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How Do Brokers Broker? Tertius Gaudens, Tertius Iungens, and the Temporality of Structural Holes

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Organizational network research has demonstrated that multiple benefits accrue to people occupying brokerage positions. However, the extant literature offers scant evidence of the process postulated to drive such benefits (information brokerage) and therefore leaves unaddressed the question of *how* brokers broker. We address this gap by examining the information-brokerage interactions in which actors engage. We argue that the information-brokerage strategies of brokers differ in three critical ways from those of actors embedded in denser network positions. First, brokers more often broker information via short-term interactions with colleagues outside their network of long-term relationships, a process we label "unembedded brokerage." Second, when they engage in unembedded brokerage, brokers are more likely than are actors in dense network positions to intermediate the flow of information between the brokered parties, consistent with a tertius gaudens strategy. Conversely, and third, when they broker information via their network of long-term ties (embedded brokerage), brokers are more likely than are densely connected actors to facilitate a direct information exchange between the brokered parties, consistent with a tertius iungens strategy. Using a relational event model, we find support for our arguments in an empirical analysis of email communications among employees in a medium-sized, knowledge-intensive organization, as well as in a replication study. The theory and evidence we present advance a novel, temporal perspective on how brokers broker, which reconciles structural and process views of network brokerage. Our findings substantiate the notion of brokers as a dynamic force driving change in organizational networks, and they help to integrate within a unitary explanatory framework tertius iungens and tertius gaudens views of brokerage.

Keywords: brokerage process; unembedded interactions; tertius gaudens and tertius iungens; relational event model
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Introduction

Extant network theory posits that "brokers"—actors whose network spans many structural holes—have an advantage over more densely embedded employees because they can broker the flow of information between disconnected colleagues and groups (Burt 1992). Supporting this argument, a sizable body of research finds that brokers receive better salaries, faster promotions, and higher bonuses compared to colleagues occupying closed network positions (Burt 1992, 2004, 2010), and their opinions have greater influence within the organization (Burt 2004). Whereas this research demonstrates the benefits accruing to people in brokerage positions, it does not directly address the mechanism postulated to drive such effects—information brokerage. As a result, our understanding of *how* actors in brokerage positions broker information between their colleagues remains disappointingly limited (Burt 2007a).

Recent scholarship on the dynamics of network brokerage clarifies two points that might help us to address this theoretical gap. The first is the distinction between brokerage as a *structural position*, as defined by an actor's network of long-term relationships, and brokerage as an information exchange *process* (Obstfeld et al. 2014, Spiro et al. 2013). This distinction matters because actors can broker information across a structural hole in at least two very different ways. One, tertius gaudens strategy,[1] is to intermediate the exchange of information between the brokered parties by acting as the only passage through which information flows across the hole. The other, tertius iungens strategy, is to facilitate the flow of information across the structural hole by enabling a direct exchange between the brokered parties (Obstfeld et al. 2014). Extant research shows that brokers may adopt either strategy and that each can be effective, depending on the context and timing in which brokerage occurs (Long Lingo and O'Mahony 2010). These findings suggest that it is difficult to understand how brokers broker by looking solely at actors' network-structural positions. A more fruitful approach, which we use here, is to develop an integrated perspective that disentangles actors' network position and the information-brokerage strategies they adopt.

The second point is that information brokerage processes occur via interactions with individuals who may or may not be part of one's network of long-term relationships (Vissa 2012). Because brokering information between one's long-term contacts may require different

relational strategies than brokering information among unfamiliar contacts, this view suggests that it may be useful to distinguish between two distinct kinds of brokerage process. One, which we label "embedded brokerage," occurs when actors broker information via their network of long-term ties. The other, which we label "unembedded brokerage," occurs when actors broker information by interacting with colleagues who are *not* part of their long-term network. Even though early work on organizational networks has tended to emphasize the role of long-term ties as channels of information brokerage (Burt 1992), the notion that actors may gain valuable information through short-lived interactions with unfamiliar contacts has long been established (e.g., Granovetter 1973). Also, with its emphasis on temporary project work and dynamic roles, the contemporary workplace constitutes a setting where many opportunities arise by brokering information among colleagues who are not, and may never become, part of a long-term network (Bechky 2006). To examine how actors broker information within contemporary organizations, and more specifically, whether the information-brokerage strategies of brokers differ from those of actors occupying denser network positions, it is therefore important to distinguish between processes of embedded versus unembedded brokerage.

This study builds on these considerations in an attempt to further our understanding of how brokers broker. We propose that brokers' information-brokerage strategies differ in three critical ways from those of more densely embedded employees. First, brokers engage in unembedded brokerage much more often than do densely embedded employees. Said differently, the denser an actor's network position, the stronger is the tendency to broker information via one's established network of long-term ties. Second, when engaging in unembedded brokerage, brokers are more likely to adopt a tertius gaudens strategy (i.e., to intermediate the flow of information between the brokered parties) relative to actors occupying denser network positions. However, and third, the opposite is true in the case of embedded brokerage processes. That is, when brokering information via one's network of long-term ties, brokers are more likely than are other employees to adopt a tertius iungens strategy, thereby facilitating a direct information exchange between the brokered parties.

To test these hypotheses, we analyze a medium-sized digital agency comprising 129 employees (and replicate our analyses in the headquarters of a consulting firm, $N = 87$). Following a standard approach in network research, we identify each employee's network position by looking at the aggregate pattern of information exchanges within the firm (Kleinbaum 2012), which enables us to assess the extent to which employees occupy a brokerage versus dense network position. To examine the process of brokerage, however, we consider the information-brokerage interactions in which employees engage throughout the observation window, roughly eight months. We use email communications to trace information exchange interactions and a relational event model (Butts 2008) to distinguish between embedded and unembedded interactions. We consider that regular, repeated email interactions between two employees over long periods to be embedded in a long-term information-exchange relationship; conversely, we regard email interactions that extend over brief periods and depart from employees' long-term information exchanges to be unembedded. Our empirical test provides support for our hypotheses. Additional analyses lend further support to our theoretical claims by corroborating the validity of our postulated mechanisms.

Theoretical Development

Interpersonal relationships take time to develop but, once mature, they enhance trust and mutual understanding (Granovetter 1983), which facilitates the flow of information among the interacting parties (Podolny 2001). Network research emphasizes in particular the importance of developing social relationships with contacts who are separated by a structural hole, i.e., who do not have a relationship among each other. A well-established tenet among network scholars is that, since these relationships provide access to non-overlapping streams of information, actors may use them to broker information between their mutually unconnected contacts (Burt 1992, Obstfeld et al. 2014). Many studies found evidence consistent with this argument. Burt (2007b), for example, showed that bankers who have developed interpersonal ties with mutually unconnected contacts tend to perform better; the reason, he argues, is that those bankers have privileged access to information that their contacts cannot access directly because they are separated by structural holes. Similarly, in the context of an IT staffing firm, Bidwell and Fernandez-Mateo (2010) argue that developing social relationships across structural holes creates opportunities for brokers to intermediate information between the brokered parties.

Brokering information via a network of long-term social relationships represents an important form of brokerage, but not all information-brokerage interactions are necessarily embedded within established social relationships. Even single interactions among unfamiliar persons may convey valuable information (Berger and Calabrese 1975), and recent management scholarship emphasizes that actors often broker information by interacting with colleagues with whom they have no prior social relationships (e.g., Vissa 2012, Perry-Smith and Mannucci 2015). Because these unembedded brokerage interactions occur outside a network of long-term ties, they are not core to current network theories and models. However, they may be an especially important locus of information brokerage precisely within the kind of knowledge-intensive,

contemporary organizations on which so much social network research has focused. With their emphasis on flat structures and dynamic, bottom-up decision making, such organizations represent a context where information-brokerage opportunities often come and go very quickly, sometimes within the brief episode of a single conversation or meeting. For example, a fleeting encounter with unfamiliar colleagues by the coffee machine or at a party mixer may lead to a discussion about a promising business opportunity (Ingram and Morris 2007), or a brief cross-functional meeting may prompt a useful technical suggestion by previously unfamiliar colleagues (Bechky 2006, Kleinbaum and Tushman 2007). Whatever specific form unembedded brokerage may take, its distinctive feature is that it unfolds within a brief time horizon, and it involves the brokering of information among colleagues who are not part of one's network of long-term relations.

Recognizing that information brokerage can occur during brief interactions with unfamiliar colleagues, and not just through one's network of long-term relationships, is not only useful to reconnect existing theories of network brokerage with the reality of the contemporary workplace. We propose that it is also necessary to understand how brokers broker, that is, how the information-brokerage interactions in which brokers engage differ from those of actors occupying denser network positions.

Hypotheses

Our first hypothesis is that brokers engage in unembedded brokerage interactions more often than do densely embedded employees. Stated differently, the denser an actor's network position, the stronger the tendency to broker information via one's network of long-term relationships; the more brokering an actor's network position, the stronger the tendency to broker information by interacting with colleagues outside one's existing network.

