hospitals *i* and *j* in MDC *k*; the numerator expresses the overall sum of niche overlaps between hospitals *i* and *j* across all MDCs *k*; and the denominator expresses the niche width of the *i*-th hospital (i.e. total number of patients admitted by hospital *i* across all MDCs).

The term $\min(x_{ik}, x_{jk})$ requires that C_{ij} range between 0 (no overlap) and 1 (complete overlap). Thus, the dyadic niche overlap coefficient C_{ij} may be interpreted as the overlapping proportion of the two hospitals' patient pools. Calculating all niche overlap coefficients results in a one-mode matrix of size 91 × 91. Cells of this matrix indicate the amount of competition within each hospital dyad. Hospitals in dyads with a niche overlap coefficient close to 1 are exposed to strong competitive pressures, because they compete for the same pool of patients.

The second variable of theoretical interest is *Geographical proximity*, operationalized as the geographical distance (in kilometres) between each pair of hospitals. The distance is multiplied by -1 to reverse the scale so that larger numbers indicate higher proximity.

Control variables. The empirical model includes two groups of control variables – organization- and dyad-specific attributes – to account for factors that may confound the relation between niche overlap and the propensity of hospitals to collaborate. Control variables are described in detail in Appendix A. Table A1 in Appendix also reports descriptive statistics and first-order correlation coefficients of all the variables included in the empirical model specification. Table 1 provides definitions.

Insert Tables 1 about here

Empirical model

The empirical model adopted in this study takes the following form:

$$E(Y_{ij}) = \lambda_{ij} = \exp\left(\beta_0 + \beta_1 R_{ij} + \beta_2 R_{ij}^2 + \beta_3 D_{ij} + \beta_4 R_{ij} D_{ij} + \beta_4 R_{ij}^2 D_{ij} + \theta X_{ij} + \varepsilon_{ij}\right)$$

where λ_{ij} is the expected number of patients that hospital *i* sends to hospital *j*; R_{ij} is the niche overlap between hospitals *i* and *j*; D_{ij} is the geographical proximity between hospitals *i* and *j;* $R_{ij}D_{ij}$ and $R^2{}_{ij}D_{ij}$ are the two main interaction effects for testing the research hypotheses; X_{ij} summarizes the effect of covariates in the model; and $\exp(\varepsilon_{ij})$ is an error term assumed to follow a Gamma distribution with unit mean. Negative binomial regression is implemented, with maximum likelihood estimation being used for the inferential task because the dependent variable takes the form of discrete counts (possibly including zero).

Because the data are dyadic, covariates representing continuous organization-specific variables (i.e. number of employees) enter the model specification as absolute differences between levels of the variable observed for 'sender' and 'receiver' hospitals. The smaller the difference is, the more similar the hospitals are. When the difference is zero, hospitals are identical with respect to the specific attribute being considered. For covariates taking categorical values (i.e. *LHU membership*) and binary values (i.e. *Level of care*), an exact match is used to identify organizations in the same category. In this case, a zero value is interpreted as a measure of difference rather than similarity. Conversely, a value of one signals that members of a dyad share membership in the same category or are part of the same class.

One major concern with dyad-oriented observation schemes is that the observations are not independent; each actor in the network appears in multiple dyads, thus creating complex dependencies across observations. Consequently, the coefficient estimates will be consistent, but the standard errors may be estimated incorrectly. In empirical studies of interorganizational networks, this problem is typically alleviated by introducing a fixed effect for each source or

recipient of a relation (OWEN-SMITH and POWELL, 2004; REAGANS and MCEVILY, 2003). The same analytical strategy is applied for the results in the empirical part of the present paper. The estimation of fixed effects also controls for additional sources of heterogeneity among hospitals, which may affect the latent tendency of individual hospitals to send or receive patients.

RESULTS

Table 3 reports maximum likelihood estimates of the model specified in the previous section.

Insert Table 3 about here

Models are reported in increasing order of completeness. In particular, Model 0 includes only the intercept and control variables. Model 1 adds the effect of niche overlap and its quadratic term to test the first research hypothesis. Model 2 introduces the geographical proximity variable. Model 3 adds the moderating effect of geographical proximity, by introducing the first-order interaction between geographical proximity and niche overlap. Finally, Model 4 reports the full model, including the interaction between geographical proximity and the quadratic term of niche overlap.

