Intraorganizational Network Dynamics in Times of Ambiguity

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Contrary to the assumption of relational inertia that is prevalent in much of the research on organizational change, I propose that intraorganizational networks are instead subject to transitory shifts when organizational change produces high levels of ambiguity for employees. I develop a theoretical account of how networks defined by formal, semiformal, and informal organizational structure change in response to heightened ambiguity. I argue that, when ambiguity increases, people will tend to (1) decrease communication with formal network ties that do not have a significant semiformal component, (2) increase communication with semiformal network ties that do not have a significant formal component, and (3) increase communication with informal network ties. Empirical support for these propositions comes from unique data— including 40 weeks of archived email metadata, the full roster of email distribution lists, personnel records, and qualitative interviews—that span the period before, during, and after an ambiguity-producing restructuring at a large information services firm. These findings contribute to research on organizational structure, organizational change, and social capital activation and also have implications for management practice.

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1. Introduction

Research on social networks within organizations has revealed two remarkably consistent empirical regularities. First, interpersonal relationships and communications tend to hew to the contours of organizational structure, for example, the boundaries defined by departments and functions (Kleinbaum et al. 2013, Han 1996, Hinds and Kiesler 1995). Indeed, as Allen (1977, p. 211) noted, "The real goal of formal organization is the structuring of communication patterns." Second, networks within organizations are characterized by relational inertia; that is, they can be slow to adjust to changing organizational circumstances (Gargiulo and Benassi 2000, Maurer and Ebers 2006).

Against this backdrop, a growing body of research has started to surface the conditions under which intraorganizational networks counteract the tendency toward relational inertia through both permanent (Briscoe and Tsai 2011) and transitory (Allatta and Singh 2011) adjustments. At the same time, whereas research on formal and informal organization has historically remained separate and unconnected, recent years have seen a surge of interest in the dynamic interrelationships among formal, semiformal, and informal organizational elements (Biancani et al. 2014, McEvily et al. 2014).

In this article, I bring together insights from these disparate research traditions to examine the question: How do networks defined by formal, semiformal, and informal organizational structure change during periods of heightened ambiguity? A wide variety of organizational events—for example, post-merger integration, the launch of a new growth initiative, or restructuring—can give rise to ambiguity, which results when people have multiple, competing interpretations of the same situation (Weick 1995). Ambiguity of this kind exerts two countervailing forces on the diversity of contacts with whom a person seeks interaction (Reagans and McEvily 2003). On one hand, ambiguity tends to increase network diversity as people seek interaction with colleagues who can provide a different perspective and novel interpretations of unfolding events (e.g., Saint-Charles and Mongeau 2009). On the other hand, ambiguity tends to constrict network diversity as people seek interaction with familiar and trustworthy colleagues (e.g., Krackhardt 1992).

I propose a theoretical account of how these competing forces of ambiguity—those that increase and those that decrease network diversity—jointly produce transitory shifts in formal, semiformal, and informal organizational networks. To the extent that these perturbations to intraorganizational networks occur predictably alongside heightened ambiguity, they have important implications for both theory and practice. For example, prior work on network structure and individual well-being following an ambiguity-producing organizational change has implicitly assumed stability in interpersonal relations (Ashford 1988, Shah 2000). If instead people chose to interact with a distinct set of social relations in periods of ambiguity than they did in more stable times, it could

lead them to mobilize a very different set of social resources to cope with ambiguity than has been assumed in prior research. Similarly, organizational leaders often rely heavily on the formal organizational structure to communicate about ambiguity-producing organizational change (see Klein 1996 for a typical set of communication guidelines for managers). Yet if the formal structure placed a weaker constraint on interpersonal contact in times of ambiguity than it did in times of clarity, it would suggest the need to rethink prevailing views about effective communication strategies for organizational change.

Despite the importance of understanding how networks change in response to ambiguity, the extant literature has largely overlooked this question. One important reason is methodological: Prior studies on ambiguity-producing organizational change have tended to rely on methods such as formal models (Hannan et al. 2003a, b), simulations (Krackhardt and Stern 1988, Lin et al. 2006), and retrospective surveys (Shah 2000) and interviews (Balogun and Johnson 2004, Huy 2002) that are ill-suited to detecting real-time network shifts.

Access to unique data on network microdynamics in the period before, during, and after the quasi-exogenous onset of heightened ambiguity in a large information services firm enables me to directly test theoretical propositions about ambiguity's effects on intraorganizational networks. The data include personnel records that aided in locating individuals and tracking their mobility within the formal structure; the complete roster of email distribution lists, which identified people's changing positions in the semiformal structure (e.g., teams, task forces, employee groups); 40 weeks of archived email metadata on 114 senior leaders in the firm that provided a window into changes in communication with formal, semiformal, and informal network contacts; archived internal communications that helped in constructing the key event time line; and interviews with 23 individuals who were affected by or involved in implementing the restructuring.

2. Theory and Hypotheses

2.1. Relational Inertia and Network Change
Network ties are prone to relational inertia. That is, there is a tendency toward stability in interpersonal relations given that people tend to follow routinized patterns of interaction with familiar others (Granovetter 1973, Portes and Sensenbrenner 1993). For example, Maurer and Ebers (2006) report based on comparative case analyses of six biotechnology firms that initial choices of partner selection resulted in relational lock-in, which kept in place network configurations that were previously valuable even after the environment changed.

Though the tendency toward relational inertia is strong, a growing body of work has started to surface the conditions under which these inertial forces can be overcome,

resulting in permanent or temporary changes in interpersonal networks (Briscoe and Tsai 2011, Allatta and Singh 2011). In line with this work, I argue that ambiguity arising from organizational change can give rise to transitory shifts in intraorganizational networks. To develop this argument, I start by distinguishing the different forms of intraorganizational ties that exist within organizations. I then explicate the situations of organizational change that give rise to ambiguity and describe the competing forces it exerts on the types of network contacts a person seeks out for interaction. Finally, I conceptually unpack how these forces will influence communication patterns for each type of network tie.

2.2. Formal, Semiformal, and Informal Network Contacts
Formal organization refers to the departmental affiliations, reporting relationships, and roles that *prescribe* behavior and interaction, whereas informal organization represents *discretionary* patterns of behavior and interaction. Between these two poles lies semiformal organization, shared affiliations *afforded* (but not necessarily mandated) by participation in the myriad project teams, task forces, and employee groups that exist within organizations (Biancani et al. 2014, Feld 1981, Kleinbaum et al. 2013, Yakubovich and Burg 2014).[1]

Just as relationships exist among individuals in an organization, so a network can be defined based on people's positions within formal and semiformal structure. The networks of formal and semiformal ties differ from the informal social network in that the former are independent of the individuals occupying those particular positions (McEvily et al. 2014). Thus, two people working in the same formal subunit—for example, the same department—can be thought of as having a formal network tie that is independent of whatever personal connection they might have. Similarly, the closer two individuals are to each other in semiformal structure—based on the extent to which they participate together on many project teams, task forces, employee groups, and so forth—the more we can think of them as having a semiformal network tie. Finally, people who do not have a formal or semiformal tie to one another but nevertheless have an interpersonal relationship can be thought of as having an informal network tie.