To support this hypothesis, we begin by noting that the extant research has documented a generalized preference for engaging in embedded rather than unembedded interactions. People repeatedly resort to their existing network of long-term contacts as a source of information (Ingram and Roberts 2000), collaboration (Zaheer and Soda 2009), and socializing (Ingram and Morris 2007, Rivera et al. 2010), while they generally avoid engaging in unembedded interactions. For example, Ingram and Morris (2007) found that even at networking events in which guests participate with the explicit purpose of creating brokerage opportunities and making new contacts in a safe and trusting environment, people interact predominantly with others they already know. A main reason for this tendency is that unlike what happens when dealing with established contacts, unembedded interactions have neither a "shadow of the past" (i.e., a common prior history) nor a "shadow of the future" (i.e., an expectation of continuity into the future) (Poppo et al. 2008). Consequently, when interacting with unfamiliar contacts, actors face lower levels of interpersonal trust and greater subjective uncertainty compared to when they interact with long-term contacts (Berger and Calabrese 1975, Poppo et al. 2008). Furthermore, the brief time horizon within which unembedded interactions typically occur may further complicate the interaction process, as it presses actors to regulate and adapt their relational responses swiftly.

While the tendency to interact preferentially with long-term contacts is likely to be universal, we posit that a distinctive feature of brokers is that they are more prone to deviating from this tendency than are actors who occupy denser network positions. The extant research highlights two main reasons supporting this claim. First, employees who develop workplace networks rich in structural holes tend to have inherent individual-level traits which, both in terms of social skills and of motivational orientation, are conducive to unembedded brokerage. Notably, Burt et al. (1998) find that the single most important individual-level difference between people with a brokerage versus a dense network position within the organizational network is that the former have what the authors dub an "entrepreneurial outsider" orientation. These employees are naturally capable of detecting and are intrinsically motivated to pursue information brokerage opportunities even when this requires venturing outside their comfort zone and interacting with others from an outsider position. Oh and Kilduff (2008), furthermore, show an association between the tendency to occupy a brokerage position within the organizational network and the ability to empathize with new contacts outside an actor's network of long-term relationships. This entrepreneurial outsider orientation stands in contrast to the "obedient insider" tendency characteristic of employees who preferentially build dense network positions. In interaction with others, obedient insiders seek the stability and security of preexisting and well-established relationships, and are less motivated to pursue brokerage opportunities among new contacts (Burt et al. 1998). Thus, whereas an entrepreneurial outsider orientation should facilitate engaging in unembedded brokerage processes, actors with an obedient insider orientation should be more reluctant to engage in such processes.

In addition to an entrepreneurial outsider orientation, engaging in unembedded brokerage interactions requires a good deal of social perceptiveness and adaptability. Particularly relevant in this respect is research on the psychological foundations of networks, which has found that people who develop brokerage positions within the organizational network tend to have a marked "self-monitoring" personality (Mehra et al. 2001, Oh and Kilduff 2008, Sasovova et al. 2010). High self-monitors should be better equipped to overcome the uncertainties inherent in unembedded brokerage interactions because they are alert and adaptive to situational cues, and are able to detect others' motives, emotions, and intentions even within fleeting social exchanges (Gangestad and

Snyder 2000). Furthermore, high self-monitors are generally faster at understanding the work-related problems facing their colleagues, and at showing helpfulness and competence even when interacting across novel work situations and contexts (Lippa 1978), which should increase the chances that they envision and pursue unembedded brokerage opportunities. In sum, those who preferentially build a brokerage position within the organizational network tend to be individuals who, because of their inherent social skills and motivational orientation, are naturally inclined to recognize and pursue the value of unembedded brokerage. Conversely, those who build dense workplace networks are more likely to be individuals whose natural inclination is to interact almost exclusively with preexisting, well-established contacts.

Second, occupying a network position rich in structural holes leads actors to *acquire* social skills and a motivational orientation conducive to unembedded brokerage, while being entrenched in a dense network may further amplify people's generalized preference for embedded interactions. People in brokerage positions must maintain relationships across organizational and social boundaries that most other employees never cross (Burt 2007a, Kleinbaum 2012). Such boundary-spanning ties give brokers access to a rich information environment. However, they also pose contradictory demands and problems of double loyalty, forcing brokers to participate in groups with distinct and often conflicting cultures and norms (Krackhardt 1999). Since managing such tensions is critical to preserve a broker's effectiveness and legitimacy, actors occupying brokerage positions tend to learn to adapt to and translate information across novel and dissimilar contexts. Conversely, the denser the network within which employees are embedded, the more they will tend to focus on and value only the ideas and opportunities generated within their own social group of trusted contacts (Burt 2010, p. 45). According to (Burt 2010, p. 52), occupying a brokerage position "exposes ego to diverse opinion and practice in other groups. In the course of managing contradictory relationships, ego develops cognitive skills of analogy and synthesis, and emotional skills for reading, engaging, and motivating colleagues." Such acquired skills, in turn, are necessary for actors to see value in engaging in unembedded interactions and in pursuing the brokerage opportunities that those interactions might generate.

In sum, these arguments suggest that compared to densely embedded employees, who tend to focus exclusively on their existing network of long-term social relationships, people in brokerage positions are more likely to have both the skills and the motivation to pursue information brokerage opportunities via unembedded interactions. This leads to our first hypothesis:

HYPOTHESIS 1 (H1). *Employees who occupy brokerage positions are more likely to engage in unembedded brokerage than employees occupying denser network positions.*

We argued that, compared to more densely embedded actors, brokers more often broker information via unembedded interactions. Now we ask, when engaging in such unembedded brokerage interactions, what information brokerage strategy—tertius gaudens versus tertius iungens—do brokers preferentially adopt?

In unembedded brokerage processes, actors broker information via short-term interactions with unfamiliar contacts. Therefore, whether actors engage in tertius gaudens or tertius iungens strategies is likely to depend on the ease with which actors can intermediate (versus facilitate) the flow of information between the unfamiliar contacts involved in the unembedded brokerage process. We reason that the denser an actor's network position, the fewer and more difficult opportunities the actor has for short-term tertius gaudens strategies, whereas the unfamiliar contacts with whom brokers interact should generally offer more of these opportunities. The reason is that many of the unfamiliar colleagues with whom an actor interacts stem from that actor's network of long-term contacts, who might act as referrals (Abraham 2014) or facilitate introductions during unplanned, casual encounters (Kilduff 2010). Given that brokers have social relationships across mutually disconnected people and groups within the organization, the unfamiliar contacts brokers meet via their existing contacts are more likely to be mutually unconnected, and to cut across the organization's internal boundaries. Interacting directly is difficult for socially and organizationally distant actors, which should create a window of opportunity for short-term tertius gaudens strategies by the broker. At the same time, it should make it harder to facilitate a direct information exchange between the brokered parties, reducing opportunities for tertius iungens strategies.

Whereas a broker's network spans social and organizational silos, the network of densely embedded employees crosses fewer social and organizational boundaries. Consequently, the unfamiliar contacts a densely embedded actor meets via referral or introduction tend to come from closely overlapping social and organizational groups. Insofar as intermediating the flow of information is harder when the brokered parties are socially and organizationally close, densely embedded actors should have fewer opportunities for short-term tertius gaudens strategies. Adding to this, detecting intermediation opportunities among unfamiliar contacts is generally difficult because, in the absence of specific information, people tend to wrongly assume individuals to be mutually connected even when they are not (Freeman 1992). People in brokerage positions may partly offset this bias because they more often interact with unfamiliar contacts, thereby gaining experience with this type of interactions, and they tend to be highly socially perceptive. However, experimental research shows that this bias is especially strong for densely embedded actors (Janicik and Larrick 2005), which should further hinder their ability to adopt tertius

gaudens strategies when engaging in unembedded interactions with unfamiliar alters. These arguments lead to our second hypothesis:

HYPOTHESIS 2 (H2). *Employees who occupy brokerage positions are more likely to adopt a tertius gaudens (as opposed to tertius iungens) strategy when they engage in unembedded brokerage, than are employees occupying denser network positions.*

Finally, we suggest that brokers also differ from densely embedded actors in how they broker information between their long-term contacts. As argued previously, individuals occupying brokerage positions tend to have a marked self-monitoring trait, which means that they are highly skilled at sensing what behaviors are appropriate and effective in any given interaction and at adjusting their relational strategies accordingly (Fang et al. 2015). Furthermore, their characteristic entrepreneurial outsider orientation suggests that they are especially keen on recognizing the value of brokerage across disparate social contexts and situations (Burt et al. 1998). Building on these arguments, we reason that brokers should be more likely than densely embedded employees to detect which type of brokerage strategy—tertius iungens or tertius gaudens—is more appropriate and valuable across different kinds of interactions. Long Lingo and O'Mahony (2010), for example, provide evidence that brokers adopt either a tertius iungens or tertius gaudens strategy depending on the specific circumstances within which a given brokerage process unfolds.

