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One of us or one of my friends: How social identity and tie strength shape the creative generativity of boundary-spanning ties

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One of us or one of my friends: How social identity and tie strength shape the creative generativity of boundary-spanning ties

Abstract

Social ties to colleagues on other work teams can spur creative ideas and workplace innovation by exposing an individual to diverse knowledge. However, for external knowledge to be recombined into innovation, the knowledge must first be recognized as potentially valuable. Going beyond traditional structural explanations, we predict that the use of diverse knowledge to generate creative ideas and solutions will depend in part on employees' psychological attachment to the organizational groups to which they belong, i.e. their social identity, and the strength of their social ties. We test our hypotheses in an R&D division of a global high-technology firm, finding that social identity influences the creative generativity of boundary-spanning ties. Specifically, stronger team identity renders interactions with colleagues on other work teams less generative of creative ideas, while identification with an overarching, superordinate group (e.g., a division) enhances creative generativity. We also hypothesize and find that tie strength attenuates the negative effect of team identity.

Keywords: social networks, dyadic interaction, tie strength, innovation, creativity, social identity, superordinate social identity, teams

Introduction

Workplace innovation often begins with the generation of creative ideas by employees. In fact, organizations increasingly rely on employees for novel solutions to problems or creative ideas for improvement. However, organizational structures and systems can impede employee creativity (Perry-Smith, 2006). Specialization and organization by expertise and function has the effect of creating boundaries between co-workers with diverse knowledge (Reagans & Zuckerman, 2001). At the same time, innovation comes from the recombination of diverse knowledge into creative ideas, products and processes (Henderson & Clark, 1990; von Hippel, 1988). Therefore, reaching across organizational boundaries to interact with colleagues external to one's own work team is valuable for accessing and acquiring the distinct and varied knowledge, approaches, and perspectives that generate creative ideas and solutions (Burt, 2004; Obstfeld, 2005; Perry-Smith & Shalley, 2003; Sosa, 2011).

A wealth of social network research has shown that boundary-spanning ties, i.e., social relationships that span organizational boundaries, have been shown to be consequential for generating creative ideas and innovation because they provide access to diverse knowledge (Burt, 2004; Fleming, Mingo, & Chen, 2007; Hargadon & Sutton, 1997). However, boundary-spanning ties are not all equally generative of creativity and innovation. Recent micro-level network research goes beyond the structural characteristics of networks to find that individual differences, e.g., propensity to connect others, openness to experience, personal values (Baer, 2010; Obstfeld, 2005; Zhou, Shin, Brass, Choi, & Zhang, 2009) and characteristics of the relationship between a knowledge recipient and contact, e.g., tie strength, trust (Kijkuit & van den Ende, 2010; Levin & Cross, 2004; Sosa, 2011) can all condition how well the innovative potential of social ties is realized. This work represents an emerging recognition of the importance of micro-level psychological and social psychological factors for social networks.

We contribute to this emerging stream of social network research by considering individual-level and relational factors that affect how and when social ties are useful for creative idea generation. In particular, we incorporate and extend insights from social psychological theories of social identity into social network theories of innovation to address two important questions: 1) why do some individuals

find boundary-spanning ties more useful for generating creative ideas than others and 2) why are some boundary-spanning relationships more creatively generative than others? We use creative generativity – ease of generating creative ideas from boundary-spanning relationships – as a dependent construct, rather than the overall creativity of an individual, in order to explore and compare dyadic relationships (Sosa, 2011). In addition, since contacts on different work teams hold diverse knowledge as a function of performing different work tasks, we restrict our attention to only those relationships that go outside a focal individual's work team, i.e. their boundary-spanning ties.

For individuals to find boundary-spanning ties creatively generative, they must be receptive to the diverse knowledge available through these ties. Though access to diverse knowledge from colleagues on other work teams may be a precondition to innovation, it does not guarantee, or even necessarily make it easier to generate creative ideas or innovative workplace solutions (Maurer, Bartsch, & Ebers, 2011). Diverse knowledge cannot ease creative idea generation if it is not noticed and considered. An individual could be differentially receptive to each of his or her boundary-spanning ties, depending on characteristics of each specific relationship or contact. We, therefore, investigate individual and relational characteristics likely to influence receptivity to the diverse knowledge held by external contacts.

One such individual-level characteristic likely to influence receptivity is a focal individual's social identification or sense of identity derived from organizational groups, such as a team or a division. This characteristic is likely to play an important role, as decades of research in the social identity tradition reveals that identification influences how people think, feel, and behave towards one another in group settings (for reviews, see Ellemers, 2012; Haslam & Ellemers, 2005). For example, people who identify strongly with their team tend to allocate more of their limited resources, including cognitive ones, to team members (Brewer, 1979; Kane, 2010; van Knippenberg, 1999). This tendency suggests that individuals with a strong team identity may not sufficiently consider knowledge from external contacts, i.e. contacts who do not belong to their own team, for their interactions to be generative. Individuals, however, can derive a sense of identity simultaneously from multiple groups (e.g. Dovidio, Gaertner, & Saguy, 2009; George & Chattopadhyay, 2005; Hornsey & Hogg, 2000). They can identify with a work team, and,

independently of the strength of this proximal identification, they can also identify with distinctive superordinate groups like an organizational division strongly enough to affect workplace behaviors (Gaertner & Dovidio, 2000; Hinds & Mortensen, 2005; Hornsey & Hogg, 2000). Individuals with a strong division identity might be receptive to diverse knowledge from external contacts who, despite being on another team, belong to a common, psychologically important group, i.e., the division (Lomi, Lusher, Pattison, & Robins, 2013). Therefore, the strength as well as the locus of an individual's social identity is likely to be a determinant of how useful particular boundary-spanning ties are for creative idea generation.

Addressing the second question of why some boundary-spanning ties are more useful than others for creative generativity requires attention to characteristics of an individual's relationships and of the contacts the individual is connected to. First, dyadic relational characteristics, such as tie strength or overlap in expertise, have been shown to generally ease knowledge transfer and creative idea generation (Reagans & McEvily, 2003; Sosa, 2011). We, therefore, examine tie strength as an important relational characteristic of boundary-spanning relationships likely to influence creative idea generation, and focus on its potential to moderate the impeding effect of a strong team identity. Second, characteristics of an individual's contacts, i.e., alters, should be important because they are the source of diverse knowledge. Alter characteristics, such as their prior work experience or knowledge diversity, have been shown to affect the creativity of a focal individual, i.e., ego, because they represent the diversity of knowledge held by alters (Baer, 2010; Fleming, et al., 2007; Reagans & McEvily, 2003). Ties to alters on other work teams provide access to such diverse knowledge because different work teams have diverse tasks and responsibilities (Reagans & Zuckerman, 2001). However, this access may be insufficient for creative generativity, since alters may not freely share their diverse knowledge, especially across organizational boundaries (Babcock, 2004; Cabrera & Cabrera, 2002; Constant, Kiesler, & Sproull, 1994). Because identification with a superordinate group expands one's sense of self to include those outside of proximal groups (Dovidio, et al., 2009), the strength of an alter's identification with a common division may

facilitate the provision of diverse knowledge (Cabrera & Cabrera, 2002), leading ego to find the relationship generative of creativity.