Whereas informal network ties are conceptually distinct, formal and semiformal network ties are not mutually exclusive. For example, two people can have both a formal and semiformal network tie if they belong to the same department and also participate on the same project team. In principle, formal and semiformal organization can overlap completely—if all project teams and other employee groups consist only of members from the same formal subunit—or not at all—if all such groups have no two members from the same subunit. In most cases, there is *partial* overlap between formal and semiformal

Figure 1 Types of Intraorganizational Network Contacts
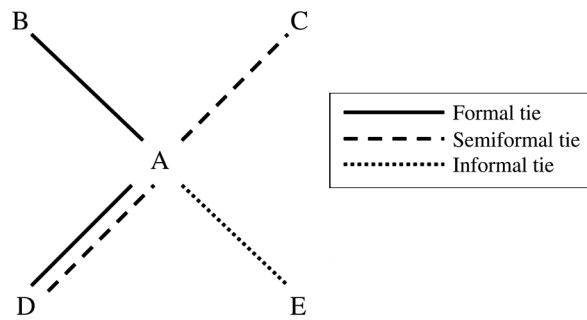
organization, and the conceptual arguments that follow pertain to organizations of this kind. This partial overlap defines three possible configurations of formal and semiformal ties between two colleagues: (1) formal tie with no, or a limited, semiformal component; (2) semiformal tie with no, or a limited, formal component; and (3) tie with significant formal and semiformal components.

Figure 1 provides a schematic representation of these different types of network contacts. The focal actor, A, and B have a formal tie with no, or a limited, semiformal component. A and C have a semiformal tie with no, or a limited, formal component. A and D have a tie with significant formal and semiformal components. Finally, an informal tie exists between A and E, who are not otherwise meaningfully connected in formal or semiformal structure.

2.3. Ambiguity Arising from Periods of Organizational Change

Ambiguity exists whenever a situation spawns multiple, competing interpretations of what is going on and thereby produces a shock of confusion ((Saint-Charles and Mongeau 2009, Weick 1995, Weick et al. 2005). This confusion can arise both because a given person can see multiple ways to interpret a situation and because different people may interpret the same situation differently.

Organizational changes vary in the degree of ambiguity they create for employees. Some organizational changes—for example, the planned retirement of a CEO in an organization with a robust succession plan—are well anticipated, unfold in predictable fashion, and have clear-cut implications for individuals and groups. These changes produce little ambiguity. Other changes can breed high levels of ambiguity: for example, a major restructuring that takes the organization by surprise and involves the unanticipated realignment of organizational subunits and their members; gets implemented in phases in response to changing circumstances; and sends unclear or mixed signals about organizational priorities and internal political dynamics. The arguments that follow pertain to these latter types of organizational change.

Not only do organizational changes vary in the degree of ambiguity they produce, but levels of ambiguity

can also vary considerably across phases of a particular change. For example, in the restructuring example mentioned above, ambiguity is likely to spike soon after the announcement of new formal or semiformal arrangements—for example, the intent to form, dissolve, or combine subunits—when crucial details have yet to be specified. In such a time, people will tend to have conflicting interpretations of what the organizational realignments signal about how the company is changing its strategic direction, how the changes will shift the balance of power among individuals and established coalitions, what new coalitions will form and which ones will fade away, and how the changes will affect the meaning and value of people's work. These questions cannot be resolved by simply acquiring factual information. Instead, they lead people to initiate a process of trying to make sense of the changed circumstances (Gioia and Chittipedi 1991, Weick 1995). In other words, the partial reveal of an organizational change often creates multiple, competing interpretations of the situation, and this ambiguity remains elevated until enough additional details are announced to enable differing perspectives to converge.

Heightened ambiguity leads people to seek contact with others who can help them make sense of what is going on, what it means for them, and how they should respond (Saint-Charles and Mongeau 2009).[2] Ambiguity simultaneously places upward and downward pressure on the diversity of contacts with whom a person seeks interaction (Reagans and McEvily 2003). Ambiguity tends to increase network diversity as people seek interaction with colleagues who have divergent perspectives on a situation and can thereby help them understand, integrate across, and reconcile multiple competing interpretations (Saint-Charles and Mongeau 2009). At the same time, ambiguity tends to decrease network diversity as people seek interaction with familiar and trustworthy colleagues (Krackhardt 1992).

To unpack how the competing forces of ambiguity on network diversity will change communication with formal, semiformal, and informal network contacts, I draw upon a framework proposed by Borgatti and Cross (2003) for assessing the probability that a focal actor will seek out the knowledge and perspectives of another. They propose that this probability is a function of the focal actor: (1) knowing and valuing what the other person knows; and (2) being able to gain access to the other person at limited interpersonal cost—for example, the time or effort needed to have the interaction.

2.4. Communication with Formal Ties That Do Not Have a Significant Semiformal Component

With respect to formal ties that do not have a significant semiformal component (e.g., the tie between A and B in Figure 1), I propose the focal actor, A, will tend to know what B knows but will deem what B knows to be less

valuable during periods of ambiguity relative to times of clarity. This is because, across a variety of empirical settings, formal organization has been shown to be a powerful determinant of communication (Friedkin 1982, Han 1996, Hinds and Kiesler 1995, Lazega and van Duijn 1997). That is, people communicate with much greater frequency within the boundaries defined by formal organization (e.g., departments) than they do outside those boundaries. Frequent communication among individuals promotes uniformity of opinions and perspectives (Friedkin 1993), especially among those who share a common identity such as a departmental affiliation (cf. Liu and Srivastava 2015). Thus, when facing heightened ambiguity, A will perceive less value in what B knows because the latter will tend to have the same, rather than a divergent, perspective on the unfolding situation. This shift in the perceived value of B's knowledge and perspectives will lead A to decrease contact with B.

At the same time, in periods of ambiguity relative to times of clarity, A will have relatively easy access to B but will tend to perceive greater interpersonal cost in interacting with B. Ease of access is facilitated by belonging to the same formal subunit. Meanwhile, costs of interaction arise because of concerns people have about admitting ignorance to colleagues. As Borgatti and Cross (2003, p. 435) write, "Esteem and reputation issues come into play in seeking help from others as we are motivated to maintain positive self-images . . . . One's trust in another is likely to shape the extent to which people are forthcoming about their lack of knowledge." If the tie between A and B has a limited semiformal component, it implies that they have few shared activities and limited experience working together collaboratively on project teams, task forces, and so on. As a result, their relationship is less likely to have a strong foundation of positive affect and trust (Kollock 1994, Podolny 1994). Thus, even with relatively easy access to B, A will tend to perceive greater interpersonal cost in reaching out to B to make sense of an ambiguous organizational change. Taken together, these arguments lead to the following expectation.

HYPOTHESIS 1. *An increase in ambiguity will lead people to decrease communication with formal network contacts that do not have a significant semiformal component to them.*

2.5. Communication with Semiformal Ties That Do Not Have a Significant Formal Component

With respect to semiformal ties that do not have a significant formal component (e.g., the tie between A and C in Figure 1), I propose that—subject to the scope condition that the semiformal structure is relatively stable in comparison to the formal structure—the focal actor, A, will be less likely to know what C knows but will consider what C knows to be more valuable during periods of

ambiguity relative to times of clarity. Because A and C work in different formal subunits, they will be exposed to distinct flows of communication. As a result, they will likely adopt differing perspectives on the same ambiguous situation (Dougherty 1992). Moreover, in times of ambiguity relative to periods of greater clarity, A will place greater value on C's divergent perspectives, which can help A in evaluating and updating his or her own interpretation of the situation. This shift in the perceived value of C's knowledge and perspectives will prompt A to increase contact with C.

