

**SECONDHAND SOCIAL CAPITAL: BOUNDARY SPANNING, SECONDHAND
CLOSURE, AND INDIVIDUAL PERFORMANCE**

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Abstract

We move beyond the performance returns of individuals' direct network connections to study the effects of "secondhand" social capital, i.e., from the networks of one's contacts. We propose that certain colleagues may be more valuable to one's job performance than others when their spillovers of novel information combine with spillovers of the cooperation needed to obtain that novelty. In a study of 1,273 engineers across 16 business units, we find that the most benefit to one's own performance comes from having ties that span business units and that also include secondhand closure (i.e., where one's contacts are each embedded in a constrained, dense network). Bridging the organizational boundary provides the novelty; and secondhand closure provides the cooperation. Further, by examining who in the network is constraining these contacts, we are able to trace their cooperative motivation both to reputational and organizational identity concerns, which each create a spillover of cooperation toward the focal individual, who reaps the returns.

Keywords

social networks; knowledge transfer; boundary spanning; work performance; help seeking; secondhand social capital; secondhand closure

Network research emphasizes the benefits and detriments associated with people's involvement in workplace relationships (Brass, Galaskeiweicz, Greve, & Tsai, 2004; Burt, Kilduff & Tasselli, 2013). These connections facilitate the transfer of work-related knowledge and resources. Theorizing by network scholars largely centers on how direct connections to others can generate career advantages, including higher job performance (e.g., Ahuja, Galletta, & Carley, 2003; Mehra, Kilduff, & Brass, 2001; Sparrowe, Liden, Wayne, & Kraimer, 2001), and thereby serve as a source of social capital (Burt, 2000). Beyond direct connections, the literature has explained that third parties influence knowledge sharing. Third parties enhance the novelty of shared knowledge due to the lack of connections among one's direct contacts (i.e., brokerage) (Burt, 1992; Granovetter, 1973; Rodan, 2010) or enhance cooperation to share knowledge through the presence of connections among one's direct contacts (i.e., closure) (Baker, 1984; Burt, 2005; Coleman, 1990; Granovetter, 1985). Thus, the literature offers well-researched explanations for how an individual's "firsthand" network, i.e., the degree and structure of connections among one's direct contacts, provides the social capital to benefit his or her own performance.

However, it remains less clear whether or how an individual's "secondhand" network, i.e., one's *contacts'* networks, may create value for one's own performance. To be sure, research on network centrality has incorporated to some extent the value in contacts' network configurations, in the form of betweenness, closeness, or eigenvector centrality (Bonacich, 1987). However, such research typically combines the impact of firsthand and secondhand (and thirdhand and so on) networks, making it difficult to see what impact, if any, a secondhand network has on performance. What little literature has focused on secondhand networks in particular has yielded ambiguous conclusions (Burt, 2007; 2010; Cummings & Cross, 2003). Specifically, this research demonstrates that secondhand brokerage, i.e., where each contact is

situated in an unconstrained, sparse network sometimes seems to matter and other times not. For instance, some research shows that contacts' seniority in the organization relative to the focal individual influences whether contacts' networks will produce beneficial spillovers of novel knowledge (Galunic, Ertug, & Gargiulo, 2012), because senior contacts who act as brokers can share access to influence and expertise that may be unreachable without these relationships (Sparrowe & Liden, 1997, 2005). Conversely, other research finds no effects of brokerage in contacts' networks after taking into account people's direct network structure (Burt, 2007; 2010).¹

Since being connected to brokers may not be universally beneficial, secondhand brokerage may offer only a partial explanation of how secondhand social capital affects performance. Indeed, the value of network connections, in terms of firsthand social capital and knowledge transfer, has been attributed to two factors: (1) the novelty of conveyed knowledge and (2) the motivation to fully share the knowledge with the focal individual. Scholars have described these factors in terms such as range and cohesion (Reagans & McEvily, 2003; Reagans & Zuckerman, 2001), vision and closure (Burt, 2005), or novelty and trust (Levin, Walter, Appleyard, & Cross, 2016). Accordingly, the ambiguity in the existing literature that has focused on secondhand brokerage may be attributable to the presence or absence of contacts' cooperative motivation. For instance, Galunic et al. (2012, p. 1219) found individuals rated their colleagues' help as most valuable to them due to secondhand brokerage when the "broker" colleagues were more senior to the focal individual, since "the leader role should naturally motivate occupants to broker information and resources for subordinates." Thus, we propose that secondhand social capital, i.e., the advantages returned to individuals due to their contacts' network configurations,

¹ Research outside of organizations applies the idea of secondhand networks to manufacturers and their suppliers, but the focus of that research is firm survival and performance (e.g., Uzzi, 1996, 1997), not individual performance.

may be most beneficial to job performance in cases when information novelty combines with a cooperative motivation.

Indeed, network forces can encourage cooperation, through closure. Closure is a configuration where one's contacts tend to know one another. To be sure, network closure around an individual need not come solely from contacts who are in the focal individual's own division or business unit, as inter-unit boundary-spanning ties can potentially be a part of a dense network as well. Closure has been associated with network structures that convey repeated and redundant information (Burt, 1992, 2000) but that also establish trust and reputation by serving as an informal type of social governance (Burt, 2005; Granovetter, 1985). Accordingly, this network structure facilitates strong norms (Coleman, 1990) and may inform individuals' social identity (Podolny & Baron, 1997). Relatedly, closure has been associated with enforcing relational and reputational stability (Burt, 2010) and easing knowledge transfer (Reagans & McEvily, 2003). Thus, the culture of cooperation and the reputational concerns of people in closed networks may encourage cooperative behavior. For instance, Gargiulo, Ertug, and Galunic (2009) found closure to be especially valuable for work performance when the focal individual is an acquirer of information but not a provider of it. That is, closure may provide a solution in those situations where people need knowledge from someone who might otherwise lack a cooperative motivation.

Our research question is whether a focal individual (hereafter, "ego") can derive performance benefits (i.e., become a high performer, rather than just an average one) from contacts (hereafter, "alters") by combining secondhand closure with knowledge novelty. As such, for this novelty effect, we will turn to research of boundary spanning, which has shown that workplace relationships that span business units (sometimes called bridging ties, but we use the more precise term, "boundary-spanning ties") often offer novel knowledge (Tushman, 1977).