Building on these arguments, we suggest that when brokering information between their long-term contacts, brokers are more likely than densely embedded employees to adopt a tertius iungens strategy, that is, to facilitate (as opposed to intermediate) a direct information flow between the brokered parties. Research suggests that the benefits an actor can derive from intermediating information between mutually unconnected parties, and hence the value of tertius gaudens strategies, decline steeply as structural holes age (Bidwell and Fernandez-Mateo 2010, Burt 2002). Baum et al. (2012, p. 3) explain that "bridging benefits are typically conceived in terms of concrete, short-term goals, and their advantages are relatively short lived." One important reason is that intermediating information between colleagues requires access to novel information that the brokered parties do not yet have (Reagans and Zuckerman 2008). However, as time passes and the focal actor exploits available intermediation opportunities, the information brokered tends to become less novel. Baum et al. (2012), for example, argue that nascent bridging relationships carry the characteristic benefits of exploration, exposing actors to ideas and opportunities that were previously outside their purview. As access to novel information is more likely when interacting with new contacts than with long-established ones, the value of tertius gaudens strategies often shrinks as the relationship between focal actor and brokered parties matures.

In addition to being less valuable, adopting a tertius gaudens strategy when brokering information between long-term contacts is likely to be considered less situationally appropriate. As an initial contact turns into a mature relationship, actors develop increasing levels of trust and mutual obligation, as well as heightened attention to avoiding conflict (Baum et al. 2012). As the "shadow of the future" begins to govern it Poppo et al. (2008), the relationship becomes an end in itself as opposed to a means toward other ends, and the value of shielding the relationship from possible disruptions increases commensurably. Insofar as intermediating information between contacts implies obstructing, or at least not favoring, the flow of relevant information between them, a tertius gaudens strategy might be perceived as inappropriate, if not altogether opportunistic. Conversely, facilitating a direct information exchange between long-term contacts, for example by coordinating a meeting and openly discussing opportunities together, would represent situationally appropriate behavior that might further strengthen the relationship. Furthermore, a tertius iungens strategy may be more effective when the brokerage process requires sustained collaboration and coordinated action between the brokered parties (Obstfeld 2005) or mutual ownership, sustained and coordinated effort, and synthesis of each other's ideas (Fleming et al. 2007).

Since brokers (relative to densely embedded actors) are more likely to detect what relational strategies are most appropriate and effective in a given situation, and they are more capable of adjusting their behaviors to fit each situation and brokerage opportunity, we propose the following:

HYPOTHESIS 3 (H3). *Employees who occupy brokerage positions are more likely to adopt a tertius iungens (as opposed to tertius gaudens) strategy when they engage in embedded brokerage, than are employees occupying denser network positions.*

Empirical Setting and Data

Our empirical setting is a medium-sized digital advertising agency with offices in Europe and the United States, providing strategic communication and design services for its clients' digital presence. This project-based organization is an exemplar of contemporary organizations, featuring a dynamic work environment characterized by flexible working arrangements, temporal workers, compositional changes, and short-term project assignments. A large majority of the work of the agency is project-based. This means that while the agency is formally organized by functional areas, the workflow is centered on clients and the projects that the agency undertakes for them. Working on projects ensures that employees must coordinate

across functions within relatively short time frames (e.g., a typical project lasts between four and six months).

To understand the process of information brokerage within the agency, we collected all email messages exchanged by all 129 employees during a period of eight months (January–August 2008). We chose to collect email data because our theory required us to obtain a large quantity of very granular information about interactions between employees over time, which is not possible via survey. Existing research shows that respondents are fairly inaccurate at reporting specific interactions rather than long-term trends of interactions (Bernard et al. 1979, Freeman et al. 1987) and observational or diary methods cannot usually be sustained for the duration (eight months) and scale (129 employees) that the monitoring of electronic communications permits (Zwijze-Koning and De Jong 2005). Furthermore, existing empirical findings validate the usefulness of email data in characterizing and analyzing social networks in organizations (Aral and Van Alstyne 2011, Kleinbaum 2012, Quintane and Kleinbaum 2011) and also show that networks of long-term interpersonal relations can be predicted by aggregating email data (Wuchty and Uzzi 2011). Finally, email is a communication medium of choice in the agency, because of flexible working arrangements (e.g., from home, odd hours) that require asynchronous electronic communication means and because of the need to regularly share task-sensitive electronic documents. This is not to suggest that other means of communication are not used in the company. However, observational evidence confirms that email was the primary means of communication for work-related matters. The first author spent several years working as a consultant for the company during which time he visited their main office on several occasions. He was able to observe the work dynamics of the organization as well as conduct interviews with senior executives and project managers aimed at gaining a deeper understanding of temporal patterns of information exchange and at validating the key methodological choices made in the paper.

The email data were received from the firm in the form of 245 text files, each representing the communication activity of the entire company during a single day. A Java program was custom developed to extract sender, recipient, and time information from the logs and import them in a database, where the identities of the senders and recipients were removed (no message content was collected). We reduced the data set by removing all emails for which either sender or recipient(s) were not active employees of the company. Then, we discarded all emails that had more than one recipient. Selecting only single-recipient emails suits the aim of this research as it restricts our analysis to emails specifically addressed to one individual. It is more likely to reflect interactions through which more valuable, private or even sensitive information is exchanged. This information, in turn, would arguably be more likely to provide brokerage opportunities. The results are nevertheless robust to various thresholds of recipients (see the online supplement, "Robustness Checks," available as supplemental material at https://doi.org/10.1287/orsc.2016.1091). The final data set—single recipient emails only—contained 75,308 time-stamped dyads.[2] We complemented the email data by obtaining each employee's department, hierarchical level in the formal organizational structure, gender, country of origin, tenure in the organization, and contractual status (freelancer or permanent employee).

Methods

To explore information brokerage in unembedded interactions we choose a modeling approach that enables us to preserve the temporal granularity of email exchanges (Robins 2013). By using a relational event model (Butts 2008), we retain information about the exact sequence in which emails are sent, instead of aggregating the sequence in cross-sectional panels or counts. More specifically, we consider that all emails sent (and received) by the employees of the agency compose a single sequence of dyadic exchanges and our modeling technique enables us to treat each email in the sequence as a dependent variable. We calculate statistics that reflect the prior history of direct or indirect interactions between the two individuals involved in a given email and compute the probability that this pattern of interactions would lead to the occurrence of an email.

To distinguish between information brokerage through embedded versus unembedded interactions, we create statistics that capture a history of both short-term and long-term prior interactions when predicting each email in the sequence. More specifically, we identify short-term interactions by considering one week of email interactions occurring prior to the event predicted. The choice of one week is based on two main considerations. First, many of the organization's activities follow a weekly rhythm. Employees work on projects that were planned and resourced on a weekly basis and there were weekly management meetings to review milestones and deadlines. Second, our qualitative research on site show that weeks were a salient temporal frame that cognitively anchors employees as they organize their activities, tasks, and objectives. We measure long-term relations by computing statistics based on all the events that occurred since the beginning of the observation period and until the event being modeled. In doing so, we consider that social relations are constituted by repetitive interactions over a long(er) period of time. This is consistent with previous literature, as patterns of interactions over time are generally considered as generating social relations or at least as an indication of them (Granovetter 1973, Ingram and Morris 2007) and the strength of social relations is frequently measured by the frequency of interaction between

contacts (e.g., Burt 1992, Reagans and McEvily 2003). However, we refrain from making a direct association with email frequency or tie strength. Our focus is not on tie strength, rather tie stability. Our assumption is that a repetitive exchange of emails between two individuals is indicative of the existence of an information exchange relation between them. A long-term tie exists if there is *regularity* of exchange over the long term between two people.

Because the short-term is nested in the long-term, including both short-term and long-term statistics in the model imply that short-term interactions deviate from long-term interactions. Hence, the two time frames enable us to examine information brokerage processes occurring via interactions embedded in long-term relations (embedded brokerage) separately from those occurring via short-term interactions that deviate from these long-term relations (unembedded brokerage). Our statistical model belongs to the family of multinomial conditional logistic regression models and is based on the relational event framework developed by Butts (2008). Each event in a sequence is considered a stratum in the regression, and the stratum comprises the actual event as well as the potential events that could have occurred instead of it (i.e., all dyadic combinations of active employees at the time of the event). The regression is conditional because a potential event in a stratum has a conditional probability based on prior exchanges, actor characteristics, and exogenous attributes. See Quintane et al. (2013 and 2014) for additional information about the modeling method.