Moreover, access and interpersonal cost considerations will, on balance, bolster A's propensity to seek contact with C. That A and C belong to different formal subunits will, all else equal, make it harder for A to gain access to C. Yet if A and C have many shared foci (Feld 1981) in the form of the various groups to which they both belong, they will also tend to have many other opportunities for interaction. Thus, A will be able to overcome access barriers rooted in the formal organizational boundary that separates A from C. Moreover, A will tend to perceive relatively low interpersonal costs in reaching out to C, since their proximity in semiformal structure implies that they have had a history of prior exchange. These prior exchanges promote familiarity and trust (Kollock 1994, Podolny 1994), which allay esteem and reputation concerns that A might have in revealing his or her lack of knowledge to C. Interpersonal trust also promotes the exchange of knowledge between individuals, regardless of the strength of the tie between them (Levin and Cross 2004). Thus, the onset of ambiguity will lead people to not only turn away from formal network ties that do not have a significant semiformal component but, at the same time, turn toward semiformal network ties that do not have a significant formal component. Therefore, I anticipate the following.

HYPOTHESIS 2. *An increase in ambiguity will lead people to increase communication with semiformal network contacts that do not have a significant formal component to them.*

2.6. Communication with Informal Network Contacts in Times of Ambiguity

Next, I propose that the choice to initiate contact with informal network contacts (e.g., the tie between A and E in Figure 1) will be shaped by a similar set of considerations as the choice to interact with semiformal ties that do not have a significant formal component. The focal actor, A, will be less likely to know what E knows because, by definition, A and E work in different formal subunits. Yet A will tend to place greater value on E's perspective in times of ambiguity because it is more likely to diverge from A's own perspective.

At the same time, A can be expected to have ready access to E given that they have forged a relationship in

spite of the fact that they are not connected to each other through formal or semiformal structure. That is, A and E have previously sought each other out and built a relationship even when they have had little work-related reason to do so. Thus, it seems likely that A would be able to call upon E in a period of ambiguity. Moreover, even though they lack a shared history of working together on groups and teams, the informal tie between A and E is likely to have a strong foundation of interpersonal trust and positive affect (Krackhardt and Hanson 1993). A is therefore likely to perceive low interpersonal cost in exposing his or her lack of knowledge to E. Taken together, these arguments suggest the following.

HYPOTHESIS 3. *An increase in ambiguity will lead people to increase communication with informal network contacts.*

2.7. Communication with Ties That Have a Significant Formal and Semiformal Component

Finally, I turn to the case of ties that have a significant formal and semiformal component (i.e., the tie between A and D in Figure 1). I posit that the focal actor, A, will tend to know what D knows (since they are in the same formal subunit) but will consider what D knows to be less valuable during periods of ambiguity relative to times of clarity (because they are embedded in overlapping communication flows and will therefore tend to have the same, rather than differing, perspectives). Thus, knowledge and value considerations will make it less likely that A will reach out to D during times of ambiguity.

On the other hand, A will have ready access to D because they belong to the same formal subunit and are comembers of many of the same groups. In addition, their history of prior exchange in these groups will give them a foundation of trust and positive affect that will lower the interpersonal costs that A will perceive in exposing his or her lack of knowledge to D. The access and cost perspectives, therefore, suggest that A will be more likely to reach out to D when ambiguity increases. In sum, the theoretical arguments run in opposing directions; therefore, it is not possible to make a clear prediction about A's propensity to seek contact with D in ambiguous times. I do not, therefore, propose a hypothesis about ambiguity's effects on ties that have a strong formal and semiformal component.

3. Methods

3.1. Research Setting and Data Collection

A global information services firm (InfoCo) served as the research site for this study. The firm consisted of four large divisions, which were subdivided into departments primarily along functional lines (e.g., marketing, product development, sales). In the years preceding the start of this study, the company had experienced heightened industry competition and stagnant growth. In response, the management team decided to undertake a major organizational restructuring. The restructuring involved the creation of new subunits (e.g., global marketing function); the combination of existing subunits, such as "solution lines" that integrated product development and marketing; and the elimination of certain other subunits and job roles. The broad thrust of the changes—centralization of certain functions, regionalization of others, and downsizing to reduce costs—was largely consistent with the forms of ambiguity-producing restructuring experienced by workers across a wide range of U.S. corporations (Cappelli 2008, Cappelli et al. 1997, Osterman 2000).

To minimize potential disruption from the study and to protect employee privacy and company confidentiality, I agreed to the following: (1) collect network data in the form of email metadata, that is, using messages stripped of all content except for subject lines, (2) restrict the data collection to the intraorganizational communications of the 114 members of the CEO's extended leadership team;[3] and (3) convert identifying information such as email addresses into hashed (irreversibly encrypted) identifiers.

I worked with HR and IT staff to set up an automated system to collect three forms of data about the extended leadership team: (1) weekly email logs; (2) monthly human resource records to identify how people were affected by the restructuring, for example, whether or not they remained employed or moved across departments; and (3) monthly extracts of all active email distribution lists as a window into employees' changing position in semiformal structure. This system was set up soon after the CEO sent an email to all employees hinting that organizational changes were forthcoming but several weeks before the onset of heightened ambiguity. Data collection continued for 40 weeks, well after all of the changes in organizational structure, reporting relationships, and roles had been implemented. Taken together, these data provided a rare, unobtrusive window into network microdynamics in the period before, during, and after a period of heightened ambiguity.

Although people knew that some kind of organizational change was imminent, very few had knowledge of what specific changes were envisioned or how the restructuring would affect them personally. This was true even for most extended leadership team members because the CEO and head of HR had decided to limit knowledge of the impending reorganization to a small circle: the CEO's direct reports and a handful of HR and information technology (IT) staff.

There is good reason to believe that the extended leadership team experienced heightened ambiguity during this restructuring. By the time restructuring concluded, many had been significantly affected by the changes: 43 (37.7%) had a change in supervisor, 15 (13.6%)

moved to a different InfoCo division, and 13 (11.4%) exited the company. Some experienced more than one of these changes, yet most did not know in advance whether and how they would be affected or what these changes would mean for their careers and standing in the organization. Well after the 40-week period of archival data collection, I conducted interviews with 23 people who were either directly affected by or involved in the implementation of the restructuring. These interviews provided strong qualitative support for the assumption that even extended leadership team members experienced high levels of ambiguity during the restructuring. The interviews also indicated variation in the level of ambiguity experienced by more and less senior extended leadership team members. I exploit this variation in analyses reported below to help establish ambiguity's causal role in producing network change.

Archived internal communications and qualitative evidence from the interviews I conducted strongly suggested that the period of greatest ambiguity commenced in week 9. That was when the CEO released the first of several communications, which provided details of the new organizational structure. Additional memos announcing the formation of new subunits, the consolidation of other units, and the appointment and departure of personnel were sent intermittently until week 18. As Figure 2, which contains an excerpt from one of these communications, illustrates, these memos raised more questions than they answered. For example, why were some solution lines being formed before others? Why were certain products being moved into a solution line, whereas others remained separate? Why were certain people selected and others not selected to join the initial solution line team, and what did this signal about their respective career prospects? In sum, week 9 marked the onset of a significant rise in ambiguity.