However, alters in another business unit may have limited incentives to cooperate (Tortoriello & Krackhardt, 2010). For example, boundary spanning limits the shared identity and reporting structure that encourages knowledge sharing within units. Moreover, boundary spanning also limits the shared language and shared perspective that increases knowledge familiarity within organizational units (Cohen & Levinthal, 1990). As a result, it takes even more willingness to explain something to someone in another unit, because they often do not even know the basics (Hansen, 1999). In such cases, cooperation becomes especially important.

Therefore, those boundary-spanning ties to alters whose network structures encourage cooperation, i.e., secondhand closure, should be the most valuable to ego's own performance. We argue further that this closure in alters' networks will be beneficial to ego via two distinct mechanisms—reputational concerns along with feelings of shared identity—both of which encourage the alter to help ego solve work-related problems. Accordingly, in cases when cooperation and novelty are essential, secondhand closure, rather than secondhand brokerage, could be a more appropriate construct to consider when taking into account how alters' social capital affects ego's performance.

Our study contributes to the literature in three ways. First, given the current limited understanding of second-order network effects in workplace networks (Galunic et al., 2012), we examine the nuanced conditions under which secondhand social capital enhances performance. Particularly, whereas the existing literature indicates that secondhand brokerage may be positive or neutral, we suggest it actually may be harmful in the case of connections that span across business units, since alters who are brokers likely lack the cooperative incentives that facilitate knowledge transfer. Thus, we emphasize a need for spillovers of both novelty and cooperation in boundary spanning, and extend this insight from firsthand networks to secondhand networks also. Second, the literature has indicated individual-level benefits of intra-organizational

boundary spanning (Burt, 2004; Perry-Smith, 2006), along with the challenges of alter selection that arise due to these boundaries. For instance, Tortoriello and Krackhardt (2010) found boundary spanning to be beneficial for innovation generation when an individual and his or her alter share a third party in common. An alter's cooperative motivation may not need to be so direct, however. We find evidence that when it comes to boundary spanning, the constraining influences of the alter's wider network, attributable to sources within ego's business unit and even those outside of the alter's and ego's business units, can benefit ego's performance. We associate these sources with two mechanisms of cooperative motivation: reputation concerns and superordinate identity. Whereas prior literature has looked at constraint in general, to our knowledge it has not been common to examine the *source* of constraint, especially with respect to second-order constraint. Finally, a central benefit of organizational networks is that they can help overcome some of the information-exchange limitations imposed by the organization structure. We suggest how alters' relative organizational unit membership and network structure can work together to provide performance advantages, thereby emphasizing the crucial interplay between workplace networks and formal organization (e.g., Brennecke & Rank, 2016). In so doing, we help create a more nuanced and mature understanding of how work relationships and networks help performance (Kwon & Adler, 2014; McEvily, Soda, & Tortoriello, 2014).

Theory and Hypotheses

Organizational boundaries, such as the demarcation of business units, shape the nature and ease of knowledge flow within organizations (Krackhardt & Stern, 1988; Tortoriello, Reagans, & McEvily, 2012). Within the boundaries of a particular business unit, common languages, understandings, perspectives, and meanings develop among members (Brown & Duguid, 1991; Cohen & Levinthal, 1990; Tortoriello et al., 2012), such that “opinion and behavior are more homogenous within than between groups” (Burt, 2004, p. 349). A common

base of knowledge develops as people interact and exchange information in the course of their daily work (Brown & Duguid, 1991). As a result, people within a given business unit will typically know the basics within that business unit, and—although this basic knowledge may not be as easily understood by people outside the business unit—those within it should be fairly familiar with and understand it (Cohen & Levinthal, 1990; Katz & Kahn, 1966).

Novelty through boundary spanning

Just by virtue of their spanning a business-unit boundary, then, alters in another business unit can help ego to learn something novel (Burt, 2001; Reagans & McEvily, 2003). Ties that span such boundaries have long been shown to provide exposure to information and capabilities that differ from one's own, thereby engendering novel ideas and innovation (Allen & Cohen, 1969; Allen, Tushman & Lee, 1979; Hargadon, 2002). Because these ties are likely to involve dissimilar knowledge bases, they afford access to the novel information that scholars have consistently shown prompts creativity (Perry-Smith, 2006), innovation (Obstfeld, 2005), and high performance (Cross & Cummings, 2004).

However, across business units, it may be easy for someone to avoid requests for advice or assistance—or fulfill them only superficially—as interactions like these are unlikely to rise to the attention of the (much higher-up) executive in charge of both business units. Thus, people may feel safer saying no to or ignoring someone in another business unit than they would with someone within the same unit, where a common reporting structure produces hierarchical and reputational pressure to get along and cooperate (Bartol & Srivastava, 2002) and where there are expectations of cooperative behavior that urge timely and accurate exchanges (Reagans & McEvily, 2003). In addition, shared identities, shared goals, and group norms that exist within a business unit (Lave & Wenger, 1991; Lomi, Lusher, Pattison, & Robins, 2013) also engender a higher motivation to provide advice and information with same-unit members. The

organizational boundary thus creates an environment within which providers are more willing to share information and receivers are more able to absorb and integrate new knowledge into their existing base of it, such that membership within the same organizational unit engenders cooperative knowledge exchange (Bechky, 2003; Cohen & Levinthal, 1990; Szulanski, 1996). In contrast, such cooperation is far from a given in boundary-spanning ties, where it is much more common for an alter to be unwilling to help (Tortoriello & Krackhardt, 2010). Thus we argue that in the case of boundary-spanning ties to other units, cooperation is not only especially needed but it is also, ironically, likely to be especially lacking.