In this paper, we seek a deeper understanding of when boundary-spanning social ties generate creative ideas by taking into account the social identity of both of the people in the relationship and the strength of the relationship. Our study extends traditional structural approaches to social networks and complements other recent research that calls on both social network factors and attributes of individuals or their relationships to explain creativity and innovation (e.g., Baer, 2010; Kijkuit & van den Ende, 2010; Levin & Cross, 2004; Obstfeld, 2005; Rodan & Galunic, 2004; Sosa, 2011; Zhou, et al., 2009). Our attention to social identity is both novel in the study of creativity from social relationships and important to it, because it acknowledges the importance of groups in organizations (Kozlowski & Ilgen, 2006), and recognizes that group identification and social network ties have independent effects. Our inclusion of tie strength as a moderator acknowledges the separate and distinct effects for social identity and social relationships, and also demonstrates a condition under which strong ties contribute to creativity. Finally, we show that the social identity of both parties in a relationship affects the creative generativity of that relationship. Recent work has started to consider the diversity of knowledge that alters can offer, but we show that alters' psychological attributes can also influence how well ego can access that knowledge.

Theory

The Creative Generativity of Boundary-Spanning Ties

The creative generativity of a social network tie is the ease with which a person can generate creative ideas and solutions from interacting with another person. When the creative generativity of a tie is high, a focal individual finds that interacting with a specific contact stimulates creativity. By contrast, when it is low, a focal employee finds few creative benefits from interactions with that contact. Though creativity is typically studied as an individual-level construct, recent research has shown that creativity often relies on a social process, where interaction with diverse contacts can generate creativity (Baer, 2010; Perry-Smith, 2006) or creative ideas and solutions can be generated in dyads or collectives

(Hargadon & Bechky, 2006; Sosa, 2011). The mechanism underlying a social perspective on creativity is access to diverse knowledge through relationships. To the extent that social contacts can offer new knowledge or perspectives to a focal person, relationships have the potential to be generative of creativity. When an individual on one work team interacts with someone on another team, this relationship crosses an organizational boundary that separates groups of people doing different things, and, de facto, offers an opportunity to acquire non-redundant knowledge that can be learned and recombined with existing knowledge for innovation (von Hippel, 1988).

However, individuals are not automatically receptive to external contacts' knowledge outside of what is needed for a prescribed task. Individuals employed by organizations do not unilaterally choose interaction partners; instead, many of their interactions are necessitated and determined by the organization (D. Katz & Kahn, 1978; March & Simon, 1958), and they may not be willing to spend the time and effort required to assimilate knowledge and perspectives that are different from their existing knowledge base (Carlile, 2004; Dougherty, 1992). Besides being costly, using knowledge acquired through external contacts to generate new ideas can also be risky because such efforts do not necessarily yield new ideas or creative solutions. The propensity of individuals to incur this risk should be associated with its perceived benefits, which include those benefits accruing from people's attachments to one another and to the groups to which they belong.

Social identity and Creative Generativity

In his pioneering work, Tajfel (1972: 31) defined social identity as an individual's "knowledge that he or she belongs to certain groups together with some emotional and value significance to him [or her] of that group membership." Identification derives not only from features of the social context, e.g., prestige or group values, but also from the degree of fit between these features and characteristics of the individual (Haslam, 2004; Haslam & Ellemers, 2005). Social identity expands one's sense of self to the group-level, and, thus, generally motivates strongly identified people to act on behalf of these groups (Ellemers, 2012; Haslam & Ellemers, 2005). Although ingroup favoritism, e.g., preferential resource

allocations (Brewer, 1979), was initially demonstrated in settings contrasting an ingroup with an outgroup, scholars increasingly recognize that people can identify with multiple groups (Gaertner & Dovidio, 2000; Haslam & Ellemers, 2005; Hornsey & Hogg, 2000). In organizational settings, employees may develop varying degrees of identification with local groups, e.g., team, as well as with inclusive, superordinate groups, e.g., division. Though identification with nested groups is often correlated (Ashforth & Johnson, 2001; Haslam, Eggins, & Reynolds, 2003), these identities can be independent such that an employee may identify strongly with a team and weakly with a division or vice-versa (Millward, Haslam, & Postmes, 2007; Riketta & van Dick, 2005; van Knippenberg & van Schie, 2000).

Our theoretical model draws on the recognition that individuals can identify to varying degrees with multiple groups, positing that social identification with nested organizational groups, e.g., team and division, separately, directly, and differentially influences creative generativity. Teams and divisions represent different social contexts vis-à-vis the creative generativity of relationships within organizations. Whereas the team is a local group with the potential to separate focal individuals from their contacts on other teams, the division is an inclusive, superordinate group that acts as an alternative identification target with the potential to unite focal individuals and their contacts on other teams. As we elaborate in the following sections, we propose that the extent to which individuals realize the creative generativity of interacting with external contacts will be negatively associated with the strength of their own work team identity and positively associated with the strength of their own and their external contact's division identity.

Team-Level Social Identity as an Impediment

Social identity derived from one's work team is likely to impede the creative generativity of interactions with colleagues on other work teams. Interacting with an external contact (alter) cannot spark creative ideas for a focal individual (ego) unless the interaction is rich enough for diverse knowledge to be uncovered. Social identification can ease social interaction in ways that support the emergence of such diverse knowledge. People who strongly identify with a group, for example, are trusting of and likely to

afford the benefit of the doubt to members of that group (Brewer & Kramer, 1985; Pettigrew, 1979). Feelings of closeness that come with strong identification also play a role in enriching social interaction (Wilson, O'Leary, Metiu, & Jett, 2008). These ingroup-favoring ways of thinking and feeling about others can lead to rich interactions in which much knowledge is shared, misunderstandings can be overcome, and affordances can be made. The more people identify with a local group, however, the less likely they are to grant such affordances to people outside of the group. This means that egos who strongly identify with their own team may be unlikely to engage in interactions with external contacts that are rich enough for much of their diverse knowledge to emerge.

Creative generativity not only requires that diverse knowledge emerges in boundary-spanning interactions with alters, but also, as suggested earlier, that egos attend to it sufficiently for it to spark their own ideas. Yet the more people identify with a social group, the more they focus on the group, its concerns, and its members as rewards accrue from supporting valued groups (Haslam & Ellemers, 2005). In organizational contexts, strong work team identity has indeed been associated with employee motivation, job involvement, and cooperative team-supporting behaviors (Riketta & van Dick, 2005; Tyler & Blader, 2001; van Knippenberg & van Schie, 2000). Such attention to one's own team and its members contributes to team effectiveness, but it also implies a concomitant degree of inattention to those colleagues located beyond work team boundaries. People have limited capacity to process information such that attention allocated for one use is unavailable for another use (Newell & Simon, 1972). This means that egos who identify strongly with their team should have few remaining cognitive resources available for attending to external contacts' knowledge.

Strong identification with one's work team may lead an ego to consider an external contact's knowledge so cursorily that he or she has little chance of uncovering the diverse knowledge needed for the interaction to be generative of creativity. Consistent with this reasoning, participants who strongly identified with a group were found to pay little attention to and generate few arguments in response to persuasive messages shared by members of a different group (van Knippenberg, 1999; van Knippenberg & Wilke, 1991). The propensity to only cursorily consider ideas from outside of one's social identity

group may explain the negative association found between strong organizational identification and scientists' creative output in one of the few empirical studies of social identity and innovation (Rotondi, 1975). In such cases when people identify strongly with an organizational group, their focus on that group comes at a cost as they are disinclined to thoroughly consider what others beyond their group boundary have to offer, ultimately limiting their access to diverse knowledge. For these reasons, strong team identity should interfere with creative idea generation from interactions with an external contact.