All changes to the organizational structure had been made, key positions had been filled, and departing employees had all exited by week 18. In other words, much of the ambiguity had been resolved by week 18, though some questions remained, for example, how work processes would be modified in the new structure. Thus, as Figure 3 indicates, weeks 9 through 18 corresponded to the period of greatest ambiguity. In the analyses that follow, I use this period as a quasi-exogenous shock to identify the effects of heightened ambiguity on changes in formal, semiformal, and informal networks.

3.2. Data Structure and Variables

Because some of the measures (described below) were inherently relational, I constructed the data at the level of dyads (Mizruchi and Marquis 2006). The dependent variable was a time-varying count of one-to-one messages sent in a given week from a focal actor i to a colleague j, where j was also an extended leadership team member. I focused on one-to-one messages, rather than all messages, for three reasons. First, this restriction eliminated mass emails, which are less likely to reflect people's deliberative choices to seek contact with colleagues in response to ambiguity. Second, sensitive communications about the restructuring were more likely to occur in one-to-one messages than in messages sent to multiple recipients. Although the most sensitive communications likely took place in face-to-face interactions, past research indicates a strong correspondence between emails sent to a small number of recipients and face-to-face communication (Kleinbaum et al. 2008). Finally, the measure of semiformal networks (described below) was based on colleagues' comembership on email distribution lists. By using one-to-one messages, I eliminated all communications sent to distribution lists and thereby kept the two measures empirically distinct from one

Figure 2   Sample Ambiguity-Producing Communication Message

"You'll recall that in December [our CEO] announced the formation of the new Global Solution Line organization; he noted that his direct reports would commence working on the organization structure for their respective teams."

"We've already made great progress launching one of the first global Solution Lines, [Name]."

"Here is a brief overview of the [Name] Solution Line top line structure:
*- [List of sub-units]*
- [List of sub-unit leaders where identified]
- [List of open positions to be filled]"

"I am very excited about our growth opportunities at [Name of Solution Line] and look forward to working collaboratively with all of you across many markets and geographies in order to seize opportunities and leverage our assets and resources."

"Please join me in congratulating the leadership team in their new assignments and supporting the entire [Name of Solution Line] team for continued success.
Each [Name of Solution Line] leader will announce his or her team over the next few weeks."

Figure 3   Restructuring Time Line
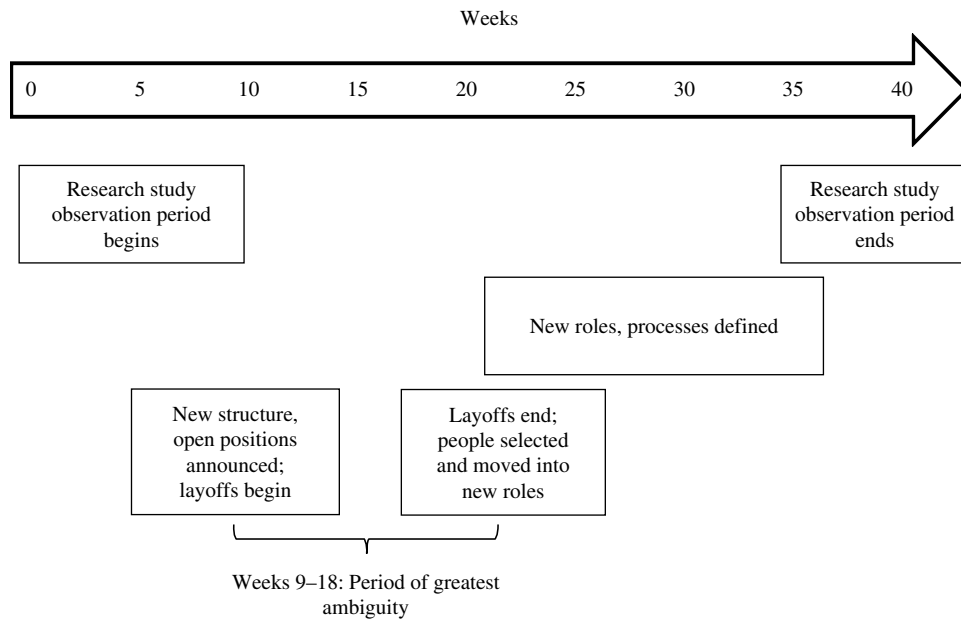
another. Because the email logs included subject lines, I was able to identify and remove messages—for example, those containing "Out of Office" in the subject line—that appeared to be sent automatically rather than through purposive choices. Subject lines also enabled me to identify scheduling-related communication (i.e., messages with terms such as "Invited:," "Accepted:," "Declined:," and "Tentative:" in the subject line), because people's calendars in this organization were linked to the email system. These messages were indicative of face-to-face communication, albeit only that occurring in formally scheduled meetings, and served as the basis of a robustness check described below.[4]

Within InfoCo, people belonged to a few large divisions, within which were included multiple departments. To identify network contacts with a strong formal component to the relationship, I defined a time-varying indicator variable, *Formal Tie*, which was set to 1 when i and j belonged to the same department.

To identify semiformal network contacts—those defined by shared affiliations outside the formal structure such as standing committees, task forces, advisory teams, and interest groups—I relied on the complete roster of email distribution lists active in a given period.[5] Widely used across organizational settings, distribution lists reflect the myriad affiliations employees share with one another. These affiliations connect individuals within semiformal structure (Feld 1981, Biancani et al. 2014). Yet most organizations—including InfoCo—do not have visibility into, and lack the resources to actively track, all time-varying activities and shared affiliations that exist among employees.

Prior research attempting to identify semiformal affiliations among people using email data has assumed that,

when two people receive the same mass email, they also have a semiformal affiliation (Kleinbaum et al. 2013). In effect, this approach infers the existence of an email distribution list based on messages exchanged. By contrast, I had direct access to distribution lists and could more precisely determine when two people belonged to the same list and thus had a shared affiliation. Whereas organization charts represent formal structure and network maps trace informal structure, I propose that distribution lists can provide a powerful window into semiformal structure.

I defined the measure, *Semiformal Tie*, in two steps. First, I generated a count in week t of the lists shared by i and j, divided by the sum of the lists i belonged to and the sum of lists j belonged to. Formally, this time-varying measure, which could theoretically range from 0 (for dyads with no shared distribution lists) to 0.5 (for dyads with fully overlapping distribution lists), was defined as follows:[6]

$$Semiformal\ Affiliations_{i,j,t} = \frac{\sum_k s_{i,j}}{\sum_k m_i + \sum_k m_j},$$

where i, j index members of the dyad, k indexes distribution lists active in a given week, t indexes weeks,

$s_{i,j} = 1$ if i and j both belong to list k, 0 otherwise;
$m_i = 1$ if i belongs to list k, 0 otherwise;
$m_j = 1$ if j belongs to list k, 0 otherwise.

Second, to identify relationships with an especially strong semiformal component, I created an indicator variable, *Semiformal Tie*, which was set to 1 for dyads that were above the mean in a given week in *Semiformal Affiliations*.