Cooperation through secondhand closure

Secondhand closure, however, offers the possibility of providing this much-needed cooperation. One of the hallmarks of closure, generally, is that it encourages cooperation (Coleman, 1990). The culture of cooperation induced by feelings of mutual obligation, devotion, trust, the fear of informal third-party sanctions, and reputational effects for mistreating someone all direct people towards helpful behaviors in a closed network (Reagans & McEvily, 2003; Tortoriello et al., 2012). As Burt (2010, p. 151) notes, “People wary of news reaching colleagues that might erode their reputation in the network are careful to display appropriate opinion and behavior.” Tortoriello and Krackhardt (2010) related this idea to having third parties in common between two people involved in a boundary-spanning tie, with the result being a cooperative motivational effect due to the presence of mutual connections to the third parties. We would argue, however, that this effect is broader than just knowing a single individual in common or not. In making this claim, we build on Brass (2009, p. 264), who noted, “Closure...does not require that everyone in the network be connected to everyone else in order for norms to develop or sanctions to be applied...Closure and the resulting trust, norms of reciprocity, and so on require only that there be a network path connecting the members.” The result is that people

embedded in such closed networks are apt to become fairly cooperative with their alters, even if they are in another business unit. Thus, we would argue that the combination of boundary spanning and secondhand closure should produce the cooperative motivation necessary for the sharing of useful knowledge across business-unit boundaries, thereby enhancing ego's own performance.

To be sure, alters whose networks are closed may possess less diverse knowledge than do their open-network counterparts (Burt, 2010), but this enhanced ability is unlikely to be of much use to someone from another business unit given the inherent difficulties in absorbing nuanced and sophisticated knowledge from an unfamiliar domain (Bechky, 2003). Thus, a boundary-spanning tie's information, even that which does not contain "exclusive" expertise, may nonetheless be "good enough," because that is probably all that an ego from another business unit can absorb anyway. Yet such knowledge, if shared, should still prove valuable to the receiver, because it comes from a boundary-spanning tie and is therefore likely to be novel. Thus, we hypothesize that secondhand closure will enhance performance specifically in the case of boundary-spanning ties.

H1: Closure in the networks of alters who are tied to ego via boundary-spanning ties will be positively associated with high performance by ego.

Sources of cooperation through secondhand closure

Whereas our initial theoretical focus has been on network closure in general around a given alter, we now turn to the source of those constraining effects. In so doing, we note that an alter's membership in relatively closed networks is not synonymous with his or her membership in intra-unit networks, as dense networks can contain one or more boundary-spanning ties. Indeed, secondhand closure might benefit the job performance of ego due to the alter's cooperative motivation induced by extensions of normative cooperative behavior; concerns about

cooperative reputation signals; and identification with broader organizational entities. We associate each of these three potential theoretical mechanisms with a particular source of secondhand closure, i.e., they are based on who exactly is constraining the other-unit alter.

Normative extensions. If the reason that the alter is cooperative towards ego is because other people in the alter's business unit are constraining the alter, this may suggest that the norms of cooperative behavior that inhere among members of the alter's business unit are extending to ego. In this case, "normative extensions" would be a key theoretical mechanism underlying the benefits of secondhand closure. We consider this mechanism to be an unlikely one, however. After all, the notion that connections between one's fellow business unit members will make a person more cooperative with outsiders is an idea that runs counter to extensive research in social psychology and elsewhere that has noted a tendency toward in-group favoritism and suspicion of "outsiders" (Tajfel, 1982). That is, an alter who is constrained to conform to the norms of the internal business unit may or may not feel obliged to share information freely with others outside of that unit. Further, the set of norms that applies within the unit can perhaps be easily ignored in dealings with people outside; indeed, boundaries have a tendency to do just that—justify one set of rules for "us" and a different set of rules for "them." Accordingly, we anticipate that ego will gain limited performance benefits, if any, based on within-unit normative cooperative spillovers.

Reputation concerns. If instead the reason that an other-unit alter is cooperative towards ego is because ego or the people in ego's business unit are constraining that alter, then this would suggest that reputational concerns are key to the effects of secondhand closure. This is consistent with the arguments of Tortoriello and Krackhardt (2010), although they limit their analysis to triads (ego, alter, and a third party in common). More broadly, though, if the alter in question shares third-party ties with ego or the people in ego's business unit, then it will not be so easy for

the alter to ignore any requests for assistance from ego. Indeed, the alter may feel obligated to display accommodating or helpful behaviors toward ego, for fear of word getting around to the other people in the alter's network.

Importantly, the alter and ego knowing specific third parties in common is not, strictly speaking, necessary to induce this type of cooperation. After all, people in ego's business unit presumably have a quick path to ego, or are likely to be seen as such by outsiders (Brass, 2009), so if such people are tied to the network of ego's other-unit alter, then that alter's reputation could be harmed by mistreating ego in some way. In general, people tend to assume greater density, transitivity, and balance exists among their direct connections than there actually is (Freeman, 1992; Krackhardt & Kilduff, 1999). As a result, when a closed network includes two or more alters from the same business unit, then the perception that these alters can or do know each other (whether currently true or not) should increase, along with an increased inclination towards greater cooperation with members of that business unit. Further, employees may assume—with some justification—that such connections could arise in the future, especially given that extant closure tends to encourage the proliferation of more connectivity over time (Obstfeld, 2005). As a result, we would expect ego to benefit from being connected to other-unit alters who are constrained in this way, i.e., who are likely to be concerned about their reputation within the network.

H2: Closure in the networks of alters who are tied to ego via boundary-spanning ties will be positively associated with high performance by ego—specifically when it is people in ego's unit who are the source of that closure.

Boundary-spanning cooperation could manifest itself in a number of different ways that may benefit performance, such as taking the time to explain things, helping to solve work-related problems, looking for opportunities on behalf of someone, validating ideas, praising someone to

others, and so on (Cross, Borgatti, & Parker, 2001). In cases where reputation concerns are primary, however, we would argue that the main goal will be to signal cooperation in a way that is visible or easily identifiable to mutual third parties. Put differently, it is not enough to help; one needs to be seen being helpful—at least if reputation concerns are a driving motivation for alter's cooperation (Hardy & Van Vugt, 2006). In such cases, then, we would argue that spending considerable time with ego may be the most visible signal that the alter is being cooperative. Interestingly, time spent may not always be the most productive means of cooperation (Levin et al., 2016)—it is, after all, costly to both parties, by definition—but it is nonetheless likely to be at least somewhat helpful, especially in a boundary-spanning context. In sum, we would expect time spent in the relationship to mediate the performance effects of reputation concerns:

H3: The amount of time spent interacting in the relationship will mediate the positive association described in H2.