Overall, the results support the research hypotheses. In Model 1, a significantly positive parameter for *Niche overlap* suggests that interorganizational collaboration increases with increasing similarity in resource dependence patterns. The significantly negative parameter of the quadratic effect of niche overlap (*Niche overlap*^{2}) in Model 2 suggests that as niche overlap increases beyond a certain threshold, the effect of competition predominates and makes collaboration less likely. Taken together, these two effects confirm Hypothesis 1 by suggesting an inverted U-shaped relation between niche overlap and interhospital collaboration.

In Model 2, the positive parameter associated with geographical proximity implies that hospitals are more likely to transfer patients across short distances. Model 3 provides evidence of a negative but weak moderating effect of geographical proximity on the relation between niche overlap and interhospital collaboration. Specifically, as geographical proximity increases, high levels of niche overlap reduce the propensity of hospitals to collaborate. Finally, Model 4 documents a negative and significant parameter for the interaction effect of *Niche overlap* × *Spatial proximity*, as well as a positive and significant parameter for the interaction effect of *Niche overlap*^{2} × *Spatial proximity*.

To interpret the results in Model 4 more intuitively, interhospital patient transfers and niche overlap coefficients are plotted for high and low geographical proximity (Fig. 3).

Insert Figure 3 about here

High and low proximities are calculated by using the average geographical distance +/- 1 standard deviation as cut-off values.

For short-distance (i.e. high-proximity) hospital pairs, the effect of niche overlap on the propensity to collaborate is very mild, and is represented in Fig. 3 by a nearly flat curve. For long-distance (i.e. low-proximity) hospital pairs, an inverted U-shaped relation between collaboration and niche overlap is more directly observable. As niche overlap increases, highly distant hospitals show a rapidly increasing propensity to collaborate up to a point, after which the effect of niche overlap dramatically depresses collaboration. Intersection of the two curves shows that for moderate levels of niche overlap, long-distance hospital pairs are more likely to collaborate than short-distance pairs. In contrast, for high or low levels of niche overlap, short-distance pairs are more likely to collaborate. Fig. 3 thus provides support for Hypothesis 2 and the moderating effect

of geographical proximity: the effect of niche overlap on the propensity to collaborate is much stronger in the case of low proximity than for high proximity hospitals.

Model 4 shows that the control variables are significant in the expected directions. Patients are more likely to be transferred between hospitals differing in size (positive *Number of beds*) and facing the same administrative constraints (same *LHU membership*). Hospitals tend to transfer patients to hospitals that are institutionally similar (positive *Organizational form*) or provide complementary services (positive *Service complementarity*). Hospitals are also more likely to transfer patients to hospitals with which they previously collaborated (positive *Past collaboration*). Consistent with intuition, hospitals are more likely to collaborate with hospitals offering different levels of care (negative *Level of care*) and with hospitals that are similar in available capacity, productivity, number of services offered and efficiency (negative *Occupancy rate*, *Productivity*, *Scope of service* and *Average length of stay*). Predicted effects of niche overlap and geographical proximity on the propensity of hospitals to collaborate are virtually unchanged after controlling for control covariates.

DISCUSSION AND CONCLUSIONS

This paper explores the role of geographical proximity in moderating the relation between competitive interdependence (or niche overlap) and the propensity of organizations to collaborate and exchange resources. The main underlying assumption is that geographical proximity exerts a differentiated effect on two opposing factors affecting the propensity of organizations to collaborate: namely, cooperative opportunities and competitive constraints. Competitive forces trigger differentiation strategies, whereas institutional processes tend to induce interorganizational homophily, or isomorphism (DIMAGGIO and POWELL, 1983). The market structure emerges from the interaction between these two opposing forces. Consequently, it is important to understand how niche overlap affects the propensity of organizations to collaborate, as well as the extent to which geographical distance affects this relation.