To identify relationships with an especially strong informal component, I undertook the following steps. First, I focused only on the first three weeks of data (weeks 1–3), before the period of greatest ambiguity commenced. Second, I defined an indicator variable, *Informal Tie*, which was set to 1 for dyads that (1) did not have a significant formal tie (i.e., the *Formal Tie* variable described above was set to 0); (2) did not have a strong semiformal tie (i.e., the *Semiformal Tie* variable above was set to 0); and (3) nevertheless had contact with one another in weeks 1, 2, or 3. This approach ensured no overlap between informal ties and the other two types of ties. Finally, because I used weeks 1–3 to define the informal tie variable, I excluded these weeks from all analyses in which I used this variable. This helped to ensure that the *Informal Tie* variable was not mechanically related to the dependent variable in models using this variable.

As noted above, the period of heightened ambiguity corresponded to weeks 9 through 18. To identify the effects of ambiguity on network change, I first created an indicator variable, *Ambiguity*, which was set to 1 in those weeks (9–18). I then identified the effects of ambiguity on communication between formal, semiformal, and informal network contacts using the following interaction terms—*Ambiguity × Formal Tie*, *Ambiguity × Semiformal Tie*, and *Ambiguity × Informal Tie*.

Because Hypotheses 1 and 2 are about the effects of ambiguity on communication with formal ties that do not have a significant semiformal component and the effects of ambiguity on communication with semiformal ties that do not have a significant formal component, the models that test these hypotheses include the three-way interaction term, *Ambiguity × Formal Tie × Semiformal Tie*, and all relevant main effects and two-way interaction terms. In the presence of the three-way interaction term, *Ambiguity × Formal Tie* provides the test for Hypothesis 1 because it represents the effects of ambiguity on communication with formal ties that do not have a significant semiformal component (i.e., *Semiformal Tie* is set to 0). Similarly, in the presence of the three-way interaction term, *Ambiguity × Semiformal Tie* provides the test for Hypothesis 2 because it represents the effects of ambiguity on communication with semiformal ties that do not have a significant formal component (i.e., *Formal Tie* is set to 0). Finally, because informal ties are defined such that they do not overlap with either formal or semiformal ties, there is no need to consider three-way interactions for the test of Hypothesis 3. Rather, Hypothesis 3 is tested using the two-way interaction term, *Ambiguity × Informal Tie*.

To account for unobserved individual differences that can color people's responses to uncertainty and ambiguity (Webster and Kruglanski 1994) or their propensity to form ties within or outside their subunit (Lomi et al. 2014, Srivastava and Banaji 2011), I estimated models with sender and receiver fixed effects. These models also implicitly controlled for other time-invariant individual-level attributes such as gender, ethnicity, educational background, prior work experience, and unobserved ability. In addition, because network interactions are heavily influenced by propinquity and homophily (McPherson et al. 2001), I included dyad-level controls: *Same Location*, which was set to 1 when *i* and *j* worked in the same floor of the same building, *Same Division*, and *Same Gender*.[7]

Finally, to assess variation in the experience of ambiguity, I took advantage of the fact that the extended leadership team, though consisting of senior employees, was still heterogeneous in hierarchical rank. InfoCo had three executive-level salary bands that represented the senior-most employees. Approximately 9% of the extended leadership team was below this executive rank. I created an indicator, *Lower Rank*, which was set to 1 for these individuals.

3.3. Estimation

I estimated ordinary least squares regressions with sender and receiver fixed effects of messages sent in a given week between all dyadic pairs on the covariates described above. Comparable results were obtained using the Poisson quasimaximum likelihood estimator (Wooldridge 1997). Because interaction effects are less easily interpreted in nonlinear models, however, I opted to report results from the ordinary least squares regressions.

Regression analyses of dyad-level data must contend with the clustering, or nonindependence, of observations. The error terms in such models will be correlated across observations—a problem referred to as network autocorrelation. The failure to account for clustering can lead to underestimated standard errors and over-rejection of hypothesis tests. Following prior practice, I addressed this issue by estimating models with sender and receiver fixed effects. Including these fixed effect terms shifts the potentially autocorrelated disturbances out of the error term (Mizruchi 1989, Reagans and McEvily 2003). Comparable results were obtained when I used an alternative approach to accounting for clustering.[8]

4. Results

4.1. Descriptive Statistics

Table 1 provides descriptive statistics and a correlation matrix. Given the focus on one-to-one messages, the communication matrix was sparse, with 0.17 messages sent on average between dyads. Only 3% of dyads were in the same location, whereas 41% were in the same division. A quarter of the dyads were at the same salary grade, suggesting variation in hierarchical rank within the extended leadership team. The number of messages sent was positively correlated with *Same Location* and *Same Division*. People were also most apt to send

Table 1   Descriptive Statistics and Correlation Matrix

	Mean	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) *Sent*	0.16	1.21	1.00											
(2) *Same Location*	0.03	0.17	0.12	1.00										
(3) *Same Salary Grade*	0.25	0.43	0.00	−0.02	1.00									
(4) *Same Gender*	0.55	0.50	0.01	−0.02	0.02	1.00								
(5) *Same Division*	0.41	0.49	0.09	0.10	0.04	0.04	1.00							
(6) *Formal Tie*	0.05	0.22	0.30	0.17	0.08	0.01	0.18	1.00						
(7) *Semiformal Tie*	0.43	0.50	0.10	0.18	0.06	0.01	0.23	0.17	1.00					
(8) *Informal Tie*	0.03	0.16	0.04	−0.03	0.00	0.03	0.03	−0.02	−0.10	1.00				
(9) *Ambiguity*	0.30	0.46	0.00	0.00	−0.00	0.01	0.03	0.00	−0.07	−0.00	1.00			
(10) *Ambiguity × Formal Tie*	0.02	0.12	0.15	0.09	0.04	0.01	0.09	0.54	0.08	−0.02	0.19	1.00		
(11) *Ambiguity × Semiformal Tie*	0.11	0.32	0.05	0.08	0.02	0.01	0.12	0.09	0.41	−0.06	0.55	0.26	1.00	
(12) *Ambiguity × Informal Tie*	0.01	0.09	0.02	−0.02	0.00	0.02	0.02	−0.02	−0.08	0.54	0.14	−0.01	−0.03	1.00

Notes. $N = 433,598$. Weeks 1–3 are excluded because those weeks were used to derive the *Informal Tie* variable.

messages to those with whom they shared a formal, semiformal, or informal tie.

4.2.   Hypothesis Tests

Table 2 reports results of the regression models used to test the three hypotheses. Model 1 is the baseline. Consistent with prior research (Han 1996, Hinds and Kiesler 1995), the formal and semiformal organizational structure serves to channel internal network communication: *Same Location*, *Same Division*, *Formal Tie*, and *Semiformal Tie* all have positive and significant coefficients. Surprisingly, *Same Salary Grade* has a significant and negative coefficient, perhaps reflecting the coordination of efforts across hierarchical rank within the extended leadership team. The main effect of *Ambiguity* is not significant.