Superordinate identity. Alters may be constrained also by people who are neither in their own business unit nor in ego's business unit, i.e., they are in completely different units from ego and the alter. In this case, the cooperation that benefits ego's performance may be induced by a strong superordinate identity (Kane, 2010). That is, by being connected in this way to people throughout the company, an alter may develop a strong sense of community, giving rise to feelings of belongingness along with concern about the overall organization (Nahapiet & Ghoshal, 1998). This emotional attachment and commitment to the organization, we argue, is likely to be induced by the alter's knowing people in 'tertiary' business units who are themselves tied to the other people in the alter's network. Being constrained by these sources may give rise to a feeling that the organization's problems—and those of other employees, including employees in other units—are their own. In other words, constraint from tertiary business units

likely increases one's identification with the larger organization, which increases cooperative motivation toward organizational members (Dukerich, Golden, & Shortell, 2002). As a result, when there is a boundary-spanning tie between ego and alter in such cases, the alter will likely feel obliged to help ego and be especially cooperative, thereby enhancing ego's performance.

H4: Closure in the networks of alters who are tied to ego via boundary-spanning ties will be positively associated with high performance by ego—specifically when it is people neither in ego's unit nor in the relevant alters' units who are the source of that closure.

We note that in the case of superordinate identity, signaling cooperation is not of paramount importance. On the contrary, the goal is to help in any way one can, regardless of how it looks to others. As a result, we would not necessarily expect the amount of time spent—or any other manifestation of cooperation, for that matter—to be systematically relied upon as a basis for cooperation in these instances. Thus, we do not specifically hypothesize a mediation effect for H4. We note further that reputation concerns (H2) and superordinate identity (H4) are not mutually exclusive explanations for the benefits of secondhand closure and boundary spanning. Indeed, either or both of these may explain why ego benefits from secondhand closure. We address this further in the Discussion section.

Methods

Setting

To examine our hypotheses, we studied the networks and job performance of U.S.-based employees of a large industrial conglomerate. Our data were collected within an innovation-focused, electronics-product global research and development division that includes 1,273 experts of engineering and physical sciences across 16 business units. The division is renowned internally and externally for its extensive patents and innovations, such as new commercial and residential electronic products. We administered a web-based survey to all of these U.S.-based

employees. As our interest centered on the ways in which high performance and collaboration facilitate higher job performance, we focused on the professionals in the engineering division, which concentrated on the development, production, maintenance, and sale of electronic equipment for industries ranging from automotive to defense and technology.

Participants

Of the 1,570 employees surveyed, 1,275 (81.2 %) responded to the network questions. We removed one individual who was an outlier on all network measures, and one person who was the only one assigned to a business unit (the 17th). We used all 1,273 people (average age of 48 years old, tenure of over 10 years, and 89% male) to generate the network variables.

Our performance-focused analysis excluded 122 respondents because they were missing data on their current or prior year's performance (or both). From the remaining sample, our models include respondents for whom we could compute alter characteristics, i.e., those with at least one alter in the same business unit and at least one alter in a different business unit—and where these alters had performance data available. Indeed, from a logical perspective, if one has no alters in a different business unit, then it is impossible to compute the extent to which those nonexistent alters are constrained or even to control for those alters' performance. In comparison to those in our final sample, excluded individuals were likely to be less tenured ($M = 4.59$ vs. $M = 4.95$, $p < .01$), less likely to seek out colleagues ($M = 6.66$ vs. $M = 11.16$, $p < .01$), including outside of their own business unit ($M = 1.40$ vs. $M = 3.81$, $p < .01$), and more constrained in their networks ($M = 0.39$ vs. $M = 0.24$, $p < .01$). Thus, consistent with our theory, our study is designed to examine those employees with ties to other parts of the organization besides just their own. Our final models analyzed the performance of 737 respondents.

Procedures

Participants received surveys via email. They were assured of confidentiality and that

only aggregated data would be shared with management. Surveys assessed network data using a name-generator methodology to identify the contacts salient to participants (Bernard, Killworth, & Sailer, 1982; Freeman, Romney, & Freeman, 1987; Scott, 2013; Shah, Cross, & Levin, in press). To capture the networks within this U.S. division, we employed three prompts. The first prompt was for people in the respondent's function and location (15 names possible):

Please identify up to fifteen people who are important in your professional network and are both in your function AND located at your site. These should be people who work in the engineering community [i.e., the engineering division] and are located in the United States (as per the focus of this project). Please consider the most influential people within the U.S. engineering community that provide you with information or resources to do your job, help you think about complex problems posed by your work or have expertise you are reliant upon to be effective in your role. These may or may not be people you communicate with on a regular basis but should be the people you consider to be your most important relationships within your function AND at your site.

The other two prompts were otherwise identical to the first but asked instead about people in the respondent's function but located at a different site (10 names possible) and outside the respondent's function but still inside the overall division (10 names possible). This allowed for 35 possible names ($M = 9.3$, $SD = 5.2$), with only one respondent reaching the maximum. For each prompt, as respondents typed the name of each person, a pop-up window appeared with type-ahead functionality—based on the list of all U.S. employees in the engineering division—to help respondents identify and complete the names they selected.

Variables

Dependent variable. Every year supervisors rated each employee's performance as 1 = low, 2 = average, or 3 = high. The engineers worked on multiple projects through the year and

were evaluated by project leads in every case, on dimensions including quality, timeliness, innovation, and being a team player. These ratings were aggregated across the projects and summed by their own manager, who also evaluated content expertise in their domain. The lattermost component was considered much less heavily in the overall evaluation in comparison to the project evaluations. Based on these inputs, the manager rated performance.

Because fewer than 1% of employees were rated as low performers, we combined the bottom two categories. Thus, current-year individual performance is a dichotomous measure comparing high performers vs. everyone else. Doing so was important from a statistical perspective to avoid violation of the parallel regression assumption of ordinal logistic regression, which assumes that the relationship between outcome groups is the same (1 vs 2 same as 2 vs 3), as we found Brant tests to be significant ($p < .01$) (Brant, 1990).