To address these issues, this paper proposes a model in which niche overlap has a nonlinear, inverted U-shaped effect on the propensity of organizations to collaborate. The geographical proximity of organizations moderates this relation, which appears as a markedly inverted U-shaped curve for long-distance hospital pairs and as a nearly flat curve for short-distance pairs. The effect is tested by using data on collaborative and competitive relations within a community of hospital organizations. The results provide insights into how different levels of geographical proximity affect the formation of collaborative relations between organizations.

This work builds on and extends prior literature on the relation between collaborative and competitive processes in interorganizational networks. One view suggests that similarity in resource dependence patterns, or niche overlap, increases the intensity of competitive interdependence between organizations (BAUM and HAVEMAN, 1997; FREEMAN and HANNAN, 1983). According to this perspective, the more two organizations depend on similar resources, the more intense their rivalry will be. An alternative viewpoint suggests that organizations depending on similar resources will become more similar along relevant structural and behavioural dimensions (DIMAGGIO and POWELL, 1983). However, similar organizations may find it easier, rather than more difficult, to interact. Hence, according to this second vision, the more two organizations depend on similar resources, the more likely they will be to collaborate (INGRAM and YUE, 2008; TRADIPO, 2007).

Taken together, these two theoretical viewpoints suggest that the same forces which increase competitive intensity between organizations also increase the possibility for mutual understanding and cooperation. This conclusion resonates with well-established empirical literature on mutual forbearance showing that dependence on common resources facilitates both competition and collaboration between organizations (BAKER and FAULKNER, 1993; LOMI and PALLOTTI, 2012). On the basis of these two apparently conflicting visions, this paper proposes and tests a unifying model suggesting the presence of a nonmonotonic relation between similarities in research dependence patterns and interorganizational collaboration. In addition, this paper

documents how geographical proximity interacts with niche overlap to increase the likelihood that 'friendly competition' will become 'vicious competition' (PENG and BOURNE, 2009).

This work builds also on available empirical research in economic geography examining the relation between spatial and nonspatial proximity measures. In a seminal work, Boschma (BOSCHMA, 2005) moved beyond the strong emphasis on geographical proximity (e.g. AUDRETSCH and FELDMAN, 1996; GERTLER, 2003) to identify social, organizational, cognitive and institutional proximities as additional crucial factors affecting knowledge sharing between firms and innovation performance (also TORRE and GILLY, 2000). Since Boschma's paper, numerous studies have tried to distinguish the influence of different proximity types on the behaviour of firms (BALLAND, 2012; FLEMING et al., 2007; MOLINA-MORALES et al., 2014), and particularly on their collaborative exchange relations (e.g. TER WAL, 2014). This paper matches and advances this nascent line of research. To the extent that niche overlap can be associated with shared language, common knowledge, norms and values – all of which represent important components of cognitive proximity (MOLINA-MORALES et al., 2014) – this paper confirms the results of empirical studies showing interaction between spatial (e.g. geographic) and nonspatial (e.g. cognitive) proximity types in predicting interorganizational exchange ties (HANSEN, 2014).

This study has one main practical implication, as it sheds light on the need for executives and administrators to consider both competitive interdependence and spatial proximity in the selection of the 'right' partners for exchange. For example, when attempting to integrate and coordinate with other hospital providers, managers should preferably look for geographically proximal hospitals that are not too similar in their resource dependence profiles (i.e. types of services rendered) or for geographically distant hospitals exhibiting intermediate levels of similarity.

At least three limitations need to be considered in the interpretation of the results. The first limitation is methodological. Dyadic network data are characterized by complex local

dependencies. In the empirical analysis, this paper statistically controls for such dependencies without actually identifying them. Advanced statistical methods for directly specifying local dependencies have been developed and applied to the study of interorganizational networks (LOMI and PATTISON, 2006). These methods should be used whenever specific local configurations of interorganizational network ties can be associated with theoretically motivated hypotheses about endogenous microprocesses of network formation.