Model 2 adds the interaction term, *Ambiguity × Formal Tie*, which is negative and significant. In other words, ambiguity led to a slight decrease in messages sent to colleagues in the same department—though it remains unclear from this model whether this effect varied based on the semiformal tie that existed with these colleagues. Model 3 instead adds the interaction term, *Ambiguity × Semiformal Tie*, which is positive but not significant. Note that *Semiformal Tie* and its interaction with *Ambiguity* in this model do not distinguish between semiformal ties among colleagues with a formal tie and semiformal ties among colleagues with no formal tie. The subsequent model decomposes the two.

Model 4 introduces the three-way interaction term, *Ambiguity × Formal Tie × Semiformal Tie*, and all relevant main effects and two-way interaction terms and thereby enables a test of Hypotheses 1 and 2. As noted above, in the presence of the three-way interaction term, the variable *Ambiguity × Formal Tie* represents the effects of ambiguity on communication with formal ties that have no, or a limited, semiformal component. This coefficient is negative and significant, lending support for Hypothesis 1. The predicted number of messages sent to ties that have a formal component but not a semiformal component is 22% lower in the

period of heightened ambiguity. Meanwhile, the variable *Ambiguity × Semiformal Tie* represents the effects of ambiguity on communication with semiformal ties that have no, or a limited, formal component. This coefficient is positive and significant, lending support for Hypothesis 2. The predicted number of messages sent to ties that have a significant semiformal component but no, or a limited, formal component is 21% greater in the period of heightened ambiguity than in the period of relative clarity. The three-way interaction term, *Ambiguity × Formal Tie × Semiformal Tie*, was slightly positive but not significant—consistent with the notion that ambiguity exerts countervailing forces on the tendency to interact with network ties that have both a formal and semiformal component.

Model 5 provides the test of Hypothesis 3: an increase in ambiguity will lead to a corresponding increase in communication with informal ties. In support of Hypothesis 3, the term *Ambiguity × Informal Tie* is positive and significant.

Whereas the models in Table 2 implicitly assume that everyone experienced comparable levels of ambiguity in weeks 9 through 18, the models in Table 3 account for variation in perceived ambiguity. They rest on the assumption that leadership team members who were not in the executive ranks likely experienced greater ambiguity than did executive members of the leadership team. If this were true, then we would expect ambiguity to have a greater effect on the communication behavior of these lower-ranking employees. Model 6 includes the four-way interaction term, *Ambiguity × Formal Tie × Semiformal Tie × Lower Rank*, and all relevant main effects and lower-order interaction terms. In this model, *Ambiguity × Formal Tie*, represents, for senders of higher rank, the effects of ambiguity on communication with formal ties that do not have a significant semiformal component. This coefficient is negative but not significant. By contrast, the three-way interaction term, *Ambiguity × Formal Tie × Lower Rank* represents, for senders of lower rank, the change relative to senders of higher rank in the effects of ambiguity

Table 2 Ordinary Least Squares Regressions of Messages Sent on Covariates, with Sender/Receiver Fixed Effects

	Model 1	Model 2	Model 3	Model 4	Model 5
Same Location	0.456***	0.457***	0.456***	0.428***	0.463***
	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)
Same Salary Grade	−0.060***	−0.061***	−0.060***	−0.068***	−0.063***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Same Gender	0.048***	0.048***	0.048***	0.048***	0.049***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Same Division	0.081***	0.079***	0.081***	0.079***	0.073***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Formal Tie	1.547***	1.618***	1.547***	1.121***	1.511***
	(0.029)	(0.035)	(0.029)	(0.063)	(0.028)
Semiformal Tie	0.078***	0.079***	0.076***	0.050***	0.086***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Informal Tie					0.235***
					(0.016)
Ambiguity	0.004	0.018***	0.001	0.007**	0.011**
	(0.004)	(0.002)	(0.003)	(0.002)	(0.004)
Ambiguity × Formal Tie		−0.255***		−0.249**	
		(0.058)		(0.093)	
Ambiguity × Semiformal Tie			0.007	0.023***	
			(0.009)	(0.006)	
Formal Tie × Semiformal Tie				0.643***	
				(0.075)	
Ambiguity × Formal Tie × Semiformal Tie				0.020	
				(0.116)	
Ambiguity × Informal Tie					0.075*
					(0.035)
Sender fixed effects	Yes	Yes	Yes	Yes	Yes
Receiver fixed effects	Yes	Yes	Yes	Yes	Yes
Constant	−0.110***	−0.113***	−0.109***	−0.073***	−0.115***
	(0.019)	(0.019)	(0.019)	(0.018)	(0.019)
F	38.5	38.4	38.4	38.8	37.7
Prob > *F*	0.000	0.000	0.000	0.000	0.000
R²	0.111	0.112	0.111	0.114	0.118
N	472,244	472,244	472,244	472,244	433,598

Notes. Weeks 1–3 are excluded from Model 5 because those weeks were used to derive the *Informal Tie* variable. Robust standard errors. Two-tailed tests.

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

on communication with formal ties that do not have a significant semiformal component. This coefficient is negative and significant. In other words, the period of heightened ambiguity led to sharper decreases in communication with formal ties for lower-ranking employees (who presumably experienced especially high levels of ambiguity) than for higher-ranking employees.

Similarly, in Model 6, the interaction term *Ambiguity × Semiformal Tie* represents, for senders of higher rank, the effects of ambiguity on communication with semiformal ties that do not have a formal component. This coefficient is positive and significant. The three-way interaction term, *Ambiguity × Semiformal Tie × Lower Rank* represents, for senders of lower rank, the change relative to senders of higher rank in the effects of ambiguity on communication with semiformal ties that do not have a formal component. This coefficient is positive and significant. In other words, the period of ambiguity led to sharper increases in communication with

semiformal ties for lower-ranking employees than for higher-ranking employees. Finally, in Model 7, the term *Ambiguity × Informal Tie* represents, for higher-ranking employees, the effects of ambiguity on communication with informal ties. This coefficient is positive and significant. The term *Ambiguity × Informal Tie × Lower Rank* indicates the change relative to senders of higher rank in the effects of ambiguity on communication with informal ties. This coefficient is not significant, suggesting no difference in the tendency across ranks to increase communication with informal ties during uncertainty. Together, these models help to establish the causal role of ambiguity in producing network change: those who likely experienced greater ambiguity had more pronounced shifts in communication with formal and semiformal network contacts.[9] There was, however, no discernible difference between ranks in communication shifts with informal network contacts during heightened ambiguity.