Independent variables. We calculated closure in terms of network constraint (Burt, 1992). The average constraint of ego's alters was measured by first calculating each individual's network constraint, based on both incoming and outgoing ties, using the ego network method in Ucinet 6 (Borgatti, Everett, & Freeman, 2002), which we multiplied by 100. To test H1, these constraint values were averaged across all the alters to whom ego had a tie (incoming or outgoing) in business units different from ego's (*average constraint of other-unit alters*).

An individual's aggregated constraint value is calculated based on the sum of dyadic constraint from each person in that individual's network (Burt 1992). We calculated the 1273x1273 dyadic-constraint network using Ucinet 6. For the later hypotheses, we used this network to disaggregate other-unit alters' constraint into three sources of constraint: from members of alters' own business unit, from members of ego's business unit (including ego), and from members of tertiary business units. We averaged, across all of ego's alters, the sum of dyadic constraint (calculated by Ucinet) between each alter and the people tied to that alter who

are (a) members of the alter's business unit (used as a control variable to account for normative-extension effects: *average other-unit alters' constraint from alter's own business unit*), (b) members of ego's business unit (including ego) (used to test H2 for reputational-concerns effects: *average other-unit alters' constraint from ego's business unit*), and (c) members of business units that are not the alter's or ego's (used to test H4 for superordinate-identity effects: *average other-unit alters' constraint from tertiary business units*). These three sum to the measure used in H1.

To test H3, we assess whether *time spent in the relationship* mediates the reputation-concerns effect hypothesized in H2, averaging the reported time spent by both actors in a dyad when possible. In the case that one of the values was missing (i.e., not reported by ego or alter), we kept the existing value. Specifically, we asked our respondents, "Please indicate the amount of time you spend in a typical week preparing for and in interaction with each person [previously identified as an important work contact] listed below. Please try to estimate just the time you spend preparing for and in interactions with this person on core work related topics." The responses ranged from 1 to 6: less than 1 hour per week (1), 2-4 hours per week (2), 4-8 hours per week (3), 8-12 hours per week (4), 12-16 hours per week (5), 16 + hours per week (6). We found 126 points of missing data and replaced these values with a value of 1 to provide the most conservative test of our hypothesis.

Control variables. We controlled for attributes of ego as well as those of ego's alters.

Ego's Characteristics: We controlled for ego's previous year's performance, measured as 1 = low, 2 = average, or 3 = high, to account for existing abilities (*prior-year performance*). Because this is a predictor variable, there are fewer statistical restrictions than with a dependent variable, so it was not necessary to dichotomize it. Additionally, we also controlled for ego's ability to identify, discern, and apply knowledge that may be useful to ego's role, with ego's job

role tenure (*ego's role tenure*) and hierarchical level (*ego's job rank*), with the latter coded from 1 (administrative / technical / production employees) to 5 (executives). Network effects do not always occur for all hierarchical levels, so as a robustness check, we created an interaction term to see if our results varied by job rank; results were unchanged. Next, as indicated by Burt (2007) we controlled for firsthand closure, i.e., the lack of structural holes in ego's network, measured as constraint based on both incoming and outgoing ties, using the ego network method (*ego's network constraint*).

Alters' Characteristics: To account for alters' competence, the past year's performance values were averaged across all of the individuals whom ego nominated as an important resource in business units different from ego's (*average performance of other-unit alters*) and then all of ego's alters in ego's own business unit (*average performance of same-unit alters*). For comparison purposes, we also controlled for the average constraint of alters within ego's own business unit (*average constraint of same-unit alters*), calculated in the same way as for H1.

Results

[Insert Tables 1 and 2 about here]

Our descriptive statistics are reported in Table 1. We used logistic regression in Table 2 to predict our bivariate dependent variable. Our performance models include 737 respondents who had at least one tie to people in their business unit and one tie to people outside of their own business unit and whose alters had performance information; this methodological approach is similar to the method used by Galunic et al. (2012) to study second-order networks. We tested each model for multicollinearity by checking the variance inflation factor (VIF) levels using the `collin` command in Stata. The VIF levels in all models were below 2, well under the acceptable level of 10 (Menard, 1995).

In Model 1 (Table 2), we examined our control variables associated with ego's characteristics and found that ego's previous performance ($B = 1.68, p < .01$) and hierarchical level ($B = 0.32, p < .05$) predicted current high performance positively and significantly. In Model 2 we added our control variables associated with alters' characteristics. Here we found that same-business-unit alters' high performance predicts ego's performance ($B = 0.89, p < .01$); we attribute this to the likelihood of high performers sharing nuanced information that goes beyond the basic knowledge already familiar to members of the business unit. In the Discussion section below, we reflect on how this finding is consistent with our overall theorizing about novelty and cooperation.

Hypotheses Testing

In Table 2's Model 3, we tested and found support for secondhand closure (H1): as other-unit alters' constraint increased, so did the likelihood of ego's own higher performance ($B = 0.03, p < .05$), over and above the controls for ego and alter characteristics. We examined this effect on the margin, to aid interpretation and to gauge its size. We find that a one standard deviation increase in boundary-spanning secondhand closure (i.e., above the average closure in other-unit alters' networks) increases the probability of ego's being a high performer by 5.2 percentage points. This is a 16.0% increase relative to the average probability of high performance in our sample. Thus, we conclude that secondhand closure does play an important role in predicting the probability of high performance.