> Hypothesis 1. *The strength of a focal individual's team identity will be negatively associated with the creative generativity of a boundary-spanning tie.*

Strong ties compensate for negative effect of strong team identity

Social network tie strength has been studied as an important feature of relationships since Granovetter's (1973) seminal work. Strong ties are interpersonal connections that involve frequent interaction, emotional intensity, and intimacy (Granovetter, 1973; Perry-Smith, 2006). Because strong ties tend to be embedded in a structure of interconnected relationships, they are generally less likely to be structurally bridging (i.e., connecting separate parts of a social network) and less likely to access non-redundant knowledge (Baer, 2010; Granovetter, 1973; Perry-Smith & Shalley, 2003). Studies in the social network literature find that strong ties that are also boundary-spanning can be particularly useful for creative outcomes since they offer both diverse knowledge and frequent interaction through which diverse knowledge can be transferred (Tortoriello, Reagans, & McEvily, 2012). For example, Sosa (2011) shows that individuals are more likely to generate creative idea from strong tie relationships. In addition, Tortoriello and Krackhardt (2010) show that social ties from one research and development lab to another that are both strong and embedded are critical for generating innovation.

Though these previous studies show that tie strength can directly influence creative outcomes, we propose that it also has the potential to moderate the impeding effect of a strong team identity. In the workplace, where task interactions tend to be directed by organizational needs (D. Katz & Kahn, 1978; March & Simon, 1958), people who strongly identify with a work team can develop strong ties to others

outside of their team. Indeed, employees are often required to interact frequently with members of other work teams to coordinate efforts. Such interactions may uncover commonalities that lead to homophily, i.e., similarity-attraction (Homans, 1950; McPherson, Smith-Lovin, & Cook, 2001; Reagans, 2005). Such perceptions of similarity have been found to underlie interpersonal liking and to distinguish it from social or group-based liking (Hogg & Hains, 1996)[1]. This is noteworthy because it illustrates how employees, independently of their social identification with organizational units, can develop strong interpersonal ties with members of different work teams. In addition, individuals can maintain contacts when they change jobs, and strong ties formed in a prior job can remain relevant even after a person has moved to a new organizational unit (Dokko & Rosenkopf, 2010; Kleinbaum, 2012). When people have strong interpersonal ties to one another, relational concerns come to the foreground and group concerns tend to fall into the background (Brewer & Gardner, 1996). This means that an individual with a stronger boundary-spanning tie may be less likely to take into account team identity and conversely more likely to be motivated to support his or her connection with an external contact when noticing and considering the knowledge provided by that external contact. Therefore, though a locally-derived social identity such as a team identity is likely to interfere with generally finding boundary-spanning ties generative of creative solutions and ideas (Hypothesis 1), the strength of a particular relational tie should have an offsetting effect.

> Hypothesis 2. *Tie strength will attenuate the negative association between team identity and the creative generativity of a boundary-spanning tie.*

Superordinate Social Identity as a Facilitator

An individual's identification with a superordinate organizational group, e.g., a division that encompasses multiple teams, is likely to enhance the creative generativity of boundary-spanning social

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[1] Interpersonal liking can be viewed as a form of relationship-specific attraction arising from perceived similarities between the idiosyncratic characteristics of individuals in the relationship, whereas social liking can be viewed as a form of depersonalized attraction arising from identification, prototypicality, and, more generally, self-categorization processes (Hogg & Hains, 1996).

ties. To the extent that individuals identify with common, superordinate organizational units, they are likely to perceive others on different work teams as belonging to a common psychological ingroup (Gaertner & Dovidio, 2000). Superordinate identification has been found to influence how individuals treat members of the overarching group (Dukerich, Golden, & Shortell, 2002; Hinds & Mortensen, 2005; Mael & Ashforth, 1995). Physicians, for example, who identified strongly with their health care system, a superordinate group, displayed more cooperative behaviors than their counterparts with weaker superordinate identities (Dukerich, et al., 2002). Extending the boundaries of an ingroup to a higher-order level than a work team enables a more diverse set of people to share a sense of belonging to an overarching "we" (Argote & Kane, 2009). This also has the potential to help overcome the tendency to ignore ideas developed elsewhere, termed the "Not-Invented-Here" syndrome (R. Katz & Allen, 1982), as the psychological group boundary encompasses co-workers outside of an immediate work team and expands not only the sense of who "we" are but also of what is considered to be "Here".

Strong superordinate identity may render individuals receptive to diverse knowledge from contacts outside of their immediate work team (Kane, Argote, & Levine, 2005). These individuals may allocate the cognitive resources necessary due to a favorable impression of fellow superordinate group members and a desire to uncover value within their common group, i.e., own division. Supportive of this notion, evidence is emerging that such an identity influences how much groups attend to one another's knowledge. For example, in an experimental study of knowledge transfer, participants who strongly identified with a superordinate group considered new production routines thoroughly enough to uncover superior ones, even when the source of the new routine was a newcomer and the merits of the routine were not evident (Kane, 2010). Along related lines, strong superordinate identities were shown to reduce conflict among geographically dispersed co-workers (Hinds & Mortensen, 2005), which could interfere with recognizing the value of another's diverse knowledge. Finally, performance has been found to be higher for cross-functional product development teams with a strong superordinate identity, suggesting that it enables the sharing of unique knowledge across functions (Sethi, 2000).

Therefore, a strong superordinate identity is likely to increase receptivity to knowledge held by contacts in different organizational subunits. Relationships that span organizational boundaries, e.g., cross into other work teams, provide access and exposure to non-redundant knowledge and models of behavior (Reagans & Zuckerman, 2001), while identification with a superordinate group, e.g., a division or organization, provides the motivation to notice and consider all the external contact has to offer. In this way, a superordinate social identity can enhance creative generativity by expanding employees' social sense of self to include people outside of a formal organizational work team.

Hypothesis 3. *The strength of a focal individual's superordinate identity will be positively associated with the creative generativity of a boundary-spanning tie.*

Finally, the characteristics of either party in a relationship can affect its functioning. Though superordinate identity should increase a focal individual's propensity to find their external contacts useful for generating innovative ideas, the external contact's own social identity might also be important. In particular, an alter's superordinate identity can influence the value that the focal individual finds in the relationship because it can affect the alter's likelihood of offering knowledge. In general, employees may not share knowledge across organizational boundaries as self-interest can motivate hoarding (Babcock, 2004; Constant, et al., 1994; Maurer, et al., 2011). Furthermore, offering knowledge, especially knowledge that is not directly related to a specific task, can be socially risky. To the extent that recipients of such knowledge do not find value in it, providing knowledge carries with it some risk of harming one's own reputation, which is heightened in boundary-spanning interactions as contacts have limited information about what one another would find useful for creative idea generation. Even competent and well-intentioned alters run the risk of providing ideas that are redundant, irrelevant, or incorrect for ego.