Model Specifications

Dependent Variable. Our dependent variable is the dyad composed by the sender and receiver of the next email in the sequence of emails. More specifically, for each email event, the dependent variable is a binary variable containing a set of possible sender and recipient dyads. It takes the value of 1 if the email exchange occurs in the dyad and 0 if it does not.

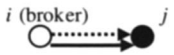
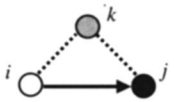
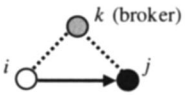
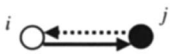
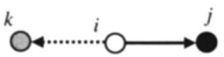
Unembedded Brokerage. To test H1, we create a statistic that captures the tendency for individuals in brokerage positions to engage more in unembedded brokerage interactions than individuals in denser network positions. The details of the statistic are available in Table 1 (*Unembedded brokerage interactions*). The goal of the statistic is to capture the extent to which brokers engage in short-term interactions with colleagues who do not belong to their network of long-term ties. We chose to measure this statistic by computing the extent to which engaging in interactions during the past week triggered a further interaction (*Prior unembedded interactions*—see Table 1) and multiply this statistic with the brokerage score of the sender. Because we control for long-term interactions, this statistic estimates the propensity to engage in unembedded interactions depending on the brokerage score of the sender. In constructing this measure, we consider that unembedded brokerage occurs via interactions with individuals who are not part of an actor's existing network.

Information Brokerage Strategies. Whereas the *Unembedded brokerage interactions* variable measures the extent to which brokers engage in unembedded brokerage interactions, capturing which specific information brokerage strategy actors employ requires us to examine the network configuration, or pattern of information brokerage. Existing studies consider that a structural hole can be minimally represented as a network 2-path, that is, a triangle with a missing base (Baum et al. 2012, Sasovova et al. 2010, Spiro et al. 2013). We consider that there is evidence of a tertius gaudens strategy when interactions that form a triangle with a missing base are repetitively associated with the absence of an interaction between the two alters at the base of the triangle. By contrast, a tertius iungens strategy is signaled by a repetitive association between interactions in the 2-path and a direct interaction at the base of the triangle. Our explanatory statistics represented the 2-path and our dependent variable is the base of the triangle. Thus, the models enable us to estimate the probability that a brokerage process (indicated by an open 2-path) leads to a tertius iungens (versus tertius gaudens) strategy, conditional on the network position of the actor through which the brokerage activity happened, and on whether that activity is embedded in the actor's network of long-term relations or occurs through unembedded interactions.

More formally, our statistics for tertius iungens captures the extent to which an interaction is triggered by prior interactions between a sender i and a set of intermediaries k, who also interact with a recipient j, as a proportion of the total interactions that are sent and received by i by j. As the relational event (dependent variable) is a direct email between i and j, when the preconfiguration and the relational event are considered together, they capture the extent to which tertius iungens occurs. Since tertius gaudens is the additive inverse of tertius iungens, a negative parameter estimate indicated tertius gaudens while a positive parameter estimate indicated tertius iungens. We provide a description and formula for each of the statistics in Table 1.

We differentiate between embedded and unembedded tertius iungens in the following manner. For embedded tertius iungens, we aim to capture long-term relationships between the sender and third parties as well as between the recipient and third parties. We therefore only allow our statistics to account for complete 2-paths over the full duration of the observation period until the event prior to the one being modeled. For unembedded tertius iungens, we also account for a complete indirect interactions path between the sender and the recipient, but only in the week prior to the event.

Table 1 Explanatory Variables and Time Varying Controls

Name	Visual representation	Probabilistic mechanism	Statistic and scaling
		Explanatory variables	
Unembedded brokerage interactions		The tendency for actor i to send an email to actor j as a function of the proportion of emails that i has sent to j in the past week, accounting for the brokerage score of the sender	Statistic $\sum_{t-r<u\leq t} Y_{iju} * Brokerage(i)$ Scaling $\sum_{0<k\leq n} \sum_{t-r<u\leq t} Y_{iku}$
Tertius iungens		The tendency for actor i to send an email to actor j as a function of the proportion of emails that i has exchanged with actor(s) k and that j has exchanged with the same actor(s) k in the past	Statistic† $\sum_{0<k\leq n} \sum_{t-r<u<t} Y_{iku} * \sum_{0<k\leq n} \sum_{t-r<u<t} Y_{kiu} * \sum_{0<k\leq n} \sum_{t-r<u<t} Y_{jku} * \sum_{0<k\leq n} \sum_{t-r<u<t} Y_{kju}$ Scaling $\sum_{0<k\leq n} \sum_{t-r<u\leq t} Y_{iku} * \sum_{0<k\leq n} \sum_{t-r<u\leq t} Y_{kju} * \sum_{0<k\leq n} \sum_{t-r<u\leq t} Y_{iku} * \sum_{0<k\leq n} \sum_{t-r<u\leq t} Y_{kju}$
Tertius iungens by broker		The tendency for actor i to send an email to actor j as a function of the proportion of emails that i has exchanged with actor(s) k and that j has exchanged with the same actor(s) k in the past, when k is the individual with the highest brokerage score of all partners	Statistic†† $\sum_{0<k\leq n} \sum_{t-r<u<t} Y_{iku} * \sum_{0<k\leq n} \sum_{t-r<u<t} Y_{kiu} * \sum_{0<k\leq n} \sum_{t-r<u<t} Y_{jku} * \sum_{0<k\leq n} \sum_{t-r<u<t} Y_{kju}$ Scaling $\sum_{0<k\leq n} \sum_{t-r<u\leq t} Y_{iku} * \sum_{0<k\leq n} \sum_{t-r<u\leq t} Y_{kju} * \sum_{0<k\leq n} \sum_{t-r<u\leq t} Y_{iku} * \sum_{0<k\leq n} \sum_{t-r<u\leq t} Y_{kju}$
		Time varying controls	
Prior embedded (full period of observation) *or unembedded* (one week) *interactions*		The tendency for actor i to send an email to actor j as a function of the proportion of emails that i has sent to j in the past	Statistic $\sum_{t-r<u\leq t} Y_{iju}$ Scaling $\sum_{0<k\leq n} \sum_{t-r<u\leq t} Y_{iku}$
Prior incoming embedded (full period of observation) *or unembedded* (one week) *interactions*		The tendency for actor i to send an email to actor j as a function of the proportion of emails that j has sent to i in the past	Statistic $\sum_{t-r<u\leq t} Y_{jiu}$ Scaling $\sum_{0<k\leq n} \sum_{t-r<u\leq t} Y_{jku}$
Activity of sender		The tendency for actor i to send an email to actor j as a function of the extent to which i has sent emails with actor(s) k in the past	Statistic $\sum_{0<k\leq n} \sum_{t-r<u\leq t} Y_{iku}$ Scaling $\sum_{0<k\leq n} \sum_{0<l\leq n} \sum_{t-r<u\leq t} Y_{klu}$
Popularity of recipient		The tendency for actor i to send an email to actor j as a function of the extent to which j has received emails from actor(s) k in the past	Statistic $\sum_{0<k\leq n} \sum_{t-r<u\leq t} Y_{kju}$ Scaling $\sum_{0<k\leq n} \sum_{0<l\leq n} \sum_{t-r<u\leq t} Y_{klu}$

Note. Let $Y_{ijt} = 1$ if i sends an email to j at time t; $Y_{ijt} = 0$ otherwise; i denotes the sender, j the recipient, and t the time of the event; r is a period of activity; and n is the number of employees.

†Where $Y_{iku} * Y_{kju} > 0$ or $Y_{iku} * Y_{jku} > 0$ or $Y_{kiu} * Y_{kju} > 0$ or $Y_{kiu} * Y_{jku} > 0$. ††Where $Y_{iku} * Y_{kju} > 0$ or $Y_{iku} * Y_{jku} > 0$ or $Y_{kiu} * Y_{kju} > 0$ or $Y_{kiu} * Y_{jku} > 0$ and k has the highest brokerage score of all ks for the pair i, j at time t.

○ Sender ● Recipient ◉ Any Node ⟶ Current Event ·····▸ Past Events.

Identifying Brokers. In a separate analysis, we identify the brokers by aggregating all dyadic events into one cross-section, resulting in a square matrix of 129 rows and columns where each cell represents the number of emails sent by the actor in the row to the actor in the column. We calculate the brokerage scores of all the individuals in the matrix in the following way. First, using UCINET 6 (Borgatti et al. 2006) we calculate the constraint of each employee. We then set all values of constraint of isolates to 1, calculate the natural logarithm of this value, normalize it, and invert the variable so that lower constraint represents higher brokerage scores. We also use different dichotomization methods and thresholds with no effect on the results presented here. See the online supplement, "Robustness Checks," for additional information about brokers.