In Model 4 we examined other-unit alters' disaggregated constraint to understand how different sources of alters' cooperative motivation may predict ego's performance. As expected, we find no evidence of normative extensions, as constraint from alters' own business unit is not associated with ego's performance ($B = 0.01, n.s.$). We do, however, find support for our reputation-concerns logic (H2), as ego's performance has a positive and significant association

with alters' constraint from members of ego's business unit ($B = 0.03, p < .05$). We next tested whether this effect is mediated by time spent, and find support for H3 using a formal mediation analysis. Per Hayes (2009), we use a bootstrapped mediation test, with 2,500 repetitions, rather than a three-step mediation test, since the bootstrapped tests offer increased power to test the indirect effect and the lack of a need to meet normality assumptions. We found time spent to significantly mediate the effects between other-unit alters' closure and ego's current-year performance (indirect effect = 0.04, $SE = 0.02$; bias-corrected 95% confidence interval: 0.01 to 0.08, i.e., $p < .05$). These mediation results suggest that a significant reason why other-unit alters constrained by their ties to people in ego's business unit provide performance advantages to ego is because they spend more time (i.e., are more openly cooperative) with ego than do other-unit alters whose networks are less constrained. Per H3, this supports our reputational-concerns logic as a mechanism that induces alters' cooperation—especially cooperation, manifested as time spent, that is a highly visible signal—to benefit ego's performance.

In Model 4 we find support for our superordinate-identity logic (H4) as well, as ego's performance has a positive and significant association with alters' constraint from members of tertiary business units ($B = 0.06, p < .05$). We did not expect that this effect would be mediated by time spent, and our results are in line with these expectations (indirect effect = -0.00, $SE = 0.01$; bias-corrected 95% confidence interval: -0.02 to 0.01, i.e., *n.s.*). Therefore, these effects indicate support for superordinate identity logic as a mechanism that induces alters' cooperation to benefit ego's performance.

Robustness Testing

We conducted three tests to further assess the robustness of our models. First, we considered Tortoriello and Krackhardt's (2010) findings that third-party ties in common between ego and other-unit alter may explain the performance benefit that ego receives from having

boundary-spanning ties. Based on our Model 3, we replaced our other-unit alters' constraint variable with one that measures the average dyadic constraint between ego and other-unit alters (which is equivalent to the Tortoriello and Krackhardt (2010) measure). As expected, we find positive effects on ego's performance, with marginal significance ($B = 0.04, p < .10$). Similarly, based on Model 4, we include all of the disaggregated constraint variables, but split the variable testing H2 (*average other-unit alters' constraint from ego's business unit*) into two parts: one variable measuring how much ego, on average, is constraining ego's other-unit alters and the other variable measuring how much everyone else in ego's business unit is constraining ego's other-unit alters. In a nested regression, these two variables have a combined significant effect ($\chi^2 = 6.07 (2), p < .05$); other-unit alters' constraint from ego does not significantly predict ego's performance ($B = 0.01, n.s.$), while the other-unit alters' constraint from other members of ego's business unit does so, with marginal significance ($B = 0.03, p < .10$). This suggests that alters may not be able to easily distinguish the networks of ego versus ego's fellow business unit members, following research describing the limitations of individuals' cognitive accuracy in network perception (Kilduff, Crossland, Tsai, & Krackhardt, 2008).

Second, some previous research has included ego's network size as a control variable in tests of secondhand network effects (e.g., Galunic et al., 2012). Since we use constraint in all of our models, we had not included network size, as the calculation of the constraint measures already takes size into account (Burt, 1992). Nevertheless, if we include a measure of ego's network size in Models 3 and 4, ego's constraint becomes negative and marginally ($B = -.02, p = .05$) and fully significant ($B = -.02, p < .05$), respectively, as expected and consistent with the benefits of firsthand brokerage (Burt, 2007). Our models remain otherwise unchanged, excepting in Model 4, the measure of other-unit alters' constraint from tertiary sources, which becomes marginally significant ($B = 0.05, p < .10$).

Third, we recognize that the communication barrier between business units may not be uniform across all pairs of units, since some business units may be more likely to interact with each other than others. We conducted a robustness test to determine whether communication barriers may have influenced our results. It stands to reason that when higher (lower) communication barriers exist between business units, there will be a decreased (increased) likelihood of boundary-spanning interaction. To measure communication barriers, we focused on the density of relationships between business units, since increased density demonstrates increased interaction. Density is a measure of existing ties relative to possible ones. To ease interpretation, we subtracted these density values from 1. Based on these values, we created a 1273x1273 individual-level ‘communication barrier’ matrix in which each cell contains the communication barrier between ego’s and alter’s business units; when ego and alter are in the same unit, the communication barrier is zero. We then recalculated our variables by weighting alters’ constraint measures based on communication barriers between ego’s and alter’s business unit; our results were unchanged.

Discussion

This research shifts the focus of network scholarship from the focal individual (“ego”) to the contacts (“alters”) in that individual’s workplace network, bringing attention to secondhand social capital. We answer three questions: First, is a focal individual’s performance influenced by the networks of his or her contacts? Second, how does the network structure around these contacts induce the cooperation that benefits the focal individual’s performance? And, third, how does this cooperation manifest to benefit the focal individual’s performance? We theorize that high performance results from secondhand social capital when there are spillovers of both novelty *and* cooperation. Within an R&D engineering division, we find that the returns from secondhand social capital are contingent upon contacts’ position in the organizational structure,

since spanning across business units offers novelty, and also upon closure in their networks, i.e., secondhand closure, since closure tends to encourage cooperation (per H1). People in the same business unit are embedded in organizational structures that enforce cooperative exchange norms; thus, basic knowledge should flow relatively freely within the business unit. In ties to people outside the business unit, however, extra cooperation may be needed to help ego realize performance advantages.

These special kinds of boundary-spanning ties may encourage cooperation for at least two reasons. First, the alters in these cases may cooperate with ego due to concerns about their reputation (Tortoriello & Krackhardt, 2010). These reputational concerns should be especially strong when the alter is constrained by ego or by other members of ego's business unit (per H2), where news of any mistreatment of ego is likely to spread fairly quickly through the alter's network. To minimize this possibility, alters constrained in this way are likely to be more cooperative toward ego—and, in particular, to be more cooperative in ways that *signal* their cooperation that can be seen by surrounding third parties. We argue that time spent in the relationship is just the kind of visible signal of cooperation that we would expect in the case of reputational concerns, and this is exactly what we find (per H3): time spent significantly mediates the link between ego's performance and when ego's other-unit alters are constrained by ego's business unit.