The propensity to incur the risks of offering knowledge should be associated with its perceived benefits, which are likely to vary as a function of alter's identification with a superordinate group (e.g., division) due to the concomitant social attraction and social rewards. To the extent that people identify with a group, they tend to feel social attraction to fellow group members, and generally consider them to

be likeable and trustworthy (Ellemers, 2012; Hewstone, Rubin, & Willis, 2002). Trust, which is defined as the willingness to take risks and rely on another (Rousseau, Sitkin, Burt, & Camerer, 1998), reduces the risk of sharing information (Penley & Hawkins, 1985). Indeed, social network research demonstrates that when contacts trust one another they share more useful knowledge (Levin & Cross, 2004). Alters may be more willing to offer a wider range of knowledge and share knowledge that is not directly task-relevant when they derive a stronger social identity from a superordinate group that also includes ego. A wider range of knowledge offered should provide more non-redundant information that can be used toward creative idea generation. Moreover, as identification creates feelings of closeness that can enrich interaction (Wilson, et al., 2008), it has the potential to motivate richer interactions characterized by creative exchanges that build on each other's ideas (Amabile, 1988; Hennessy, 2003).

Strong identification with a superordinate group is likely to expands an alter's sense of self to include ego such that alters also reap social rewards from offering knowledge to ego. First, it may be rewarding to merely offer knowledge as doing so enables strongly identified alters to see themselves as generous towards and supportive of their superordinate group. Second, strongly identified alters may derive additional social rewards from offering knowledge that has the potential to contribute to the generation of creative ideas within their superordinate group. After all, creativity is an increasingly valued characteristic in organizations (Baer, 2012), and people, on average, find it rewarding to identify with positively distinct groups (Haslam & Ellemers, 2005). To the extent that alters identify with a superordinate group that includes ego, they are likely to view as potentially rewarding the provision of knowledge to ego because doing so increases the likelihood that creative ideas are generated within their superordinate group.

Hypothesis 4. *The strength of the external contact's superordinate identity will be positively associated with the creative generativity of a boundary-spanning tie.*

Data and Methods

We investigate our questions about social identity, tie strength, and creative idea generation in the context of computer memory component development teams in a division of a large multinational high-tech company where cross-team interactions are prevalent. The division is formally organized by team, with each team reporting to a supervisor. Work teams are responsible for highly distinct, yet complementary, sub-categories of components or aspects of product development or testing. Although teams share an underlying technological platform, the specific activities they perform, the nature of the problems they focus on, and their expertise and knowledge differ. For instance, the new materials development team, the device testing team, the lithography team, and software interface development team engage in distinct parts of computer memory prototyping, testing, and development. This setting is well suited to for an investigation of the generativity of boundary-spanning relationships because teams are physically co-located and the size of each team is small, which results in frequent interaction with members of other teams. These interactions are largely dictated by task and technological requirements, and they can include both formal and informal conversations about work.

The data used in this study come from multiple sources: a survey of researchers working on development teams, archival data on team assignments, the formal organization chart, and individual demographics such as gender, tenure, and education provided directly by the company. The survey was developed after extensive interviews with company informants, and pre-tested before being sent out to all 118 members of the division's personnel identified by senior management as scientists, engineers and other researchers with active research and development duties in the division. According to the division's organization chart these researchers were assigned to 26 different development teams comprised of two to eleven people ($M = 4.5$, $SD = 2.4$). The survey yielded 87 complete responses, for a response rate of 73.7%. We tested for non-response bias but did not find any statistically significant difference between respondents and non-respondents in terms of tenure, education, or gender.

The survey was comprised of two parts: a network questionnaire to assess the extent and nature of working relationships, and a social identity questionnaire to assess individuals' team identity and division

identity. Since our questions and hypotheses are relational in nature, we used a sociometric approach to identify work relationships perceived as important by respondents (Reagans & McEvily, 2003). To identify boundary-spanning relationships, respondents were first presented with a list of co-workers in the division and asked to indicate the people they had interacted with over the past two years who were important for the respondent's professional activity. Respondents provided a total of 681 external contacts, i.e. contacts on other work teams, for an average of 7.8 boundary-spanning ties per respondent. Because of missing data, the total usable sample is composed of 673 boundary-spanning relationships. For each of these ties to an external contact, we asked respondents specific questions about the strength of the relationship (frequency of interaction) and the generativity of the relationship for creativity.

Analytical Approach

As suggested above, the data have a dyadic relational structure, where each respondent researcher (ego) has multiple contacts (alters) on other work teams. In the dyadic structure, each individual researcher is included in multiple observations because he or she reported on multiple relationships. Therefore, the observations are not independent within-person. If uncorrected for, this non-independence would result in artificially deflated standard errors and a model that appears to fit better than it actually does. An individual fixed-effects approach represents a commonly adopted solution to this estimation problem (e.g., Reagans, 2005; Reagans & McEvily, 2003; Stuart, 1998). Individual fixed-effects specifications address the non-independence of observations by introducing a dummy variable for each ego and alter in a dyadic observation. Including individual-level dummy variables essentially backs out the mean effect (i.e., the fixed effect) of each person, leaving only the within-person variance. Additionally, we apply this fixed effects approach to an ordered probit model (e.g., Mouw, 2003), since our dependent variable is a survey scale with five discrete ordinal values.[2]

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[2] We chose ordered probit modeling to allow for non-normality in the distribution of the dependent variable. However, results using ordinary least squares regression are fully consistent with the findings reported here. Tables available from authors.

Variables

Table 1 contains descriptive statistics and bivariate correlations for the study's variables.

[insert Table 1 about here]

Creative generativity of a boundary-spanning tie. Because our dependent variable focuses on the dyadic micro-social processes of innovation we use an established survey measure that captures a respondent's ease of generating creative ideas when interacting with a specific partner (Sosa, 2011). We focus on the generation of innovative ideas as a critical phase of innovative performance in that it is the initiating "spark" for innovation. Specifically, we asked each respondent (ego) to rate, for each external contact (alter), how strongly they agreed with the statement: "When I interact with this person, it is easy for me to generate creative solutions and/or ideas." The response instrument was a five-point scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). Responses to this question covered the full available range from 1 to 5 with a mean of 3.2 and a standard deviation of 1.09. By asking respondents to consider innovative value for each separate alter, we shift focus away from a focal individual as the sole source of innovation and toward a recognition of innovation as an inherently social process involving an innovator, his/her contacts, and their relationships with each other (Hargadon & Bechky, 2006; Sosa, 2011). Although knowledgeable experts can ultimately determine the creativity of specific ideas once they are formed, external raters cannot provide data regarding the creative generativity of a relationship between an ego and an alter. Indeed, knowledge recipients in dyadic interactions are the only ones able to provide a veridical assessment of each of their relationships in terms of creative generativity, which is why we relied on the recipient's evaluation. A similar methodology has been used in studies of knowledge transfer, which have relied on one relational partner to provide an assessment of the ease of transferring knowledge to another relational partner (Reagans & McEvily, 2003; Tortoriello, et al., 2012).