Brokerage Strategies of the Broker. To test H2 and H3, we create statistics that capture the tendency of individuals in brokerage versus denser network positions to engage in embedded or unembedded tertius iungens, respectively. Our broker-specific statistics (embedded and unembedded tertius iungens by brokers) follow the operationalization of the baseline tertius iungens statistics. The only difference between the two statistics is that in the broker-specific statistics we select only the path that goes through the intermediary k with the highest brokerage score.

Network Controls. We include a series of controls to isolate the process of brokerage. Dyadic controls comprise *Prior interactions* from i to j, *Prior incoming interactions* (from j to i). Together, these two effects capture the propensity of interactions to occur as a function of prior dyadic interactions. Degree effects (activity sender, popularity recipient) control for the number of emails sent and received, and represent the activity and popularity of employees (see Table 1 for a description and formula for each of the statistics).

Scaling. We follow Butts (2008) in choosing the scaling values for each statistic (see Table 1). Statistics are scaled across all values for observed and potential events, based on calculating a proportion of previous events, rather than a raw count. For instance, the statistic for *Prior interactions* is the proportion of previous emails from the sender to the recipient out of all the emails sent by the sender, not the raw count of such previous emails. All statistics are also standardized to make their effects comparable.

Individual-Level Controls. We control for several relevant attributes of the actors, providing information about their background and organizational role. We include the controls presented in Table 2, taking account of potential homophily and sender effects.

Analyses

The 129 employees exchanged a total of 75,308 emails over a period of 35 weeks between January and August 2008. An average of 2,152 emails was sent (and received) every week (standard deviation 404). The weekly average number of emails sent per employee over the observation period was 584 (standard deviation 647) with a maximum of 3,069 emails sent and received by a single employee in a single week during the observation period. Table 3 presents a correlation matrix between all the variables included in the models.

Relational Event Models. Table 4 presents four models. Model 1 estimates a baseline model including only control variables. In Model 2, we include the variable *Unembedded brokerage interactions*. In Model 3, we add the variables *Tertius iungens* for embedded brokerage and *Tertius iungens* for unembedded brokerage. In Model 4, we add two more variables: *Tertius iungens by broker* for embedded brokerage and *Tertius iungens by broker* for unembedded brokerage. Goodness of fit is reported using a deviance measure of fit for each of the models, following Butts (2008).

Time-Invariant Controls. As summarized in Table 2, we include a number of time-invariant variables to control for factors that could potentially affect patterns of information-exchange interaction among employees. Importantly, results from Table 4, Model 1 show that all the variables affect interaction patterns in the expected direction. Information-exchange interactions are more likely among employees who belong to the same hierarchical level (0.157, $p < 0.01$), who have similar tenure (0.063, $p < 0.01$), who belong to the same organizational department (0.461, $p < 0.01$), or who are both freelancers (0.403, $p < 0.01$). Furthermore, the likelihood of an interaction between two employees increases if there is a direct upward (0.127, $p < 0.01$) or downward (0.343, $p < 0.01$) reporting relation between them, or if they are in the same geographical location (1.178, $p < 0.01$). Furthermore, in line with evidence on the effects of homophily, we find that individuals interact significantly more if they share the same language (0.076, $p < 0.01$) and gender (0.314, $p < 0.01$). All these controls are dyadic. We include controls for the levels of these variables and find that individuals who are at higher hierarchical levels (-0.084, $p < 0.01$), freelancers (-0.368, $p < 0.01$), women (-0.084, $p < 0.01$), or those with longer tenure in the organization (-0.001, $p < 0.01$) tend to send fewer emails. Finally, we include departmental dummies for the sender. The direction and significance of these control variables are largely unaltered when we introduce our variables of theoretical interest, in Models 3 and 4. Exceptions are that the effects of *Both freelancers* and *Same tenure* become negative.

Time-Varying Controls. In Model 1, *Prior interactions* is positive and significant both in embedded (0.166, $p < 0.01$) and in the unembedded (0.360, $p < 0.01$)

Table 2 Description and Operationalization of Time-Invariant Controls

Characteristic	Definition
Same gender	Binary variable indicating whether the sender and the recipient have the same gender, coded as 1 if yes and 0 otherwise.
Same function	Binary variable indicating whether the sender and the recipient belong to the same functional department, coded as 1 if yes and 0 otherwise.
Same tenure	Binary variable indicating whether the sender and the recipient have a similar length of tenure. Tenure was converted from a continuous variable to a categorical variable with three categories (less than one year, between one and two years, more than two years). The variable is coded as 1 if both sender and recipient belong to the same tenure category, and 0 otherwise.
Same location	Binary variable indicating whether the sender and the recipient are physically located in the same office, 1 if yes, 0 otherwise.
Same hierarchical level	There are three hierarchical levels in the organization. The binary variable is coded as 1 if the sender and the recipient have the same hierarchical level and 0 otherwise.
Same language	We obtained the country of origin of each employee and used it as a proxy for the employee's mother tongue. The information was classified into four broad categories. The binary variable was coded as 1 if both sender and recipient fall in the same category and 0 otherwise.
Both freelancers	Binary variable indicating whether the sender and the recipient are both freelancers, coded as 1 if yes and 0 otherwise.
Sender is direct superior of recipient	Binary variable indicating whether the ID of the sender is the ID to which the recipient reports, coded as 1 if yes and 0 otherwise.
Sender is direct subordinate of recipient	Binary variable indicating whether the ID of the recipient is the ID to which the sender reports, coded as 1 if yes and 0 otherwise.
Sender is freelancer	Binary variable indicating whether the sender has a contract as a freelancer, coded as 1 if yes and 0 otherwise.
Hierarchical level of the sender	Continuous variable indicating the hierarchical level of the sender, from 1 to 4, with 1 the highest level.
Gender of the sender	Binary variable indicating whether the sender is a woman, coded 1 if yes and 0 otherwise.
Tenure of the sender	Continuous variable indicating the tenure of the sender in months.
Sender department dummies	Dummy variable for each department, excluding department 7 as a reference category.

interactions, indicating that individuals are more likely to interact with colleagues with whom they have interacted over the long term or with whom they interacted within the past few days (Rivera et al. 2010). Similarly, *Prior incoming interactions* is positive and significant both in embedded (0.109, $p < 0.01$) and unembedded (0.309, $p < 0.01$) interactions, showing that interactions are more likely to occur as a reciprocation of past interactions. Control *Popularity recipient* is significant and positive in embedded interactions (0.602, $p < 0.01$), consistent with findings on preferential attachment; however, it is negative in unembedded interactions (-0.078, $p < 0.01$). Control *Activity sender* is positive and significant in embedded (0.563, $p < 0.01$) and in unembedded (0.061, $p < 0.01$) interactions, suggesting that some people are more active than others in stimulating interactions. Again, the direction and significance of these control variables are largely unaltered when we introduce our variables of theoretical interest, in Models 3 and 4. An exception is that the effect of *Popularity recipient* in unembedded interactions becomes positive.

Explanatory Variables. Model 2 introduces the first of our variables of theoretical interest, *Unembedded brokerage interactions*, which captures how the tendency to engage in unembedded brokerage varies as a function of an actor's network position (brokering versus dense). The effect of *Unembedded brokerage interactions* is significant and positive (0.184, $p < 0.01$). This means that the more actors are in brokerage positions within the organizational network, the more they tend to engage in unembedded brokerage; the denser actors' networks, the more they tend to engage in brokerage within their existing network of long-term contacts.[3] This result supports our first hypothesis.

Model 3 shows that employees have a general tendency to adopt a tertius iungens (versus tertius gaudens) strategy, and this is true both when brokering through their long-term relations (*Tertius iungens in embedded brokerage interactions* (0.590, $p < 0.01$) and when brokering through unembedded interactions (*Tertius iungens in unembedded brokerage interactions* 0.283, $p < 0.01$). In Model 4, we estimate how the tendency to engage in embedded and unembedded tertius iungens varies as a function of actors' network positions, which serves as a test for our second and third hypotheses. The model shows that *Tertius iungens by broker in unembedded brokerage interactions* is significant and negative (-0.165, $p < 0.01$). This indicates that when the information brokerage process occurs outside the focal actor's network of long-term ties, the more brokering is the network position of the focal actor, the less likely is that actor to facilitate

