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WIN OR LOSE THE BATTLE FOR CREATIVITY: THE POWER AND PERILS OF INTERGROUP COMPETITION

MARKUS BAER
Washington University in St. Louis

ROGER TH. A. J. LEENDERS
University of Groningen

GREG R. OLDHAM
Tulane University

ABHIJEET K. VADERA
Indian School of Business

Integrating and refining social interdependence theory and structural adaptation theory, we examined the effects of intergroup competition on the creativity of 70 four-person groups engaged in two idea generation tasks. We manipulated both group membership change (change, no change) and intergroup competition level (low, intermediate, high). Competition had the expected U-shaped relation with creativity in open (membership change) groups but failed to produce the hypothesized inverted U-shaped pattern in closed (no membership change) groups. In the latter, effects were positive for low to intermediate competition and flat for intermediate to high levels. Within-group collaboration mediated these effects.

Recent economic trends demanding the delivery of new products and services at an ever-increasing speed and at higher levels of quality have encouraged organizations to focus on how to more effectively use the creative potential of their employees. To ignite the creative spark heralded by many scholars as necessary for innovation (e.g., Van de Ven, 1986), organizations are increasingly relying not only on team-based structures (Griffin, 1997; Lawler, Mohrman, & Ledford, 1995; Leenders, Van Engelen, & Kratzer, 2007; Sundstrom, 1999), but also on internal competition between teams (Birkinshaw, 2001; Kanter, Kao, & Wiersema, 1997; Marino & Zábojník, 2004).

The list of companies attempting to foster creativity—that is, ideas about organizational products or services that are both novel and useful (Amabile, 1996; Oldham & Cummings, 1996)—via intergroup competition is long (Peters & Waterman, 1988). For example, discussing innovation at Rubbermaid, DuPont, and Fidelity, Kanter et al. (1997) highlighted the critical role of internal competition. Teams at these companies compete against one another to obtain scarce resources to advance their new ideas, and managers often simultaneously charge multiple teams with pursuing the same opportunity to foster creativity (Birkinshaw, 2001).

The motivating premise underlying the increasing use of intergroup rivalry to stimulate creativity is the notion that competition adds to the positive tension of challenge in a group (Amabile, 1988). In fact, one of the long-accepted hypotheses in the study of group behavior is that external threats weld groups into tight-knit social units in which members view each other as interdependent and in a positive manner (Fiedler, 1967; Sherif & Sherif, 1953; Staw, Sandelands, & Dutton, 1981). This, in turn, fosters collaboration and participation by blurring the distinction between self- and group interest (Bornstein & Erev, 1994; Kramer & Brewer, 1984). As collaboration and participation increase, groups should be able to leverage the benefits associated with bringing individuals with different ideas and viewpoints together while minimizing the process losses often plaguing group work, ultimately achieving elevated creativity (Hackman & Morris, 1975; Taggar, 2002; Van der Vegt & Bunderson, 2005).

Although this rather static view of groups and the way competition affects their creativity certainly has some validity, recent research has suggested that groups in organizations are best viewed as complex and dynamic entities that adapt and change over time (McGrath, Arrow, & Berdahl,

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2000). In the context of creativity, change in membership composition is one particularly important means by which groups assemble the knowledge needed to maintain the ability to generate novel and potentially useful solutions to ever-changing problems (Choi & Thompson, 2005). Accordingly, membership change has become a reality for many groups (Dineen & Noe, 2003), especially those charged with the production of creative ideas (Ancona, Bresman, & Kaeufer, 2002; Ancona & Caldwell, 1998).

What are the implications of membership change for the effectiveness of intergroup competition as a means to stimulate creativity? The purpose of the present study was to examine this question. Following social interdependence theory (Deutsch, 1949), we suggest that enhanced participation and collaboration—the benefits typically associated with increasing intergroup competition in a static context (one in which no change in groups' membership occurs)—result in elevated group creativity. However, refining the implications of social interdependence theory, we hypothesize that there are limits to the creative benefits that can be expected from instilling a cooperative mind-set via intergroup competition and that fierce rivalry (i.e., an increase in intergroup competition from an intermediate to a high level) may even undermine creativity by constricting collaboration.

We also adopted structural adaptation theory (Beersma et al., 2009; Johnson, Hollenbeck, Humphrey, Ilgen, Jundt, & Meyer, 2006), a theoretical framework suggesting that groups experience more difficulty in adopting a cooperative mind-set toward (past) competitors than in shifting from a cooperative to a competitive mind-set. Thus, we suggest that groups exchanging a member with a competing group may have difficulty harvesting the creative benefits typically (i.e., under noncompetitive conditions) associated with membership change (Choi & Thompson, 2005; Nemeth & Ormiston, 2007; Ziller, Behringer, & Goodchilds, 1962). However, refining structural adaptation theory, we hypothesize that this phenomenon—termed "cutthroat cooperation" (Johnson et al., 2006)—is limited to circumstances in which competition increases from low to intermediate levels and can be overcome in a fiercely competitive intergroup environment. Specifically, we argue that facing fierce intergroup rivalry (i.e., competition increasing from intermediate to high levels) provides groups with the impetus to expend the effort and energy necessary to reconfigure their within-group structural arrangement to accommodate a newcomer and thereby harvest the creative benefits typically associated with the arrival of a new member.