Table 3 Ordinary Least Squares Regressions of Messages Sent on Covariates, with Sender/Receiver Fixed Effects—*Assessing Variation in Ambiguity Based on Hierarchical Rank*

	Model 6	Model 7
Same Location	0.427***	0.463***
	(0.028)	(0.028)
Same Salary Grade	−0.067***	−0.062***
	(0.005)	(0.005)
Same Gender	0.048***	0.049***
	(0.004)	(0.004)
Same Division	0.079***	0.073***
	(0.005)	(0.005)
Formal Tie	1.145***	1.511***
	(0.068)	(0.028)
Semiformal Tie	0.049***	0.086***
	(0.004)	(0.004)
Ambiguity	0.008***	0.012**
	(0.002)	(0.004)
Ambiguity × Formal Tie	−0.175	
	(0.104)	
Ambiguity × Semiformal Tie	0.019***	
	(0.006)	
Formal Tie × Semiformal Tie	0.615***	
	(0.081)	
Ambiguity × Formal Tie × Semiformal Tie	−0.038	
	(0.127)	
Lower Rank	0.021	0.010
	(0.012)	(0.013)
Formal Tie × Lower Rank	−0.153	
	(0.173)	
Semiformal Tie × Lower Rank	0.026	
	(0.014)	
Ambiguity × Lower Rank	−0.009	−0.012
	(0.008)	(0.010)
Ambiguity × Formal Tie × Lower Rank	−0.526**	
	(0.202)	
Ambiguity × Semiformal Tie × Lower Rank	0.090*	
	(0.039)	
Formal Tie × Semiformal Tie × Lower Rank	0.221	
	(0.236)	
Ambiguity × Formal Tie × Semiformal Tie × Lower Rank	0.158	
	(0.349)	
Informal Tie		0.229***
		(0.017)
Ambiguity × Informal Tie		0.076*
		(0.035)
Informal Tie × Lower Rank		0.056
		(0.071)
Ambiguity × Informal Tie × Lower Rank		−0.010
		(0.157)
Sender fixed effects	Yes	Yes
Receiver fixed effects	Yes	Yes
Constant	−0.074***	−0.115***
	(0.018)	(0.019)
F	37.8	37.0
Prob > *F*	0.000	0.000
R^2	0.114	0.118
N	472,244	433,598

Notes. Weeks 1–3 are excluded from Model 7 because those weeks were used to derive the *Informal Tie* variable. Robust standard errors. Two-tailed tests.

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

4.3. Robustness Checks

Although email logs have certain advantages as a data source—for example, they can be collected unobtrusively and, unlike traditional network surveys, do not suffer from recall bias (Marsden 2011)—they only represent one form of communication that occurs among network contacts. Indeed, it seems likely that the most sensitive communications about restructuring occurred in phone or face-to-face interactions rather than over email. Because I had access not only to email metadata but also to subject lines, I was, however, able to identify the subset of messages (approximately 12%) that were about scheduling meetings. Under the assumption that scheduling communication is indicative of phone or face-to-face interaction, I reestimated all models on this subset of messages.[10] Though the data were considerably thinner, the results are remarkably consistent for Hypothesis 1. When Table 2, Model 4 is estimated using only scheduling communications, the coefficient for *Ambiguity × Formal Ties* is negative and significant. *Ambiguity × Semiformal Ties* is of the expected sign (positive) but is not significant. Similarly, when Table 2, Model 5 is estimated using only scheduling communications, the coefficient for *Ambiguity × Informal Ties* is not significant, but these are also the interactions that are most likely to occur through unscheduled meetings. Together, these models partly mitigate concerns that ambiguity's effects on communication were somehow different in phone or face-to-face communication than over email—though they cannot speak to how unscheduled communications might have been affected.

I also conducted a supplemental analysis to help rule out a possible alternative explanation for these findings. It is possible that changes in communication were not a response to ambiguity but rather a reflection of role transitions and shifting task interdependencies. For example, if a person were moving from one subunit to another, there would be a period of transition as she completed prior assignments and ramped up in her new job role. Similarly, if she were moving from one work group to another, there would be a period of adjustment from one group to the other. To account for these shifts, all models were reestimated using lagged and leading measures of formal and semiformal ties. Including these covariates produced comparable results. Thus, there was little support for an alternative explanation based on role transitions and shifting task interdependencies.

5. Discussion

The goal of this article has been to illuminate how intraorganizational networks change in response to ambiguity, such as that arising from restructuring or other significant organizational change. I theorized that, when facing heightened ambiguity, people will tend to (1) decrease communication with formal network ties

that do not have a significant semiformal component, (2) increase communication with semiformal network ties that do not have a significant formal component, and (3) increase communication with informal network ties. Empirical support for these propositions comes from unique data—including 40 weeks of archived email metadata, the full roster of email distribution lists, personnel records, and qualitative interviews—that span the period before, during, and after a period of heightened ambiguity at a large information services firm. Supplemental analyses reveal that the first two effects were more pronounced for lower-ranking employees, who presumably experienced greater ambiguity than did those in the executive ranks.

5.1. Contributions

This study makes a number of noteworthy contributions to theory and practice. First, it contributes to our understanding of the interplay of formal and semiformal structure (Biancani et al. 2014, Kleinbaum et al. 2013, Soda and Zaheer 2012). It suggests that the degree and nature of overlap between formal and semiformal structure can importantly shape whom a person chooses to interact with during a period of ambiguity. Two people who are strongly tied in formal structure but not in semiformal structure will tend to diminish contact with each other in ambiguous times. By contrast, two people who are weakly tied in formal structure but strongly connected through semiformal structure will tend to increase contact with each other when facing ambiguity. In a sense, semiformal network ties that do not have a significant formal component have similar qualities to "trusted weak ties" (Levin and Cross 2004, p. 1486). On one hand, they are sources of valuable, nonredundant knowledge and perspectives. On the other hand, they have a strong foundation of trust that mitigates the interpersonal costs of exposing one's lack of knowledge to another. Like trusted weak ties, semiformal network ties that lack a strong formal component may serve as important conduits for the flow of knowledge and perspectives in organizations, particularly during times of ambiguity-producing change.

Second, the study challenges the assumption of relational inertia that is implicit in prior work on the microdynamics of organizational change. For example, Allatta and Singh (2011, p. 1111) conclude in an email study of post-merger integration that "worker routines are slow to change even when a transformative event such as an acquisition occurs." Yet their data were collected in four-month intervals. Whereas their choice of time intervals may have been appropriate for a study of organizational routines, it may also have masked periods of significant fluctuation in network communication that could only be detected in a more granular analysis of the change process. Similarly, Shah (2000) reports results of a study that examines how the survivors of a layoff fare when

their network contacts lose their jobs. The study relies on a retrospective survey, which implicitly assumes stability in social relations during the layoff period. Insofar as those individuals experienced ambiguity during layoffs, the present study suggests that these individuals may have mobilized social resources from different contacts than they would have turned to in times of greater clarity. These unobserved mobilized resources could, in turn, have influenced employee attitudes and outcomes in ways that could not be detected through a retrospective survey.

Next, the present investigation informs the burgeoning literature on social capital activation (Mariotti and Delbridge 2012, Menon and Smith 2014, Smith 2005). For example, Smith et al. (2012) use both survey data and a laboratory experiment to show that, under conditions of job threat, high-status individuals cognitively activate (or recall) a larger and less constrained subsection of their network than do low-status individuals. They argue that the cognitive activation of network contacts is an important precursor to the subsequent mobilization of those relationships and that, as a consequence, low-status individuals may have poorer access to valuable information and perspectives than high-status individuals. The present study reports results that complicate this account. Insofar as organizational rank can be thought of as a measure of status (e.g., Astley and Sachdeva 1984) and email communication a form of network mobilization, the lower-status members of InfoCo's extended leadership team exhibited a stronger tendency to mobilize broader networks (i.e., outside their department) than did higher-status members. To the extent that these results generalize to other settings and employee groups, it may suggest the need to account for the possibility that the types of contacts that people recall in response to a situational prime might differ from the contacts they actually interact with and the resources they mobilize—at least in organizational settings during times of ambiguity.