Table 3 Correlation Table

	1	2	3	4	5	6	7	8	9	10	11	12
1. *Both freelancers*	0.012**											
2. *Same hierarchical level*	−0.028**	−0.030**										
3. *Same gender*	−0.002*	−0.100**	0.045**									
4. *Same location*	0.029**	−0.041**	0.048**	0.115**								
5. *Same language*	0.126**	0.028**	−0.036**	−0.043**	0.046**							
6. *Same tenure*	0.026**	0.179**	−0.001	0.184**	0.022**	0.056**						
7. *Same function*	−0.014**	−0.098**	0.023**	0.065**	0.026**	0.022**	0.202**					
8. *Sender is superior of recipient*	−0.013**	−0.094**	0.020**	0.063**	0.023**	0.021**	0.193**	−0.011**				
9. *Sender is subordinate of recipient*	0.336**	0.023**	−0.046**	−0.009**	−0.036**	0.076**	0.023**	−0.007**	−0.039**			
10. *Sender is freelancer*	0.014**	0.398**	−0.045**	−0.142**	−0.072**	0.023**	0.055**	−0.014**	−0.205**	0.035**		
11. *Hierarchical level of sender*	−0.029**	−0.038**	0.506**	0.042**	0.019**	−0.057**	−0.030**	0.017**	0.011**	−0.085**	−0.075**	
12. *Gender of the sender*	−0.085**	−0.101**	0.059**	0.200**	0.039**	−0.087**	0.000	0.008**	0.074**	−0.252**	−0.270**	0.109**
13. *Tenure of the sender*	0.024**	−0.028**	0.057**	0.108**	0.063**	0.036**	0.128**	0.235**	0.077**	−0.011**	−0.032**	0.032**
14. *Prior embedded interactions*	0.023**	−0.032**	0.063**	0.110**	0.060**	0.033**	0.125**	0.100**	0.225**	−0.033**	−0.129**	0.072**
15. *Prior embedded incoming interactions*	−0.071**	−0.201**	0.214**	0.202**	0.033**	−0.106**	−0.019**	0.036**	0.107**	−0.217**	−0.443**	0.394**
16. *Activity sender in embedded interactions*	−0.062**	−0.210**	0.180**	0.193**	0.037**	−0.100**	−0.022**	0.133**	0.026**	−0.013**	−0.023**	0.020**
17. *Popularity recipient in embedded interactions*	0.015**	−0.029**	0.060**	0.094**	0.050**	0.025**	0.096**	0.171**	0.067**	−0.014**	−0.037**	0.032**
18. *Prior unembedded interactions*	0.012**	−0.031**	0.066**	0.094**	0.047**	0.024**	0.092**	0.089**	0.157**	−0.028**	−0.111**	0.071**
19. *Prior unembedded incoming interactions*	−0.028**	−0.077**	0.080**	0.079**	0.011**	−0.041**	−0.007**	0.017**	0.043**	−0.085**	−0.169**	0.149**
20. *Activity sender in unembedded interactions*	−0.020**	−0.067**	0.057**	0.065**	0.009**	−0.032**	−0.007**	0.042**	0.012**	−0.007**	−0.009**	0.008**
21. *Popularity recipient in unembedded interactions*	−0.046**	−0.073**	0.233**	0.278**	0.061**	0.030**	0.085**	0.091**	0.087**	−0.134**	−0.183**	0.176**
22. *Unembedded brokerage interactions*	−0.014**	0.011**	0.033**	−0.018**	−0.004**	0.023**	0.018**	0.040**	0.023**	0.001	0.017**	−0.012**
23. *Embedded tertius iungens*	−0.061**	−0.106**	0.208**	0.428**	0.092**	0.021**	0.118**	0.097**	0.091**	−0.169**	−0.191**	0.169**
24. *Unembedded tertius iungens*	0.009**	0.002	−0.025**	−0.037**	−0.002**	−0.005**	−0.031**	−0.004**	−0.003**	0.018**	0.010**	−0.021**
25. *Embedded tertius iungens by broker*	0.013**	0.003**	−0.062**	−0.080**	−0.039**	−0.020**	−0.072**	−0.023**	−0.022**	0.037**	0.023**	−0.055**
26. *Unembedded tertius iungens by broker*	0.012**	−0.030**	0.045**	0.115**	0.046**	0.056**	0.202**	−0.011**	−0.039**	0.035**	−0.075**	0.109**

Table 3 (Continued)

	13	14	15	16	17	18	19	20	21	22	23	24	25
13. *Tenure of the sender*	0.024**												
14. *Prior embedded interactions*	0.079**	0.329**											
15. *Prior embedded incoming interactions*	0.382**	0.066**	0.228**										
16. *Activity sender in embedded interactions*	0.018**	0.236**	0.063**	0.047**									
17. *Popularity recipient in embedded interactions*	0.036**	0.653**	0.284**	0.081**	0.202**								
18. *Prior unembedded interactions*	0.066**	0.284**	0.615**	0.197**	0.078**	0.378**							
19. *Prior unembedded incoming interactions*	0.150**	0.052**	0.118**	0.471**	0.036**	0.050**	0.107**						
20. *Activity sender in unembedded interactions*	0.010**	0.115**	0.037**	0.026**	0.525**	0.105**	0.036**	0.260**					
21. *Popularity recipient in unembedded interactions*	0.193**	0.141**	0.150**	0.388**	0.365**	0.141**	0.148**	−0.027**	0.037**				
22. *Unembedded brokerage interactions*	−0.020**	−0.192**	−0.095**	−0.014**	0.081**	−0.071**	0.155**	−0.006**	−0.015**	0.050**			
23. *Embedded tertius iungens*	0.260**	0.162**	0.175**	0.413**	0.385**	0.159**	0.167**	−0.020**	0.098**	0.074**	0.555**		
24. *Unembedded tertius iungens*	−0.014**	−0.012**	−0.013**	−0.026**	−0.020**	−0.010**	−0.010**	0.011**	0.024**	−0.200**	−0.061**	−0.005**	
25. *Embedded tertius iungens by broker*	−0.028**	−0.031**	−0.033**	−0.061**	−0.049**	−0.025**	−0.026**	−0.032**	0.024**	−0.025**	0.011**	0.318**	0.135**
26. *Unembedded tertius iungens by broker*	0.024**	0.329**	0.228**	0.047**	0.202**	0.378**	0.107**	0.260**	−0.022**				

*$p < 0.05$; **$p < 0.01$.

a direct information flow between the brokered parties.[4] This result supports our second hypothesis, which states that when engaged in brokerage through unembedded interactions, brokers are more likely than actors in denser network positions to adopt a tertius gaudens strategy. Conversely, when considering the brokerage interactions actors carry out between their long-term contacts, the coefficient for *Tertius iungens by broker in embedded interactions* is significant and positive (0.064, $p < 0.01$). This means that, in the context of embedded brokerage, the more brokering actors' networks are the more likely it is that they will adopt a tertius iungens strategy. This finding supports our third hypothesis.

Replication Study. We replicate all our analyses in a second organization, an IT recruitment company operating in Australia. While we have fewer controls and less in-depth knowledge of this organization, it is an interesting site for a replication because the organization is not project based. As such, we are able to rule out specific project interdependencies as a cause of the pattern of results that we observe in our main study. Furthermore, this second organization operates in a different country (Australia versus the Netherlands) and in a different industry (IT recruitment versus digital advertising). The activity of this organization is similar to the executive recruitment firm studied by Aral and Van Alstyne (2011); it matches IT professionals with IT needs of client organizations. As in our main study, employees interact often and electronically to share information about positions and candidates.

As part of an internal assessment we were able to collect all email communications between the 87 employees of the company's headquarters in Sydney between January 1, 2012, and February 15, 2013. To be consistent with the treatment in our main study, we remove all external email addresses from the data set and eliminate emails sent to more than one recipient. As robustness checks, we also create data sets containing emails sent to four or fewer recipients (but also three or fewer, and two or fewer recipients) and our results are robust to changes in the number of recipients. The final data set used in the analysis reported below contains 96,290 emails. The demographic variables we obtained include hierarchical level, gender, functional department, and ID of the direct supervisor. In Table 5, we present the results of two relational event models with the same specifications as those explained in our main study. The results support the results from our main study (descriptive statistics and correlations are available from the authors).