The second limitation is theoretical. As organizations are embedded in a multidimensional resource space, the paired concepts of 'niche' and 'niche overlap' are multidimensional as well. Projecting these concepts onto a single dimension (i.e. similarity in the range of services rendered) clearly oversimplifies the complex nature of the environment in which hospitals operate. Furthermore, the emphasis placed on patients as the main source of competition and collaboration does not mean that patients are the only important resource for hospitals. Hospitals may collaborate in many other ways, such as through the mobility of managers and doctors, or through joint training programs for healthcare professionals. Observing all possible relations among organizations is a daunting task. Moreover, it is possible that not all observable relations are equally helpful in identifying organizations' positions in meaningful resource spaces. A more balanced approach towards defining organizational niches should probably be based on a mixture of relational and nonrelational elements. The present study has only indirectly considered such elements by controlling for several organizational and institutional attributes at the individual-hospital and dyad levels.

The final limitation concerns the scope of the results. Hospital organizations have many idiosyncrasies and cannot be considered as representative of the organizational world at large. For example, hospitals operate in highly institutionalized environments, and their survival depends on their abilities to balance complex forms of legitimation granted by various normative external sources (RUEF and SCOTT, 1998). Hospitals face trade-offs between managerial principles of financial equilibrium and institutionalized principles of universal coverage and free access to

healthcare. These contextual features of hospital organizations may make the findings reported here hard to be found in different settings. Nevertheless, determining the effects of similarity in resource dependencies on the propensity of organizations to collaborate is an issue of general relevance that surpasses the specific competitive and institutional settings examined here. In this respect, the model proposed in this paper may easily find application and invite comparative research in different institutional contexts.

REFERENCES

AHUJA G. (2000) Collaboration networks, structural holes, and innovation: A longitudinal study, *Administrative Science Quarterly* **45**, 425-55.

ALDRICH H. E. and RUEF M. (2006) *Organisations Evolving*. Sage Publications, Thousand Oaks, CA

ALTER C. and HAGE J. (1993) *Organizations working together.* Sage, Newbury Park, CA.

ANGELI F., GRANDI A. and GRIMALDI R. (2014) Directions and Paths of Knowledge Flows through Labour Mobility: A Social Capital Perspective, *Regional Studies* **48**, 1-22.

AUDRETSCH D. B. and FELDMAN M. P. (1996) R&D spillovers and the geography of innovation and production, *The American Economic Review*, 630-40.

BAKER W. E. and FAULKNER R. R. (1993) The social organization of conspiracy: Illegal networks in the heavy electrical equipment industry, *American Sociological Review*, 837-60.

BALLAND P.-A. (2012) Proximity and the evolution of collaboration networks: evidence from research and development projects within the global navigation satellite system (GNSS) industry, *Regional Studies* **46**, 741-56.

BARRETTA A. (2008) The functioning of co-opetition in the health-care sector: An explorative analysis, *Scandinavian Journal of Management* **24**, 209-20.

BAUM J. A., COWAN R. and JONARD N. (2010) Network-independent partner selection and the evolution of innovation networks, *Management Science* **56**, 2094-110.

BAUM J. A. and HAVEMAN H. A. (1997) Love thy neighbor? Differentiation and agglomeration in the Manhattan hotel industry, 1898-1990, *Administrative Science Quarterly*, 304-38.

BAUM J. A. and SINGH J. V. (1994) Organizational niches and the dynamics of organizational mortality, *American Journal of Sociology* **100**, 346-80.

BAUM J. A. C. and SHIPILOV A. (2006) Ecological approaches to organisations, in CLEGG S. R., HARDY C., NORD W. and LAWRENCE T. (Eds) *Handbook of Organisations Studies* Sage, London.

BECKMAN C. M. and HAUNSCHILD P. R. (2002) Network learning: The effects of partners' heterogeneity of experience on corporate acquisitions, *Administrative Science Quarterly* **47**, 92-124.

BORGATTI S.P. (2002) *Netdraw: Network visualization software*. Boston, Analytic Technologies.

BOSCHMA R. (2005) Proximity and innovation: a critical assessment, *Regional Studies* **39**, 61-74.

BOSCHMA R. and FRENKEN K. (2010) The spatial evolution of innovation networks. A proximity perspective, *The Handbook of Evolutionary Economic Geography*, 120-35.

BROEKEL T. and BOSCHMA R. (2012) Knowledge networks in the Dutch aviation industry: the proximity paradox, *Journal of Economic Geography* **12**, 409-33.