Social identity. Key independent variables of interest have to do with social identity. As part of the survey, we asked researchers to assess their identification with their own team and with the superordinate division. Since we hypothesize about the effects of ego's social identity and alter's social

identity, we distinguish these measures for each member of the dyad, recording team- and division-level identity for the ego (*Ego's team id* and *Ego's division id*) and division-level identity for the alter (*Alter's division id*) in each dyad. Note that these measures are self-reported, meaning that ego's social identity measures come from the questionnaire that ego completed, while alter's social identity measure comes from the questionnaire completed by alter. Consequently, alter's social identity is self-assessed, and not ego's perception of alter's social identity.

Team identity was measured with a five-item scale (based on Mael & Ashforth, 1992) that have been shown to reliably capture social identity across a wide variety of contexts (Haslam, 2004). Sample items included "My team's successes are my success," and "When I talk about my team, I usually say 'we' rather than 'they'." Parallel questions were asked about division identity. Responses could range from 1 (strongly disagree) to 7 (strongly agree) on each scale, and the two identity variables represent the average of responses for each seven-item scale. Team identity ranged from 1 to 7, with a Cronbach's alpha of .81. Division identity ranged from 1.2 to 7, with a Cronbach's alpha of .81

Tie strength. We assess tie strength with frequency of communication on work-related topics (Levin & Cross, 2004; Morrison, 2002; Reagans & McEvily, 2003). Tie strength has also been operationalized with other of its dimensions, such as emotional intensity (see Granovetter, 1973; Marsden & Campbell, 1984), which is especially appropriate when close ties that have been dormant, with infrequent recent interaction, are reactivated to acquire information (Levin, Walter, & Murnighan, 2011). However, studies of social networks in a single business organization have consistently found measures of communication frequency and emotional closeness to load on a single dimension (e.g. Hansen, 1999; Levin & Cross, 2004; Reagans & McEvily, 2003), suggesting that either measure can serve as a valid indicator of tie strength in such settings.

As part of the survey, we asked researchers to indicate the frequency with which they interacted with each of the contacts in their network for "information or knowledge on work-related topics." Responses could range from 1 (Rarely) to 5 (Very frequently). Responses to this question covered the full available range from 1 to 5 with a mean of 3.10 and a standard deviation of 1.13. Using a standard

approach in network research (Burt, 1992) we computed network proportions to express tie strength. For every dyad, we used:

$$p_{ij} = z_{ij} \Big/ \sum_{q=1}^{N} z_{iq} \quad q = j$$

where the frequency with which respondent *i* interacts with respondent *j* (z_{ij}) is divided by the aggregate level of interaction in a person's (*i*'s) network. This measure ranges in values from 0 to 1, with greater values of p_{ij} identifying a person's comparatively stronger ties while smaller values of this measure identify comparatively weaker ties. In our particular case we observed a distribution skewed toward weaker ties with a mean value of .09 and a standard deviation of .05 (min = .009, max = .36).[3]

From the independent variables of interest, we develop an interaction variable (*Ego's team id x Tie strength*) to test Hypothesis 2, which concerns the interaction between ego's team-level identity and the strength of the tie to alter. To eliminate nonessential collinearity, we mean-center the variables used in the interaction term (Jaccard, Turrisi, & Wan, 1990).

Control variables. Since we situate our study in a single division of a single firm and sampled researchers at the same organizational rank, many factors about the context are accounted for, such as reward systems, organizational culture, and hierarchical status. We controlled for a number of factors that might affect the propensity of ego to generate innovative ideas when interacting with alter. First, we controlled for ego's overall *Network size*, derived from the survey data. The size of ego's social network may be related to their overall need to generate innovative solutions, or it may affect the likelihood of finding each individual contact useful for innovative performance. We do not predict a direction for this variable, but we include it in our models to control for its effects. Second, we include controls for relational demography to account for homophily effects (McPherson, et al., 2001). These controls include *Same sex*, coded 1 if both ego and alter are the same sex; *Education difference*, which is the absolute

[3] Given the name generating question we used to elicit answers about respondents' networks (i.e. "please indicate individuals who have been *an important source of knowledge* for you in the past two years") strong ties might be overrepresented in our dataset. However, by focusing on the relative frequency of interactions among contacts so obtained, we still observe enough variation in terms of comparatively stronger/weaker ties.

difference between ego's and alter's level of education (1 = PhD, 2 = Master, 3 = College); and *Tenure difference*, which is the absolute difference between ego's and alter's years of tenure at the company.

Third, we control for structural equivalence to account for similarities in the network position occupied by individuals. Occupying similar network positions (i.e., being connected to similar alters) might facilitate communication and ability to act upon each other's knowledge, or conversely, might reduce the amount of the diverse information available for generating innovative ideas. Following Reagans and McEvily, (2003: 257) we use the following formula for structural equivalence: [4]

$$se_{ij} = \sqrt{\sum_{q=1}^{87} \left(z_{iq} - z_{jq}\right)^2 + \left(z_{qi} - z_{qj}\right)^2}$$

The formula above is a measure of network similarity based on the Euclidian distance between patterns of network interactions between any two given individuals in our sample. For each dyad *ij*, the formula captures differences/similarities in the frequencies of interactions (*z*) that individuals *i* and *j* have in common across all the possible colleagues identified by the subscript *q*. Higher values indicate that two individuals are "more dissimilar" in that they tend to interact with different contacts inside the organization while lower values identify situations in which individuals are "more similar" (i.e., they tend to interact with the same set of contacts).

To control for possible confounding effects defined at the team level of analysis, we introduced a set of dummy variables to control for individuals' team affiliations.[5] Finally, individuals differ in a number of ways that may affect their general propensity to innovate or be generative of innovation. These individual attributes, while unobserved, could at least in part be correlated with our dependent variable and thus affect our findings. Our implementation of fixed effects, as described earlier, allows us to control for unobserved differences among respondents and among respondents' contacts. In particular, within each dyad, dummy variables for the parties involved are set equal to one, while all the others are

[4] Binary data, instead of valued data, can also be used to generate structural equivalence measures. Our results are robust to a structural equivalence measure based on binary data.
[5] Results remain robust to the inclusion or the exclusion of these team controls. A table of results without team dummy variables is available from authors.

set equal to zero. These dummy variables control for unobserved characteristics of respondents and contacts that might bias our results. For instance, respondents rating their contacts high on generativity, might do that in an effort to emphasize their own level of innovativeness, or they might have a general propensity to mark high responses on surveys; or, there might be unobserved differences among contacts in terms of their ability to generate new ideas in others. Through the use of a two-way fixed effect, we are able to take these possible confounding effects into account, thus providing a more accurate test of our theoretical model (Wooldridge, 2002).

Results

Table 2 displays results obtained from a series of ordered probit models of creative generativity that control for individual differences with person dummy variables and for team affiliation with team dummy variables. Model 1 is a controls only model. Model 2 adds main effects, and Model 3 is the full model including the interaction effect. Results for the full model are discussed.

[insert Table 2 about here]

Hypothesis 1 predicted that the strength of a focal individual's locally-derived social identity, team identity, would have a negative effect on the creative generativity of interacting with a contact on another work team. As shown in the full model (Model 3), the coefficient for *Ego's team id* is negative and significant, $b = -.40$, $p < .001$, indicating support for Hypothesis 1.