The study also makes a methodological contribution to organizational research by illustrating a novel application of email distribution lists, which are nearly ubiquitous in organizations but have only started to be used as a tool for locating people within an organization's social structure (Liu et al. 2015). I demonstrate how distribution lists can yield a measure of people's changing positions in semiformal structure and suggest how researchers with access to list names can refine this measure in future work. This data source would appear to have broad applicability in organizational research.

Finally, these findings have implications for management practice. Whereas prevailing wisdom about effective communication during restructuring emphasizes the importance of timely and carefully coordinated messaging through formal structure (Herzig and Jimmieson 2006, Klein 1996), this study casts doubt on

the appropriateness of this protocol. Organizational leaders who rely on the formal structure to communicate about a restructuring may be swimming upstream, given that the ambiguity of restructuring can lead people to decrease in communication within their formal subunits. Instead, leaders may gain more traction by communicating through the groups that constitute semiformal structure.

5.2. Limitations and Directions for Future Research

This study has certain limitations, which point to avenues for future research. First, because of privacy and confidentiality concerns, I did not have access to email content and therefore could only draw indirect inferences about why communication patterns changed during restructuring. In particular, it was not possible with these data to fully disentangle the different mechanisms that could have produced these results. Future studies could profitably use content analysis techniques that can discern broad patterns in email data—for example, the use of words associated with information or perspective seeking—while still preserving anonymity and privacy (Aral and Van Alstyne 2011, Goldberg et al. 2015). Experimental studies in organizational settings can also help to disentangle the mechanisms that underpin network interaction choices (Srivastava 2015).

Second, the analyses were all conducted at the relational, or dyadic, level but could not account for the role of the broader structure in which network ties are embedded. Thus, it was not possible to identify whether people were apt to reach out to particular boundary-spanning ties—for example Simmelian ties (Tortoriello and Krackhardt 2010)—or how structural and relational factors might have jointly shaped interaction choices (Reagans and McEvily 2003). Access to a broader data set—for example, an entire division or business unit—would allow for more nuanced, structural extensions of the theory developed in this paper.

Third, because this study was based on the communication patterns of a senior group of employees in a single restructuring organization, the question of generalizability naturally arises. On one hand, this empirical setting may have afforded a conservative test of the predictions, given that InfoCo's extended leadership team likely experienced less ambiguity than a typical rank-and-file employee in a restructuring organization. On the other hand, certain aspects of this restructuring were likely idiosyncratic to the leadership of this CEO (e.g., limiting knowledge of impending changes to a small circle), and these patterns are only expected to hold when certain scope conditions hold (e.g., the changes are unanticipated by many people and have unclear implications for their careers).

Finally, this study relied on an admittedly incomplete indicator of communication (email exchanges, including the subset related to meeting scheduling) and imperfect proxies for semiformal structure (distribution list comemberships) and informal relationships (based on email exchanges in the first three weeks of analysis). Future research could improve upon this design by collecting archival records of broader forms of communication (e.g., phone and text message logs) and by collating direct, time-varying records of work and nonwork group lists in organizations where they are tracked.

6. Conclusion

In sum, this study underscores the value of examining the dynamic interplay of formal, semiformal, and informal structure. It also highlights the need to examine the microdynamics of organizational change, including the perturbations to intraorganizational networks that arise when the forces of ambiguity intersect with different facets of organizational structure.

Endnotes

[1]My definition of semiformal organization differs slightly from that of Biancani et al. (2014) in that I leave open the possibility that semiformal affiliations (e.g., project teams that span formal subunits) can sometimes be strongly encouraged or mandated and are not always voluntary.

[2]Ambiguity—for example, that arising from organizational restructuring—is sometimes accompanied by feelings of threat—for example, potential job loss. Though ambiguity tends to promote interpersonal contact, threatening situations can lead people to constrict information processing and thereby reduce contact with others (Staw et al. 1981). Therefore, I do not theorize about the effects of ambiguity on the volume of interpersonal communication. Rather, the arguments that follow focus on ambiguity's effects on the types of network contacts with whom a person chooses to interact. See Schilling (2015) for a parallel set of arguments about sensemaking and ambiguity at the interorganizational level.

[3]The extended leadership team consisted of the top management team (i.e., the CEO and his direct reports), the direct

reports to the CEO's direct reports, and a range of others at lower organizational ranks who were deemed essential to implementing the company's strategy.

[4]At the time these data were collected, it was not common for people in this organization to use personal email accounts to communicate with work colleagues. Moreover, emails sent through personal digital assistants were routed through the same servers as those sent from desktops and laptops.

[5]Distribution lists can, of course, correspond to elements of formal organization—for example, lists representing all members of a department or all direct reports of a supervisor—and informal relationships—for example, lists set up by groups of friends to ease communication with one another. With access to distribution list names, the researcher could cull such lists and focus just on those defined by semiformal structure. In this study, I could not do so because the company only provided encrypted list names. Despite the limitation of not being able to identify list names, there are at least three reasons to believe that the lists in use at this company were primarily related to semiformal structure. First, in a representative week, there were over 2,300 active lists. By contrast, there were only a handful of formal subunits in this organization. Thus, lists defined by formal structure were likely to have been mere noise to the signal of semiformal structure. Second, I am aware of only one other study that used email distribution lists as a data source and in which list names were known to the researchers (Liu et al. 2015). In that organization (the research arm of a biotechnology firm), only about 10% of the lists appeared to be purely social (e.g., the running club). Insofar as this pattern generalizes across settings, lists based on informal ties also likely constituted a relatively small share of the ones active at InfoCo. Finally, my interviews at InfoCo suggested that lists were primarily established to aid communication in work groups and project teams. For example, one interviewee reported, "I tend to use email distribution lists for very specific project-related activity. People have gotten so weary of email that we've had a push to narrow distribution lists to work-related projects that are active at a given point in time." Taken together, these facts support the use of distribution lists as a proxy for the semiformal affiliations that existed between each pair of actors.

[6]I also used a variant of this measure in which list comemberships were weighted by list size. Assuming that lists defined by formal structure—for example, ones representing all employees in a large department—were larger than those defined by semiformal structure, this alternative measure should further dampen the noise created by such lists. Using this alternative measure produced comparable results to those in the main tables.

[7]I also considered other dyad-level controls such as *Same Age*, *Same Ethnicity*, and *Same Entering Cohort* (based on the year in which i and j were hired). Because none was a significant covariate and the results of interest were materially unchanged with their inclusion, I did not include these variables in the reported analyses.

[8]The alternative approach involved using a variance estimator that enables cluster-robust inference and accounts for autocorrelation by clustering in two dimensions (by sender and by receiver) (Cameron et al. 2011, Dahlander and McFarland 2013, Kleinbaum et al. 2013). Because the two approaches yielded similar results, I report results from models with sender and receiver fixed effects, which accounted for both network autocorrelation and unobserved heterogeneity. I thank an anonymous reviewer for recommending this approach. Finally, I also considered but decided against another alternative: stochastic actor-based models of the kind estimated using the software program SIENA. These models assume a dichotomous dependent variable and are therefore not appropriate for this data structure (Snijders et al. 2010).

[9]Note, however, that these effects were estimated off a small sample ($\sim$10) of lower-ranking employees.

[10]Results of all robustness checks are available upon request.

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