BURT R. S. (1992) *Structural Holes*. Harvard University Press, Cambridge, MA.

BURT R. S. and TALMUD I. (1993) Market niche, *Social Networks* **15**, 133-49.

COHEN W. M. and LEVINTHAL D. A. (1990) Absorptive capacity: a new perspective on learning and innovation, *Administrative Science Quarterly*, 128-52.

CORREDOIRA R. A. and ROSENKOPF L. (2010) Should auld acquaintance be forgot? The reverse transfer of knowledge through mobility ties, *Strategic Management Journal* **31**, 159-81.

COSTA-FONT J. and RICO A. (2006) Devolution and the interregional inequalities in health and healthcare in Spain, *Regional Studies* **40**, 875-87.

CUMMINGS J. N. and KIESLER S. (2007) Coordination costs and project outcomes in multi-university collaborations, *Research Policy* **36**, 1620-34.

DAHL M. S. and PEDERSEN C. Ø. (2004) Knowledge flows through informal contacts in industrial clusters: myth or reality?, *Research Policy* **33**, 1673-86.

DIMAGGIO P. J. and POWELL W. W. (1983) The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields, *American Sociological Review*, 147-60.

DOBREV S. D., KIM T. Y. and HANNAN M. T. (2001) Dynamics of niche width and resource partitioning, *American Journal of Sociology* **106**, 1299-337.

FLEMING L., KING III C. and JUDA A. I. (2007) Small worlds and regional innovation, *Organization Science* **18**, 938-54.

FREEMAN J. and HANNAN M. T. (1983) Niche width and the dynamics of organizational populations, *American Journal of Sociology*, 1116-45.

GERTLER M. S. (2003) Tacit knowledge and the economic geography of context, or the undefinable tacitness of being (there), *Journal of Economic Geography* **3**, 75-99.

GOWRISANKARAN G. and TOWN R. J. (2003) Competition, Payers, and Hospital Quality, *Health Services Research* **38**, 1403-22.

GUGLAR P. and DUNNING J. H. (1993) Technology based cross-border alliances, in CULPAN R. (Ed) *Multinational strategic alliances*. Howarth Press Inc., Binghamton, NY.

GULATI R. (1995) Social structure and alliance formation patterns: A longitudinal analysis, *Administrative Science Quarterly* **40**, 619-52.

GULATI R. and GARGIULO M. (1999) Where do interorganizational networks come from? , *American Journal of Sociology* **104**, 1439-93.

HANNAN M. T. and FREEMAN J. H. (1989) *Organizational Ecology*. Harvard University, Cambridge, MA.

HANNAN M. T., PÓLOS L. and CARROLL G. R. (2007) *Logics of organization theory: Audiences, codes, and ecologies*. Princeton University Press, Princeton.

HANSEN T. (2014) Substitution or overlap? The relations between geographical and non-spatial proximity dimensions in collaborativve innovation projects. *Regional Studies*, **49**,1672-1684.

HOWELLS J. R. (2002) Tacit knowledge, innovation and economic geography, *Urban Studies* **39**, 871-84.

INGRAM P. and QINGYUAN YUE L. (2008) 6 Structure, Affect and Identity as Bases of Organizational Competition and Cooperation, *The Academy of Management Annals* **2**, 275-303.

INGRAM P. and RAO H. (2004) Store Wars: The Enactment and Repeal of Anti-Chain-Store Legislation in America1, *American Journal of Sociology* **110**, 446-87.

IWASHYNA T. J., CHRISTIE J. D., MOODY J., KAHN J. M. and ASCH D. A. (2009) The structure of critical care transfer networks, *Medical Care* **47**, 787.

KESSLER D. P. and MCCLELLAN M. B. (2000) Is Hospital Competition Socially Wasteful?, *Quarterly Journal of Economics*, 577-615.

KITTS, J.A., LOMI, A., MASCIA, D., PALLOTTI, F., and QUINTANE, E. (2013). Looking inside interorganizational ties: The dynamics of patient exchange among Italian hospitals. Presented at American Sociological Association Meeting. New York, NY.