Hypothesis 2 predicted that strength of the tie between a focal individual and each of his or her external contacts would attenuate the negative association between team identity and the creative generativity of a boundary-spanning tie. The coefficient for the interaction term *Ego's team id x Tie strength* is positive and significant in Model 3, $b = .18$, $p < .01$, suggesting support for Hypothesis 2. To corroborate this finding, we conducted a marginal effects analysis and explored the statistical significance of the slopes of these relationships (using "margins" in Stata). This type of analysis is particularly important for non-linear models like the ordered probit we use here, as the coefficients of interactions for

these models are not necessarily indicative of the true shape of the relationship (Brambor, Clark, & Golder, 2006; Greene, 2010; Hoetker, 2007). In the marginal effects analysis, the simple slope of the relationship is calculated at multiple points over the range of the moderator, and each of these slopes is tested for statistical significance. By observing how the slope of the relationship changes over the range of the moderator, the direction of the interaction is confirmed. In particular, we took the derivative of the relationship between ego's team identification and creative generativity at increasing values of tie strength. Results show that the slope increases in value over the range of tie strength, thus confirming the positive moderating effect of tie strength in the negative relationship between ego's team identification and creative generativity. To illustrate the moderating effect of tie strength, we plotted the relationship between team identity and creative generativity at different levels of tie strength.

[insert Figure 1 about here]

As Figure 1 illustrates, when tie strength is equal to zero, the relationship between team identity and creative generativity has a negative slope, consistent with the findings supporting Hypothesis 1. When tie strength values increase; however, the relationship between team identity and creative generativity becomes progressively less negative with the slope turning positive for greater values of tie strength. At the same time, the marginal effects analysis also reveals that statistical significance for the change in slope is only obtained for values of tie strength smaller or equal to 0.12. Recall that tie strength expresses strength of a particular tie relative to ego's other ties, ranging between .009 and .36 in our data, with a mean of .09, so this cutoff of .12 represents over 80% of our observations. We can conclude that tie strength does moderate the negative association between team identity and creative generativity over a range of values that is substantively meaningful; i.e. over 80% of observations in our sample. It is also worth noting that an additional analysis, a simulation-based approach that uses confidence intervals to understand regions of significance for interaction effects, also yielded essentially the same results (Brambor, et al., 2006; Zelner, 2009). Taken together these analyses indicate that tie strength attenuates the negative effect of an ego's team identity, supporting Hypothesis 2.

Hypothesis 3 predicted that the strength of the ego's division identity would be positively associated with the likelihood that he or she finds contacts on other work teams useful for innovative idea generation. The positive and significant coefficient in Model 3 for *Ego's division id*, $b = .39$, $p < .01$, supports this hypothesis, by showing that the focal individual's superordinate identity contributes to the tie's creative generativity. Finally, Hypothesis 4 predicted that the strength of alter's superordinate identity would be positively associated with the creative generativity of a boundary-spanning tie. As shown in Model 3, the positive and significant coefficient of *Alter's division id,* $b = .35$, $p < .01$ supports this hypothesis. Taken together, these findings suggest that superordinate social identity affects the innovation-related attitudes and behavior of both participants in a boundary-spanning relationship.

Coefficients for control variables show that differences in the demographic characteristics of gender, education and tenure do not appear to influence the extent to which a boundary-spanning tie makes it easier for a focal individual to generate innovative ideas and solution, in a model that includes network characteristics and relational characteristics. At the same time, network and relational characteristics, i.e. network size, tie strength and structural equivalence all show strong effects in expected directions. Finally, we performed additional analysis to check the robustness of our main analysis. We do not hypothesize about alter's team identity, since its independent effect should not interfere with the effects of other variables, and indeed, inclusion of this additional control yields results that are substantively unchanged. Second, we conducted an analysis controlling for indirect structural constraint, which Sosa (2011) found to be a determinant of creative generativity. Consistent with Sosa (2011) we observed that this variable was not statistically significant as a linear term but became significant when a quadratic term was added, suggesting an inverse-U shaped relationship between constraint and generativity. Our results are also robust to the inclusion of this control.

Discussion

The structure of relationships affects an individual's access to diverse knowledge; however, access

is only the first step to using diverse knowledge for creativity or innovation. In this study, we focus on social ties that span organizational boundaries, and our theoretical model propose that the generativity of these ties for creative ideas and solutions is influenced by the strength of social identity derived from nested organizational units – a local team nested in a superordinate division – and the strength of the relational tie. In doing so, we address the question of why boundary-spanning ties are not always useful for creativity. Social network studies have established that ties that reach across groups have generally positive relationships with a range of innovation outcomes (e.g. Corredoira & Rosenkopf, 2010; Hansen, Mors, & Lovas, 2005; Hargadon & Sutton, 1997; Reagans & Zuckerman, 2001; Song, Almeida, & Wu, 2003). However, recent work has found that individuals vary in their use of these ties for innovation (e.g. Fleming, et al., 2007; Obstfeld, 2005), and that characteristics of the contacts and relationships also condition when diverse knowledge accessed through ties leads to creativity and innovation (Perry-Smith, 2006; Sosa, 2011). We extend this line of research by incorporating social identity as a social psychological characteristic of a focal individual, in addition to the social identity of the alter and the strength of the relational tie into an understanding of when boundary-spanning ties lead to creative generativity.

The study findings are supportive of our theoretical model. The strength of individuals' identification with a local team is negatively associated with creative generativity, though this negative relationship is moderated by tie strength such that a strong boundary-spanning tie can attenuate or even overcome the effects of a strong team identity. Whereas identity at the local level acts as an impediment to the creative generatively of boundary-spanning ties, identity at the superordinate level acts as a facilitator. We find that the strength of individuals' identification with the superordinate division is positively associated with creative generativity of ties with external contacts. Recognizing that contacts' themselves play an important role, we further hypothesize and find that the contacts' strength of identification with the superordinate division also facilitates a creatively generative relationship.

Although not hypothesized, our results show that when individuals have a very strong boundary-spanning tie the association between team identity and relational generativity is positive. Strong

interpersonal relationships may not only mitigate identity-related barriers to relational generativity, but also lead to the emergence of positive correlates of team identification found in previous research, such as job involvement and motivation (Hirst, Van Dick, & van Knippenberg, 2009; Riketta & van Dick, 2005; van Knippenberg & van Schie, 2000). It also is interesting to note that an employee's superordinate, i.e., division, identity remains positive and significant, even when his or her local, i.e., work team, identity is included in the model. Though social identity at local and superordinate levels are conceptually distinct, it is possible to derive social identity from multiple groups at the same time, especially when they are compatible with each other (Dovidio, et al., 2009; George & Chattopadhyay, 2005). Recall that social identities derived from hierarchically-nested organizational groups tend to be compatible and overlapping, since higher level identities are usually inclusive of lower level identities (Ashforth & Johnson, 2001; Haslam, et al., 2003). Despite this overlap, identity at the two levels has empirically distinct effects, and more importantly, our findings suggest that strong identification with a superordinate unit can supply the motivation to find value in boundary-spanning relationships, without necessarily diluting team effectiveness benefits, e.g., job involvement, motivation, associated with a strong local identity.