Discussion

This paper asks, how do brokers broker? While extensive research has examined the benefits accruing to people in brokerage positions, few studies have focused on the information brokerage processes postulated to drive

Table 4 Parameter Estimates of Relational Event Models

	Model 1	Model 2 (H1)	Model 3	Model 4 (H2 and H3)
		Explanatory variables		
Unembedded brokerage interactions		0.184** (0.003)		
		Embedded brokerage interactions		
Tertius iungens			0.590** (0.008)	0.584** (0.008)
Tertius iungens by broker				0.064** (0.010)
		Unembedded brokerage interactions		
Tertius iungens			0.283** (0.004)	0.326** (0.004)
Tertius iungens by broker[a]				−0.165** (0.006)
		Time invariant controls		
Both freelancers	0.403** (0.052)	0.415** (0.050)	−0.067 (0.056)	−0.028** (0.056)
Same hierarchical level	0.157** (0.01)	0.145** (0.010)	0.090** (0.011)	0.091** (0.011)
Same gender	0.314** (0.014)	0.292** (0.014)	0.096** (0.014)	0.088** (0.015)
Same location	1.178** (0.023)	1.138** (0.022)	0.516** (0.024)	0.514** (0.024)
Same language	0.076** (0.011)	0.079** (0.011)	0.035** (0.011)	0.041** (0.011)
Same tenure	0.063** (0.01)	0.065** (0.010)	−0.055** (0.010)	−0.052** (0.010)
Same department	0.461** (0.012)	0.449** (0.012)	0.282** (0.012)	0.295** (0.012)
Sender is superior of recipient	0.343** (0.027)	0.291** (0.027)	0.364** (0.027)	0.376** (0.027)
Sender is subordinate of recipient	0.127** (0.030)	0.126** (0.030)	0.085** (0.03)	0.092** (0.03)
Sender is freelancer	−0.368** (0.022)	−0.270** (0.022)	−0.045** (0.023)	−0.041** (0.023)
Hierarchical level of the sender	−0.084** (0.009)	−0.095** (0.009)	−0.107** (0.009)	−0.100** (0.009)
Gender of the sender	−0.065** (0.013)	−0.053** (0.014)	−0.031** (0.014)	−0.031** (0.014)
Tenure of the sender	−0.001** (0.000)	−0.001** (0.000)	−0.003** (0.000)	−0.003* (0.000)
Sender departmental dummies	Included	Included	Included	Included
		Time varying controls		
		Embedded interactions		
Prior interactions	0.166** (0.004)	0.197** (0.004)	0.180** (0.004)	0.180** (0.004)
Prior incoming interactions	0.109** (0.004)	0.092** (0.004)	0.115** (0.004)	0.115** (0.004)
Activity sender	0.563** (0.006)	0.576** (0.006)	0.288** (0.007)	0.257** (0.007)
Popularity recipient	0.602** (0.005)	0.576** (0.005)	0.282** (0.006)	0.245** (0.006)
		Unembedded interactions		
Prior interactions	0.360** (0.003)	0.357** (0.003)	0.334** (0.003)	0.331** (0.003)
Prior incoming interactions	0.309** (0.003)	0.286** (0.003)	0.293** (0.003)	0.292** (0.003)
Activity sender	0.061** (0.006)	0.053** (0.006)	0.133** (0.006)	0.124** (0.007)
Popularity recipient	−0.078** (0.006)	−0.084** (0.01)	0.036** (0.006)	0.039** (0.006)
		Goodness of fit		
Null deviance			458,554	
Residual deviance	236,048	232,579	216,272	215,059
Observed events (potential events)			75,308 (1,506,160)	

[a]As explained in the methods section, tertius iungens and tertius gaudens are the opposite ends of a continuum. Thus, a negative sign in the parameter estimating the likelihood of tertius iungens can be interpreted as a positive effect in the likelihood of tertius gaudens, and vice-versa. Standard errors in parentheses.

*$p < 0.05$; **$p < 0.01$.

such benefits. We cover this gap by examining two information brokerage strategies—tertius gaudens and tertius iungens—enabled by the presence of structural holes in an actor's network. We use a relational event model to distinguish between brokerage interactions occurring via an actor's network of long-term relationships (embedded brokerage) and those occurring through unembedded interactions (unembedded brokerage), as well as between tertius gaudens and tertius iungens strategies. Rather than modeling interaction patterns at an aggregate level, we use this novel methodological approach to carry out a fine-grained temporal analysis of information-brokerage interactions. We conduct an empirical study of email communications among all the employees of a medium-sized organization, as well as in a replication study. Our results show that the brokerage-interaction strategies of brokers differ in three important ways from those of actors embedded in denser network positions. First, brokers engage more often in unembedded brokerage than other employees. Second, when they engage in unembedded brokerage interactions, they are more likely to adopt a tertius gaudens strategy and intermediate the flow of information between the brokered parties. However, and third, when they broker information between their long-term contacts, brokers tend to adopt a tertius iungens strategy and facilitate a direct information exchange across the structural holes separating them.

Limitations

We use email communication data because we rely on the fine-grained temporal data contained in email exchanges to understand the patterns of brokerage interactions.

Table 5 Parameter Estimates of Relational Event Models for the Email Event Sequence of the Replication Data Set

	Model 1 (H1)	Model 2 (H2 and H3)
Explanatory variables		
Unembedded brokerage interactions	0.021** (0.002)	
Embedded brokerage interactions		
Tertius iungens		0.764** (0.007)
Tertius iungens by broker		0.036** (0.006)
Unembedded brokerage interactions		
Tertius iungens		0.258** (0.003)
Tertius iungens by broker		−0.076** (0.004)
Time invariant controls		
Same hierarchical level	−0.092** (0.009)	−0.015 (0.009)
Same gender	−0.060** (0.012)	−0.049** (0.012)
Same department	0.195** (0.010)	0.087** (0.010)
Hierarchical level of the sender	0.005** (0.008)	−0.028** (0.008)
Gender of the sender	−0.104** (0.011)	−0.117** (0.011)
Sender is superior of recipient	0.454** (0.026)	0.312** (0.027)
Sender is subordinate of recipient	0.228** (0.029)	0.093** (0.029)
Sender departmental dummies	Included	Included
Time varying controls		
Embedded interactions		
Prior interactions	0.241** (0.004)	0.258** (0.004)
Prior incoming interactions	0.153** (0.004)	0.144** (0.004)
Popularity recipient	0.321** (0.004)	0.071** (0.004)
Activity sender	0.476** (0.004)	0.295** (0.005)
Unembedded interactions		
Prior interactions	0.317** (0.003)	0.308** (0.003)
Prior incoming interactions	0.281** (0.003)	0.243** (0.003)
Popularity recipient	0.065** (0.005)	0.100** (0.005)
Activity sender	0.052** (0.005)	0.070** (0.005)
Goodness of fit		
Null deviance	586,308	
Residual deviance	358,374	325,699
Observed events (potential events)	96,289 (1,925,780)	

Note. Standard errors in parentheses.
*$p < 0.05$; **$p < 0.01$.

However, email is only one medium of interaction and, despite its importance in the empirical context we analyzed, it may not completely reflect the overall pattern of interactions in this organization. Furthermore, our email data do not enable us to distinguish the type of information exchanges between employees. Future research could provide additional insights by analyzing whether the dynamics of information brokerage we document are robust across different types of interactions and information, for example, by using the content of emails or by complementing our analyses with longitudinal sociometric survey data.

The empirical site chosen for this study is suitable to test our theoretical arguments because formal role and intra-organizational boundaries—departmental, hierarchical, or geographic—are permeable due to the dynamic and project-based nature of the work. While informality, dynamicity, and permeable boundaries are distinguishing features of the contemporary workplace (Bechky 2006), many organizations are characterized by the existence of strong internal boundaries (Kleinbaum 2012). It seems plausible that the presence of thick intra-organizational boundaries may act as a safeguard for established brokerage positions (e.g., Bidwell and Fernandez-Mateo 2010), while at the same time making it more difficult to interact with structurally distant colleagues (Stovel et al. 2011). Based on this conjecture, we can speculate that generally employees in fluid and organic organizations may tend to adopt a tertius iungens strategy more frequently than do employees in more traditional, mechanistic organizations. However, there is no reason to think that the focal element of our theory—that brokers broker differently from more densely embedded employees—does not also apply to more traditional organizations. Related to this point, it could be argued that the project-based nature of the work undertaken at our studied organization might drive our results, because projects impose specific constraints on interaction patterns. In a series of additional analyses available from the authors, we examine this possibility and find no systematic association between project features and the information brokerage patterns we identified. Also, our replication study analyzes a non-project based organization, yielding the

same pattern of results. Nevertheless, it would be important to test our arguments in wider samples in order to establish their generalizability.

Finally, the theory leading to our hypotheses postulates mechanisms that, albeit rooted in prior literature, we cannot empirically observe in the present study. For example, we argue that those who occupy brokerage positions tend to be individuals with an entrepreneurial outsider orientation, as opposed to an obedient insider one, and to have (or develop) the social acuity needed to behave appropriately and effectively in interaction with unfamiliar contacts. We built on prior literature to argue that people in brokerage positions are more likely than people embedded in denser network positions to have these characteristics. However, we do not have data to bear on this claim. The credibility of our theoretical arguments would be much enhanced if future studies could test our postulated mechanisms more directly than we have been able to.

Contributions

The theory and evidence we present contribute to the extant literature in several ways. We argue that solely examining brokers' network-structural position is not enough to address the question of how brokers broker because the presence of structural holes in an actor's network makes two opposite forms of information brokerage possible. The first corresponds to the tertius gaudens strategy evoked by Simmel (1950) and Burt (1992) and depicts brokerage as a process of intermediation. The second, highlighted by Obstfeld (2005), corresponds to a tertius iungens strategy of a broker who facilitates a direct flow of information across the structural hole. This paper illuminates the conditions under which brokers are more likely to adopt a tertius gaudens or a tertius iungens strategy, based on whether they engage in information brokerage through unembedded or embedded interactions.