KNOBEN J. and OERLEMANS L. A. (2012) Configurations of inter-organizational knowledge links: Does spatial embeddedness still matter?, *Regional Studies* **46**, 1005-21.

KOVÁCS B. and MACY M. (2008) Similarity, competition and attraction: Homophily revisited, *Academy of Management Meeting*, Anaheim, California.

LAUMANN E. O. and MARSDEN P. V. (1982) Microstructural analysis in interorganizational systems, *Social Networks* **4**, 329-48.

LEE B. Y., MCGLONE S. M., SONG Y., AVERY T. R., EUBANK S., CHANG C.-C., BAILEY R. R., WAGENER D. K., BURKE D. S. and PLATT R. (2011) Social network analysis of patient sharing among hospitals in Orange County, California, *American Journal of Public Health* **101**, 707-713.

LOMI A., MASCIA D., VU D., PALLOTTI F., CONALDI G. and IWASHYNA T.J. (2014) Quality of Care and Interhospital Collaboration: A Study of Patient Transfers in Italy, *Medical Care*, **52**, 407-414.

LOMI A. and PALLOTTI F. (2012) Relational collaboration among spatial multipoint competitors, *Social Networks* **34**, 101-11.

LOMI A. and PATTISON P. (2006) Manufacturing relations: An empirical study of the organization of production across multiple networks, *Organization Science* **17**, 313-32.

MASCIA D. and DI VINCENZO F. (2011) Understanding Hospital Performance: The Role of Network Ties and Patterns of Competition, *Health Care Management Review* **36**, 327-37.

MASCIA D., DI VINCENZO F. and CICCHETTI A. (2012) Dynamic analysis of interhospital collaboration and competition: Empirical evidence from an Italian regional health system, *Health Policy* **105**, 273-81.

MASCIA D., ANGELI F. and DI VINCENZO F. (2015) Effect of hospital referral networks on patient readmissions, *Social Science & Medicine*, **132**, 113-21.

MASKELL P. and MALMBERG A. (1999) Localised learning and industrial competitiveness, *Cambridge Journal of Economics* **23**, 167-85.

MCCANN P. and SIMONEN J. (2005) Innovation, knowledge spillovers and local labour markets, *Papers in Regional Science* **84**, 465-85.

MCPHERSON J. M. (1983) An Ecology of Affiliation, *American Sociological Review* **48**, 519-35.

MOLINA-MORALES F.X., GARCIA-VILLAVERDE P.M., and PARRA-REQUENA, G. (2014) Geographical and cognitive proximity effects on innovation performance in SMEs: a way thorugh knowledge acquisition, *Entrepreneurship and Management Journal*, **10**, 231-251.

OWEN-SMITH J. and POWELL W. W. (2004) Knowledge networks as channels and conduits: The effects of spillovers in the Boston biotechnology community, *Organization Science* **15**, 5-21.

PALLOTTI F., TUBARO P. and LOMI A. (2015) How Far do Network Effects Spill Over? Evidence from an Empirical Study of Performance Differentials in Interorganizational Networks, *European Management Review,* In press (DOI: 10.1111/emre.12052).

PARK D. and Podolny J. M. (2000) The competitive dynamics of status and niche width: U.S. investment banking, 1920–1950, *Industrial and Corporate Change* **9**, 377–414.

PENG T. J. A. and BOURNE M. (2009) The Coexistence of Competition and Cooperation between Networks: Implications from Two Taiwanese Healthcare Networks, *British Journal of Management* **20**, 377-400.

PFEFFER J. (1985) A resource dependence perspective on intercorporate relations, in MIZRUCHI M. and SCHWARTZ M. (Eds) *Intercorporate Relations* (pp. 25-55). Cambridge University Press, New York.

PODOLNY J. M. (1994) Market uncertainty and the social character of economic exchange, *Administrative Science Quarterly* **39**, 458–483.

PODOLNY J. M., STUART T. E. and HANNAN M. T. (1996) Networks, knowledge, and niches: Competition in the worldwide semiconductor industry, 1984-1991, *American Journal of Sociology*, 659-89.

POPIELARS P. A. and NEAL Z. P. (2007) The Niche as a Theoretical Tool, *Annual Review of Sociology* **33**, 65–84.