Second, besides reputation concerns, alters may cooperate with ego due to a superordinate organizational identity (Kane, 2010), since having cross-unit ties, especially to those in units besides your own and ego's (i.e., to 'tertiary' business units), who know your other ties, can instill a sense of communal togetherness, a feeling that we are all part of one big, interconnected company and should therefore help one another (per H4). To be sure, there could be an element of reputation concerns even in the case of constraint by tertiary business units.

However, if reputation were the sole mechanism encouraging cooperation, we would expect to see a larger impact from constraint by ego's own business unit ($B = 0.03$), since these are closer to ego and thus more worrisome from a reputational standpoint in terms of how ego is treated. Yet this is not the case: ego does not get a smaller performance boost when other-unit alters are constrained by tertiary business units ($B = 0.06$). We interpret this pattern of results as evidence for an effect of organizational identity by constrained alters, over and above that of reputation. In other words, we argue that reputational concerns and a superordinate organizational identity are both involved in encouraging cooperation. Future research should examine these dynamics in even more detail, to better understand exactly how secondhand social capital enhances performance specifically in the case of boundary-spanning ties.

The finding that performance, and often innovation, benefit from novelty and cooperation is a prominent theme in the research of workplace networks. For many years, the bridging (i.e., brokerage) and bonding (i.e., closure) perspectives of networks remained separate, as Burt (1992) and Granovetter (1973) led the view that bridging holes in network structures facilitates access to novel information for individuals, whereas Coleman (1990) and Putnam (1995) emphasized the bonding that occurs in network structures that create cooperation for communities. Bridging and bonding, thus, were viewed as alternative types of social capital. However, scholars began to shift toward a more inclusive perspective, suggesting that cohesion and range go hand in hand in facilitating knowledge transfer (Reagans & McEvily, 2003; Reagans & Zuckerman, 2001). More generally, as Burt (2005) explained, brokerage offers the vision advantage and closure offers the reputational threat that enforces cooperation, such that their combination creates a performance advantage for individuals. Aral and Van Alstyne (2011) challenged this notion of complementarity, as relationships that can transfer novel information often lack interaction frequency and high volumes of information exchange. Levin et al.'s (2016)

rejoinder showed that novel information sharing can be unlocked by relational trust, effects that were echoed in Walter, Levin, and Murnighan's (2015) research showing that novelty can even be derived from reconnecting dormant relationships, especially if the others are trustworthy and willing to help. Thus, novelty and cooperation have had a long and storied marriage in the networks literature. Our results advance this discussion by elucidating that novelty and cooperation are obtained in different ways depending on the business-unit membership of the colleague in question. Thus, our research shows how organizational structure works in tandem with network structure—especially in the case of “secondhand” network structure—to generate performance benefits.

Secondhand social capital within business units

While secondhand closure is important outside of the business unit, this does not seem to be the case within the business unit. Indeed, a variety of normative and structural constraints already enforce cooperation inside the unit. Thus, novelty is the challenge for intra-unit ties. Specifically, the main difficulty in obtaining valuable knowledge from alters in one's own business unit is likely to be the alter's (in)ability to provide knowledge and capabilities that are valuable over and above the common, redundant, less diverse base of knowledge (“the basics”) typically already shared by most members of the same business unit. As these within-unit connections have been shown to be beneficial for enhancing one's base of specialized expertise (Rosenkopf & Nerkar, 2001), alters who should be the most helpful in this situation are those with a nuanced understanding of the subject matter, technology, and work processes. Consistent with this view, we find that high performers within the business unit—regardless of the source of their high performance—turn out to be ideal same-business-unit alters, as they are the most likely to be able to share understandable knowledge that is new and state of the art, thereby enhancing ego's own performance. Thus, our results indicate that performance advantages seem

to accrue from being connected to people in one's own business unit who are high performers themselves, as these same-unit alters likely have a nuanced understanding of unit-specific knowledge and processes. Outside of the business unit, though, alters' high performance is less important, because high levels of specialization are unlikely to be fully understood or applied by an outsider. Together with our main findings, these effects indicate that a key source of value, whether to alters inside or outside of one's own business unit, lies in the concurrence of novelty and cooperation spillovers.

Further research

Our findings raise several implications for the further development of social network theory. For instance, Burt (2000, 2004) indicated that closure increases polarization due to repetition (i.e., echo versus bandwidth), creating a biased reality (e.g., Higgins, 1992). Thus, there is the potential for inaccurate information to be retained by those who are most constrained and, in the context of our study, to share that potentially inaccurate (according to this view) information with their alters in different business units. Our findings do not support expectations of inaccuracy, however, because spillovers of inaccurate information would be unlikely to enhance performance for ego. Rather, the potential for accuracy, not inaccuracy, seems more likely in the case of the kind of basic, highly vetted information that is most apt to be transferred between business units. Future work could look more specifically at whether closure affects accuracy when spanning boundaries within organizations by studying the content of information exchanged in work-focused discussions.

Also, recent research on knowledge sharing between organizational divisions has increased attention to people's social identification. Dokko, Kane, and Tortoriello (2014), for example, found that people's strong identification with a division enhances creativity when connecting to fellow division members but diminishes creativity when interacting with

colleagues in other divisions. As well, Lomi et al. (2013) showed that managers who identify with subsidiaries seek advice within an organizational boundary, whereas those who identify with the overall organization seek advice across such boundaries. These findings complement ours in that a superordinate identity not only encourages people to seek knowledge via boundary-spanning ties (Lomi et al, 2013), but, as we find, it can also in turn encourage these knowledge sources to share what they know more fully. Future research might investigate this phenomenon in more detail by measuring organizational identification directly. Accounting for people's identification may even affect our findings, because people who identify more strongly with their own business units may be less likely to seek out alters in other divisions, limiting the potential for novel information access. In contrast, those who identify with the broader organization may gain even more rewards than we have found here.