Implications for social network theory and social identity theory

We contribute to the social networks literature by distinguishing between the general usefulness of boundary-spanning ties for innovation and the propensity to actually use external knowledge. Prior literature has addressed the opportunity and ability to use external knowledge for creativity and innovation by examining social network structure and characteristics of the knowledge held by both participants in the relationship (e.g., Perry-Smith, 2006; Rodan & Galunic, 2004). However, these explanations do not address the motivation to use knowledge from external contacts. To go further and actually use the external knowledge to generate innovative ideas requires an additional openness to unfamiliar knowledge that can be motivated or impeded by social identity (Lomi, et al., 2013).

In addition, our findings address the relationship between tie strength and creativity. Most previous research in creativity has found a consistent relationship between weak ties and creativity (Baer, 2010;

Perry-Smith, 2006; Zhou, et al., 2009). By contrast, our results suggest that strong ties have a positive effect on one aspect of creativity, which is consistent with what Sosa (2011) found. The seeming divergence in these findings can be explained in two ways. First, we study only one aspect of creativity, which might capture different causal relationships than a measure of overall creativity. For example, there is some evidence that strong ties enable an individual to champion creative ideas leading to their implementation (Baer, 2012; Kijkuit & van den Ende, 2010). In our study, tie strength might be more predictive of an explicitly relational aspect of creativity than creativity more generally. Second, these other studies compare weak and strong ties for all of ego's relationships. By contrast, we limit our focus to boundary-spanning ties, which is a boundary condition of our study. Tie strength might operate differently for boundary-spanning ties versus all ties. Strong ties within the same organizational unit could indicate a redundancy in knowledge that does not contribute to diversity; however, once ties reach outside of a knowledge group, tie strength may serve as a way to overcome social and knowledge differences and enable knowledge transfer (Krackhardt, 1992; Tortoriello, et al., 2012).

Next, our focus on the creativity generativity of the tie encourages reflection about the alter in the social tie. Despite the recognition that generating creative workplace ideas and solutions involves social processes (Hargadon, 2006; Hargadon & Bechky, 2006), relatively little attention has been paid to understanding why different relationships are differentially generative of innovation and which contacts inspire or catalyze creative thinking. Indeed, individuals may interact with a number of colleagues in different organizational units who have unique knowledge, but not all of these ties make it easier to generate creative workplace ideas and solutions. The few studies that examine the influence of alter characteristics have focused on the diversity of knowledge that alters bring (Moran, 2005; Perry-Smith, 2006; Sosa, 2011). Our study adds to this emerging stream, showing the explanatory value of examining the social identity of the alters.

In addition to extending theory about social networks and innovation, our theory and results concerning the divergent effects of a local team identity and a superordinate division identity contribute to the study of social identities in organizations in important ways. First, we respond to the call made by

Haslam and Ellemers (2005) that scholars enrich theories by examining identity at the level most proximal to the organizational activity of interest, in our case, team and division. Second, most studies have tended to focus on the effects of identity at only one level, e.g., team identity improves team climate or organizational identity increases organizational satisfaction (for a meta-analytic review, see Riketta & van Dick, 2005). We significantly extend upon this work by focusing on the two proximal levels around a boundary-spanning organizational activity, i.e., the creative generativity of interacting with contacts on other work *teams* within the same *division*. Our theory further highlights that each level can represents a distinct social context with opposite effects on the outcome with the superordinate identity acting as facilitator and the local team identity acting as an impediment. Third, we also respond to calls that scholars give greater consideration to the negative effects of identification in organizations (Elsbach, 1999; Haslam & Ellemers, 2005; Riketta & van Dick, 2005). Moreover, the negative effect of a strong team identity on creative generativity substantiates warnings by scholars that strong local identities can motivate group-supporting behaviors that undermine organizational activities (Haslam & Ellemers, 2005; Riketta & van Dick, 2005). Finally, our study demonstrates the value in examining more than one level of identity proximal to the organizational activity of interest and in considering both the potentially positive as well as the negative effects of such identities.

Finally, social interaction and social or personal identity can have a recursive relationship, such that each shapes the other (Ibarra, Kilduff, & Tsai, 2005; Luckmann, 2008). In wholly informal networks, where individuals establish relationships based on selected dimensions of homophily (Mehra, Kilduff, & Brass, 1998), distinctions between social identity effects and social network effects might blur, especially over time. However, social interactions within organizations, even those outside of formally-defined relationships, are not completely at the discretion of employees. Moreover, formal intra-organizational boundaries, such as those around work teams, circumscribe meaningful identity groups. Thus, though social identity and social networks may be related in complex ways over time, they can be distinguished, and our study demonstrates that they have separate effects. The dynamic relationship between social identity and social networks, bears closer investigation, and could provide a fruitful area for future study.

Limitations and future study

Though we addressed important alternative explanations by controlling for overall social network interactions, demographic similarity between individuals in the dyad, and unobserved characteristics of these individuals and the teams they belong to, there are some limitations to this research worth noting. First, our measure of creative generativity is a single-item, perceptual measure. Although the measure has been established in previously published research (e.g., Sosa, 2011) and such single item measures are common in network research (Krackhardt, 1990; Reagans, 2005), issues of construct validity may arise if the item does not capture key dimensions. To mitigate such concerns, we followed Marsden's (1990) sociometric procedures, which include carefully defining specific question items, focusing on long-term patterns of relationships rather than on interactions limited to particular situations or narrowly defined periods of time, and pretesting the instrument (Borgatti & Cross, 2003; Freeman, Romney, & Freeman, 1987; Wasserman & Faust, 1994). In addition, fixed effects modeling controls for unobserved heterogeneity in both participants of the relationship, and mitigates concerns that an unmeasured factor related to either person is driving results. Next, our use of a perceptual measure could mean misidentification of creatively generative relationships. Creative processes can be implicit, such that individuals may not perceive inputs to the creative process accurately, and might associate close relationships, e.g. friendships, with creative generativity through halo processes. To the extent that strong ties represent close relationships, we control for this effect, though it remains a limitation of our measure. Finally, our measure of creative generativity reflects a narrow conception of creativity. Rather than measuring the complete construct of individual creativity, we focused only on the initial phases of innovative performance. Relationships may also play an important role in later phases as colleagues reach out to one another to help them not only solve problems but also to validate solutions or implement them (Baer, 2012; Cross & Sproull, 2004). Consequently, future research might explore how dyadic ties influence subsequent phases of the process such as idea selection, refinement, and implementation.

Next, though we use archival data and survey data from both the ego and the alter, it is possible that results suffer from a common method bias as ego's social identity and the creative generativity of each boundary-spanning tie were collected with the same questionnaire. However, the constructs were measured in separate sections of the questionnaire, and the relationship between social identification and the generativity of a specific relationship for innovation is not obvious, especially as the two measures were separated by a series of name generator and interpreter questions. More importantly, even if the relationship between social identity and creative generativity of ties is overstated, it does not explain the interaction effect we find between ego's social identity and tie strength. A Monte Carlo simulation study designed to examine this issue found conclusively that common method bias (i.e., correlated errors among dependent and independent variables) cannot create artificial interaction effects, but true interactions can be attenuated (Evans, 1985). Lastly, the alter's identification with the superordinate unit comes from the questionnaire that the alter completed. Though the instrument is identical, it was completed by a different person and does not constitute a source of common method bias.