POPIELARZ P. A. and MCPHERSON J. M. (1995) On the edge or in between: Niche position, niche overlap, and the duration of voluntary association memberships, *American Journal of Sociology*, 698-720.

POUDER R. and JOHN C. H. S. (1996) Hot spots and blind spots: geographical clusters of firms and innovation, *Academy of Management Review* **21**, 1192-225.

POWELL W. W., WHITE D. R., KOPUT K. W. and OWEN-SMITH J. (2005) Network dynamics and field evolution: The growth of interorganizational collaboration in the life sciences, *American Journal of Sociology* **110**, 1132-205.

REAGANS R. and MCEVILY B. (2003) Network structure and knowledge transfer: The effects of cohesion and range, *Administrative Science Quarterly* **48**, 240-67.

ROSS W. and TOMANEY J. (2001) Devolution and health policy in England, *Regional Studies* **35**, 265-70.

RUEF M. and SCOTT W. R. (1998) A multidimensional model of organizational legitimacy: Hospital survival in changing institutional environments, *Administrative Science Quarterly*, 877-904.

SAXENIAN A. (1994) *Regional Advantage: Culture and Competition in Silicon Valley and Route 128.* Harvard University Press, Cambridge, MA.

SCOTT W. R. and MEYER J. W. (1983) The organisation of societal sectors, in MEYER J. W. and SCOTT W. R. (Eds) *Organisational environments: Rituals and rationality*. Sage, Newbury Park, CA.

SOHN M.-W. (2001) Distance and cosine measures of niche overlap, *Social Networks* **23**, 141-65.

SOHN M. W. (2002) A relational approach to measuring competition among hospitals, *Health Services Research* **37**, 457-82.

SORENSON O. and STUART T. E. (2008) Bringing the context back in: Settings and the search for syndicate partners in venture capital investment networks, *Administrative Science Quarterly* **53**, 266-94.

STUART T. E. (1998) Network positions and propensities to collaborate: An investigation of strategic alliance formation in a high-technology industry, *Administrative Science Quarterly*, 668-98.

STUART T. E., HOANG H. and HYBELS R. C. (1999) Interorganizational endorsements and the performance of entrepreneurial ventures, *Administrative science quarterly* **44**, 315-49.

SUCCI M. J., LEE S.-Y. D. and ALEXANDER J. A. (1997) Effects of Market Position and Competition on Rural Hospital Closures, *Health Services Research* **31**, 679–99.

TER WAL A. L. (2014) The dynamics of the inventor network in German biotechnology: geographic proximity versus triadic closure, *Journal of Economic Geography* **14**, 589-620.

TORRE A. and GILLY J.-P. (2000) On the analytical dimension of proximity dynamics, *Regional Studies* **34**, 169-80.

TRAPIDO D. (2007) Competitive embeddedness and the emergence of interfirm cooperation, *Social Forces* **86**, 165-91.

UZZI B. (1997) Social structure and competition in interfirm networks: The paradox of embeddedness, *Administrative science quarterly*, 35-67.

WASSERMAN S. and FAUST K. (1994) *Social Network Analysis*. Cambridge University Press Cambridge, UK.

WETERINGS A. and BOSCHMA R. (2009) Does spatial proximity to customers matter for innovative performance?: Evidence from the Dutch software sector, *Research Policy* **38**, 746-55.

WHITE H. C. (1981) Where do markets come from?, *American Journal of Sociology*, 517-47.

WONG H. S., ZHAN C. and MUTTER R. (2005) Do different measures of hospital competition matter in empirical investigations of hospital behavior, *Review of Industrial Organization* **26**, 27-60.

ZAHEER A. and GEORGE V. P. (2004) Reach out or reach within? Performance implications of alliances and location in biotechnology, *Managerial and Decision Economics* **25**, 437-52.

ZUCKERMAN E. W. (1999) The categorical imperative: Securities analysts and the illegitimacy discount, *American Journal of Sociology* **104**, 1398-438.

ZUCKERMAN E. W. (2000) Focusing the corporate product: Securities analysts and de-diversification, *Administrative Science Quarterly* **45**, 591-619.