Our study is one of the very first to directly examine the link between actors' structural position and the patterns of information brokerage in which they engage. We endeavor to disentangle, theoretically as well as empirically, two often-conflated concepts of brokerage: as a network position and as an information exchange process (Obstfeld et al. 2014). We adopt a methodological framework that allows us to model and statistically test fine-grained temporal dynamics of brokerage interactions using large-scale, quantitative data. We use Burt's standard conceptualization and operationalization of brokers to examine people's network positions and identify how many structural holes employees span through their long-term social relations. To examine brokerage as a process, we look at each individual information brokerage episode in which employees engaged during the observation period. The analytical approach we develop enables us to show that the information-brokerage strategies of people in brokerage positions differ systematically from those of actors occupying denser network positions. This finding is noteworthy insofar as it indicates that the difference between brokers and densely embedded employees is not only structural but, as importantly, behavioral.

In addition to advancing current understandings of *how* brokers broker, this study contributes to the network literature by integrating insights from the structural and process views of network brokerage within a unitary explanatory framework. Research within the structural tradition have tended to infer information brokerage processes from actors' network position, while research examining the brokerage process have tended to select empirical contexts in which brokers are defined a priori, effectively setting the structural dimension to a constant. For example, Long Lingo and O'Mahony (2010) focused on music producers because they are in a brokerage position with respect to other constituencies, including artists, songwriters, and record labels. We choose a different research strategy and explicitly examine how actors' information-brokerage interactions vary as a function of the network-structural position they occupy. Specifically, we argue and show that brokers engage in tertius gaudens when brokering through unembedded interactions but engage in tertius iungens when brokering via their network. These findings extend recent literature that has proposed that brokers differ from other employees because they switch more flexibly between tertius gaudens and tertius iungens strategies depending on the situation (Long Lingo and O'Mahony 2010).

The findings of our study also substantiate and reveal new insights into the concept of "structural autonomy" (Burt 1992). Because tracing employees' social behaviors is generally harder than tracking their performance, most extant research has focused on the performance consequences of structural autonomy. However, the structural autonomy argument has much broader theoretical scope, insofar as it highlights how different network configurations allow for varying levels of individual self-determination in social behaviors. The hypothesis, so far rarely directly tested, is that actors embedded in dense network structures "conform more closely, under threat of being excluded from relationships, to behavior characteristic of their location in social structure" (Burt 1992, p. 226) whereas actors in brokerage positions are comparatively less constrained by the dictates of network structure. Our study offers a valuable window into this argument because we were able to trace empirically a theoretically important social behavior—information brokering—and to relate it to actors' network positions. In line with the argument, we find that the structure-behavior link becomes increasingly tight as network density increases. Our results show that the information-brokerage interactions in which actors engage are highly path-dependent for densely embedded actors, leading to intense interaction patterns within their existing network but increasingly rare interactions outside it. The set of relations densely embedded employees have built

in the past delimits the space of interactions in which they engage today, absorbing most of their time and energy. Conversely, the information brokerage interactions of employees in brokerage positions are relatively autonomous from the constraints of network structure. By frequently engaging in brokerage through unembedded interactions with unfamiliar colleagues, brokers venture beyond the familiar path of their existing network, acting as "authors of their own social world" (Burt et al. 1998, p. 74).

These findings have implications for our understanding of network dynamics too. Prior research has emphasized how people systematically reproduce existing network structures, leaving moot why new ties often break away from "the familiar path of adding new ties through existing ties" (Ingram and Morris 2007, p. 583). Explaining what drives network change is difficult if researchers focus on already-established ties. For that reason, Sasovova et al. (2010, p. 661), suggested that "a more fine-grained understanding of the sequence of interactions that generated this change will require research designs that capture changes in a more continuous fashion."Our analyses respond to this call, substantiating the view of brokers as relentless agents of network change. Whereas densely embedded actors largely reproduce preexisting network structures, we highlight three ways in which the enhanced structural autonomy of brokers triggers changes in organizational networks. First, by systematically engaging in brokerage through unembedded interactions, brokers may detect unexplored structural holes and lay the foundations from which new bridges can form (Ingram and Morris 2007). Second, related to this, brokers open up information channels across structural, social, and organizational boundaries that most employees rarely cross. For example, in a set of additional analyses (available from the authors) we find that brokers are more likely than more densely embedded employees to engage in unembedded interactions with colleagues across organizational functions and hierarchical levels. Third, when brokering information within their existing network, brokers often facilitate a direct information exchange between the brokered parties, increasing the speed at which existing structural holes disappear. In sum, brokers play a key role in disrupting the natural tendency toward structural reproduction, driving continuous change in existing network patterns (Burt 2004).

Increasing evidence suggests that brokers' networks undergo a greater amount of churn than the networks of densely embedded actors (Burt 2002, Sasovova et al. 2010). Our study provides a plausible explanation for this finding. We suggest that brokers should be quicker to form new bridging ties because they venture more often beyond their established network. Such unembedded brokerage interactions are instrumental to forming new bridges because they put brokers in contact with individuals unconnected to their existing contacts. As Ingram and Morris (2007, p. 583) put it, "any opportunity to meet strangers is notable for those seeking efficacious networks, because the most entrepreneurially advantageous network positions, those that span structural holes, require knowing someone who is not known by others in one's network." At the same time, brokers' tendency to venture outside their established network means they have less time and energy to nurture their existing bridges and structural holes, which accelerates bridge decay and heightens the risk of disintermediation. Insofar as unembedded interactions boost the rate of both bridge formation and dissolution, our results may explain the network churn characteristic of brokering positions.

On a more speculative level, our findings suggest how and for whom network brokerage generates value. While a large body of literature demonstrates that brokerage positions yield value in the form of increased performance, there is scant direct evidence about how such performance benefits are generated. One interpretation puts value generation in the network position of the broker. Burt (2004), for example, discusses the value of brokering positions in terms of a "vision advantage." Through their long-term bridging ties, brokers become aware of, and involved in, information and opportunities circulating within different and mutually unconnected social groups, allowing them to identify links between ideas that would be invisible to equally skilled individuals embedded within a denser network. According to this interpretation, an extensive unembedded tertius gaudens activity would create value indirectly for brokers, by helping them identify the bridging relations that have the potential to generate a sustainable rent over the long haul. Thus, brokerage through unembedded interactions would essentially be an exploration process, the result of which is the identification of valuable structural holes to be exploited over time. While this interpretation is plausible, our results would also be consistent with a second, different interpretation in which the locus of value is brokerage through unembedded interactions, meaning that brokers would generate value in the short lapse of time during which they occupy structural holes before their value fades away. If this explanation is correct, brokers do not extract a positional rent from their long-term bridging relations. A broker's long-term bridges would be merely the residue of brokerage through unembedded interactions. Future research should use time-stamped performance data similar to Burt (2012) to adjudicate between these interpretations.

Supplemental Material

Supplemental material to this paper is available at https://doi.org/10.1287/orsc.2016.1091.

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Endnotes

[1]By strategy, we mean strategic behavioral orientation, following Obstfeld (2005).

[2]As a comparison, Kleinbaum (2012) uses an email data set of a large company where employees exchange on average 48.5 emails to four or fewer recipients (four-recipients emails) per individual per month (2,200,000 emails, 15,116 employees, three months). Similarly, Aral and Van Alstyne (2011) report collecting 125,000 emails over a 10-month period for 556 employees, a monthly average of 22 emails per employee. In our data set, we have a total of 75,308 single-recipient emails and 154,617 four-recipients emails for 129 employees over 8 months, an average of approximately 70 single-recipient and 150 four-recipients emails per employee per month. These averages are notably higher than those reported by Kleinbaum (2012) and Aral and Van Alstyne (2011). Aral and Van Alstyne (2011, p. 19) emphasize that email is heavily used in the organization they studied.

[3]We replicated this analysis using a different econometric approach (not reported here). We estimated a count model where the dependent variable is the number of emails sent to colleagues who do not belong to an actor's network of long-term relationships, as a function of the actor's brokerage position and several control variables. The results confirm the test presented here: the more brokering actors' networks are, the more they engage in information brokerage interactions outside their network of long-term relationships. We also created additional models that include the main effect of brokerage score for the sender and our results were maintained.

[4]Similarly to H1, we replicated this analysis using an alternative econometric approach. We counted the number of open and closed triads in embedded and unembedded brokerage interactions. We used each of these counts as our dependent variable and estimated, in two separate count models, how the number of open versus closed triadic interactions vary as a function of actors' network position. We found that when engaging in unembedded brokerage interactions, the more brokering is an actor's network the more open triads she or he has (which indicates an unembedded tertius gaudens strategy). Conversely, when brokering between an actor's long-term contacts, the more brokering an actor's network the more closed triads she or he has (which indicates an embedded iungens strategy). These results align with the estimates presented in our main model.

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