Finally, this study is situated in a single division of a single firm, raising questions about the generalizability of the findings. The researchers studied in this paper are a highly educated set of people whose jobs require innovation. Although creative idea generation is consequential for many jobs (Kanter, 1988), social identity's effect on creative generativity of boundary-spanning ties might vary as a consequence of other organizational factors. For example, managers at higher hierarchical levels might have other sources of motivation to receive or share external knowledge. Managers may be motivated by incentives or prospects for advancement to exploit their boundary-spanning ties for new ideas (Burt, 2004), rather than being motivated to enhance their groups. Additionally, social identity may have different effects on different types of innovative idea generation. For example, network position predicts involvement in administrative innovation, but not technical innovation (Ibarra, 1993). For the technical professionals studied here, social identity's effects might hold for technical innovations, but less strongly or not at all for administrative innovations. Lastly, the work teams in the organization we studied have distinctly different knowledge that accompanies the different functions they perform in the product

development process. Other organizations might have less distinct knowledge pools associated with their organizational units, offering less diversity from boundary-spanning ties than in this context. Future research can consider the interplay between social identity, social ties and creative outcomes when knowledge diversity is low.

Conclusion

This study advances inquiry into both relational sources of innovation and social identity. By applying a social identity perspective to the issue of the generativity of boundary-spanning relationships for innovation, we acknowledge the complex social environment that exists at work, considering formal organizational structure, informal relationships and the social psychological landscape. The strong and consistent support we find for our hypotheses suggests that social identity plays an important role in the innovative performance of individuals at work. Groups in an organization are defined by a formal organization chart, but they are also in the heads and hearts of organizational members. The findings from our study suggest that the extent to which organizational members attach their own identity to these groups has important implications for their creativity.

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Table 1
Descriptive Statistics

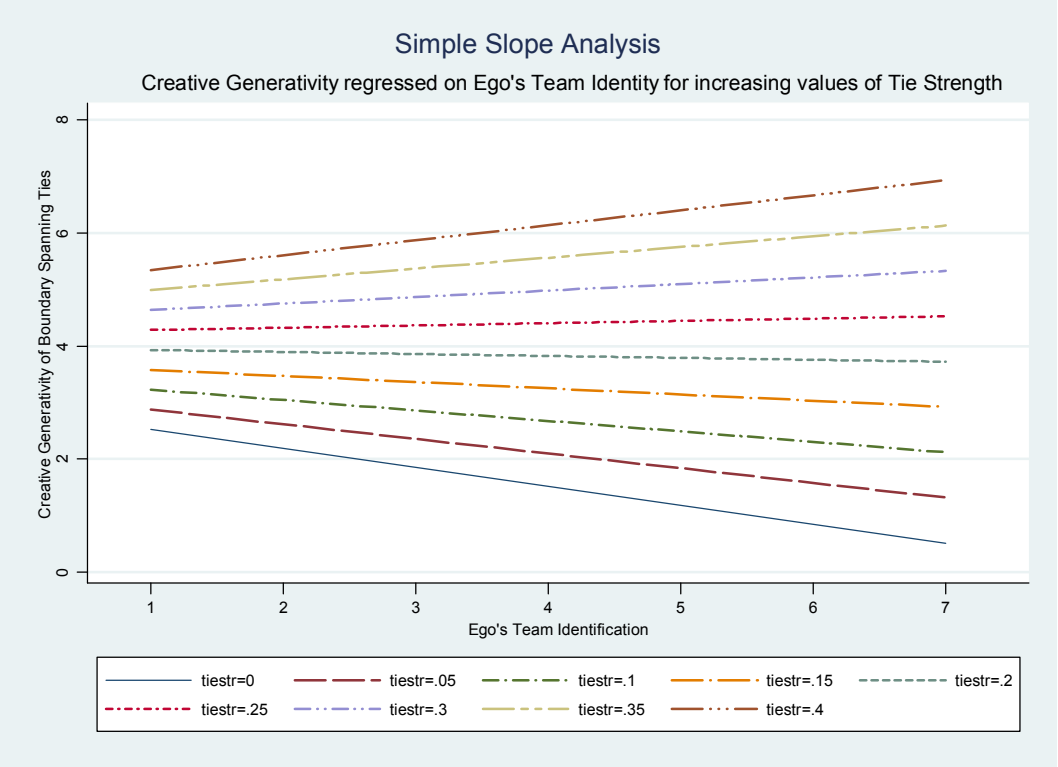
	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Creative Generativity	3.24	1.09									
(2) Same sex	0.53	0.50	0.03								
(3) Education difference	0.32	0.77	-0.15 *	0.02							
(4) Tenure difference	7.36	6.94	-0.12 *	0.02	0.28 *						
(5) Network size (logged)	2.49	0.50	-0.14 *	-0.11 *	0.00	0.15 *					
(6) Tie strength	0.09	0.05	0.32 *	0.07	-0.06	-0.08 *	-0.75 *				
(7) Structural Equivalence	2.97	0.42	-0.09 *	-0.02	0.12 *	0.12 *	0.34 *	-0.30 *			
(8) Ego's team id	5.38	1.31	-0.11 *	-0.05	0.01	0.10 *	0.21 *	-0.08 *	0.13 *		
(9) Ego's division id	4.43	1.22	0.01	0.05	-0.05	0.02	-0.19 *	0.14 *	-0.06	0.56 *	
(10) Alter's division id	4.66	1.20	0.04	0.05	0.01	0.04	-0.05	0.04	0.04	0.00	-0.01

* $p < .05$

Table 2
Ordered Probit Models of Creative Generativity

	Creative Generativity			Creative Generativity			Creative Generativity		
	Model 1			Model 2			Model 3		
	Coeff.		SE	Coeff.		SE	Coeff.		SE
Person dummies	*Yes*			*Yes*			*Yes*		
Team dummies	*Yes*			*Yes*			*Yes*		
Same sex	0.08		(0.10)	0.09		(0.10)	0.11		(0.10)
Education difference	0.07		(0.23)	0.08		(0.23)	0.07		(0.23)
Tenure difference	-0.01		(0.01)	-0.01		(0.01)	-0.01		(0.01)
Network size	1.21	***	(0.24)	1.42	***	(0.25)	1.59	***	(0.26)
Structural equivalence	-1.08	***	(0.52)	-1.18	**	(0.52)	-1.20	**	(0.52)
Tie strength	1.11	***	(0.10)	1.16	***	(0.10)	1.16	***	(0.10)
Ego's team id				-0.35	***	(0.13)	-0.40	***	(0.13)
Ego's division id				0.40	**	(0.16)	0.39	**	(0.16)
Alter's division id				0.39	***	(0.14)	0.35	**	(0.14)
Ego's team id x Tie strength							0.18	**	(0.08)
Cut_1	-1.13		(2.41)	0.83		(1.90)	0.83		(1.91)
Cut_2	-0.14		(2.41)	1.84		(1.90)	1.84		(1.91)
Cut_3	1.29		(2.41)	3.29		(1.90)	3.30		(1.91)
Cut_4	2.62		(2.41)	4.63		(1.90)	4.64		(1.91)
Observations	673			673			673		
Pseudo R^2	0.223			0.230			0.233		
Log Likelihood	-767.26			-760.20			-757.29		
Model fit (Likelihood ratio test χ^2)				14.13	***		5.82	*	

* p<.05
** p<.01
*** p<.001

Figure 1

Interaction of Ego's Team Identity and Tie Strength on Creative Generativity