Further, our research raises questions for studies of the dynamics of social networks. This research is concerned with explanations for network change over time, as predicted by relational tendencies, such as homophily, proximity, reciprocity, and closure, and individual attributes, such as gender, tenure, and performance (e.g., Ahuja, Soda, & Zaheer, 2012; Parker, Halgin & Borgatti, 2016). Since our findings show that ties offering novelty and cooperation are beneficial to performance, people may want to maintain these relationships over time. These attributes, then, might also explain why some network ties are less likely to become dormant over time (Burt, 2002; Levin et al., 2011). Specifically, future research may consider whether secondhand closure for boundary-spanning ties can explain the maintenance versus decay of those ties.

Finally, our analyses include several limitations that may be addressed by future research. We controlled for past performance but were not able to test dynamic effects, as we had information on networks at only one point in time. Still, a reverse causality argument that high performers disproportionately avoid or are avoided by brokers in other business units seems

implausible. Another potential limitation is that our results are conditional on employees doing at least some boundary spanning. Those who do not have ties outside of their own business unit may have some unmeasured characteristics that would inhibit them from reaping the rewards of secondhand closure for boundary-spanning ties. We look forward to examining what such characteristics might be, if any, in future research. Also, our study context was an innovation-focused division within a large multinational conglomerate. The effects we found thus may be different in smaller businesses where business units are more tightly linked, because the cooperative benefits of alters' closed networks may be less necessary. Additionally, we theorized that people who are embedded in closed networks tend to be cooperative toward people in different business units, though we did not measure cooperative behaviors directly (besides time spent in the relationship, per H3). These considerations suggest that more clarity may be obtained through an examination of the actual content exchanged by organizational members (e.g., Hansen, 1999; Tippmann, Mangematin, & Scott, 2013), a concern consistent in most network research.

Conclusion

Overall, our study identifies the performance benefits of secondhand social capital. Based on the premise that the most valuable workplace ties provide a combination of both novelty and cooperation (Levin et al., 2016), we examine how second-order networks interact with horizontal organizational structure to provide that very combination. Our results show boundary-spanning ties to be beneficial mainly when one's contacts in other business units are embedded in closed networks, which we call secondhand closure—especially when those closed networks also include other boundary-spanning ties that facilitate spillovers of cooperation, whether through the mechanism of reputational concerns or a superordinate organizational identity. Conversely, we find that secondhand closure is beneficial when it is combined with a tie that can provide

novelty, such as a boundary-spanning tie, that facilitates spillovers of novelty. Our research thus opens the door to future research of secondhand social capital, as secondhand closure may be valuable when bridging across professions (e.g., doctors versus nurses; Tasselli, 2015), across teams, and across firms as well. Indeed, we believe that research on networks—especially the impact of second-order networks—can benefit from focusing not just on the network in isolation but also on the broader context in which network structures are situated.

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Table 1
Means, Standard Deviations, and Simple Correlations

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12
1. Current-Year Performance	0.35	0.48												
2. Prior-year performance	2.40	0.50	.37**											
3. Job role tenure	4.95	1.22	-.03	.09*										
4. Job rank	4.89	0.69	.05	-.09*	-.08*									
5. Ego's network constraint	23.54	10.72	-.02	-.10**	-.21**	.36**								
6. Avg performance of same-unit alters	2.45	0.27	.16**	.18**	-.04	-.08*	-.03							
7. Avg performance of other-unit alters	2.44	0.35	.01	.02	.00	-.02	-.09*	.00						
8. Avg constraint of same-unit alters	23.22	7.39	-.03	-.04	-.04	.05	.30**	-.13**	-.08*					
9. Avg constraint of other-unit alters	21.02	8.29	.08*	-.01	-.04	.13**	.34**	-.01	-.19**	.31**				
Avg other-unit alters' constraint from...														
10. ...alter's own business unit	8.20	5.42	-.04	-.03	.09*	.10**	-.06	-.04	.02	.04	.05			
11. ...ego's business unit	8.70	10.06	.08*	.03	-.10**	.04	.32**	.01	-.19**	.22**	.78**	-.52**		
12. ...tertiary business units	4.11	2.96	.02	-.06	.07*	.05	-.04	.00	.07*	.05	.07	.05	-.27**	
13. Time spent in the relationship	1.42	0.70	.10**	.00	-.05	.06	.11**	-.02	-.12**	.01	.25**	-.10**	.29**	-.11**

Note: $N=737$; two-tailed tests.

* $p < .05$, ** $p < .01$.

Table 2
Logistic Regression Results for Ego's Current-Year Performance

	Model 1		Model 2		Model 3		Model 4	
	<i>B</i>	S.E.	<i>B</i>	S.E.	<i>B</i>	S.E.	<i>B</i>	S.E.
Constant	-5.55**	(0.86)	-7.69**	(1.38)	-8.07**	(1.39)	-8.02**	(1.39)
<i>Ego's Characteristics</i>								
Prior-year performance	1.68**	(0.17)	1.61**	(0.17)	1.61**	(0.17)	1.63**	(0.18)
Job role tenure	-0.13 [†]	(0.07)	-0.12	(0.07)	-0.12 [†]	(0.07)	-0.12 [†]	(0.07)
Job rank	0.32*	(0.13)	0.34*	(0.13)	0.33*	(0.14)	0.35*	(0.14)
Ego's network constraint	-0.01	(0.01)	-0.01	(0.01)	-0.01	(0.01)	-0.01	(0.01)
<i>Alters' Characteristics</i>								
Avg performance of same-unit alters			0.89**	(0.32)	0.87**	(0.32)	0.85**	(0.32)
Avg performance of other-unit alters			-0.00	(0.24)	0.09	(0.25)	0.07	(0.25)
Avg constraint of same-unit alters			-0.00	(0.01)	-0.01	(0.01)	-0.01	(0.01)
Avg constraint of other-unit alters (H1)					0.03*	(0.01)		
Avg other-unit alters' constraint from...								
...alter's own business unit							0.01	(0.02)
...ego's business unit (H2)							0.03*	(0.01)
...tertiary business units (H4)							0.06*	(0.03)
Likelihood Ratio χ^2 (<i>df</i>) =	109.96**	(4)	118.10**	(7)	124.31**	(8)	127.31**	(10)

Note: Unstandardized (*B*) coefficients shown, with standard errors (S.E.) in parentheses. *N* = 737 for all models.

[†] *p* < .10, * *p* < .05, ** *p* < .01.