Our research makes a number of valuable contributions to the extant literature. First, despite the apparent appeal of intergroup competition as a vehicle for promoting creativity, few previous studies have systematically examined the effects of intergroup competition on group creativity (see Beersma and De Dreu [2005] for an exception). Hence, it is not at all clear what the implications of competition are when it comes to this important outcome variable and whether the widespread use of intergroup competition to promote creativity in contemporary organizations is justified. Our study is one of the few attempts to shed light on this question.

Second, recognizing the dynamic nature of groups in organizations, we consider both intergroup competition *and* membership change simultaneously. In addition to examining the effects of competition in both static (no membership change) and dynamic (membership change) contexts, we refine social interdependence theory and structural adaptation theory by examining the possibility that the pattern of effects in both contexts is contingent upon the level of intergroup competition—that is, the pattern expected to emerge as intergroup competition increases from low to intermediate levels reverses when competition increases from intermediate to high levels.

Third, illuminating the mechanisms transmitting the complex, interactive effects of intergroup competition and membership change on group creativity, we examine collaboration, both in terms of idea generation and decision making, as a potential mediator. Thus, our study provides some insights into the within-group processes shaping creativity under varying levels of intergroup competition and in both static and dynamic contexts.

CONCEPTUAL DEVELOPMENT AND HYPOTHESES

Applying Social Interdependence Theory and Structural Adaptation Theory: Linear Effects of Intergroup Competition and Membership Change on Creativity

Before outlining our theoretical arguments, we define the key concepts. *Membership change* occurs when a new member joins and an existing member departs a group (Choi & Thompson, 2005; Ziller, 1965). Like Choi and Thompson (2005), we define "open groups" as those that experience membership change (i.e., departure of a member combined with the simultaneous arrival of a new member) over the course of a series of tasks and "closed groups" as those that remain stable in membership over a similar course.

Following social interdependence theory (Deutsch, 1949), we define *intergroup competition* as a social situation in which the goals of different groups are linked in such a way that goal achievement by any one group reduces the ability of other groups to reach their respective goals. Social interdependence theory is one theoretical perspective that allows us to elucidate the potential effects of intergroup competition on creativity, particularly when groups are closed. In essence, this theory suggests that whether people perceive their goals to be positively or negatively related has important implications for the way they interact and, ultimately, for their performance (Johnson, 2003). With reward structures assumed to be the primary determinant of individuals' perceptions of goal interdependence, one of the implications of social interdependence theory is that reward structures designed to facilitate competition between groups (i.e., structures that foster positive interdependence between individuals' goals) are likely to promote within-group collaboration, among other factors.

We define within-group *collaboration* as the active participation of all group members in collaborative idea generation (i.e., developing, sharing, and attending to others' ideas) and decision making (i.e., deciding which ideas to pursue and which to abandon) (Taggar, 2002). Active and equal participation by all members in both collaborative idea generation and making collective decisions regarding those ideas has been suggested to enhance the creativity of groups (e.g., Gilson & Shalley, 2004; Hargadon & Bechky, 2006; Larson, 2007; Vera & Crossan, 2005). For example, previous research has suggested that group creativity is only likely to flourish when members not only generate ideas themselves but also share their ideas (i.e., make them available to others) and carefully attend to and actively process the ideas of others (Brown, Tumeo, Larey, & Paulus, 1998; van Knippenberg, De Dreu, & Homan, 2004). Only when ideas are communicated, attended to, and actively processed, is it likely that members will generate new associations in areas they did not previously consider, build on others' contributions, or combine them with ideas of their own (Paulus & Yang, 2000; Shin & Zhou, 2007)—all of which are essential for truly creative ideas to emerge (Hargadon & Bechky, 2006). As increasing rivalry with other groups enhances within-group collaboration and thus provides members with the impetus to not only generate ideas themselves but to also share their ideas and to actively attend to the ideas of others, increasing competition should foster the creativity of closed groups (Amabile, 1988; Clydesdale, 2006).

Unfortunately, few previous studies have explicitly examined the effects of intergroup competition on group creativity. One notable exception is a recent study by Beersma and De Dreu (2005). Partially supporting the notion that intergroup competition stimulates creativity in closed groups, these authors showed that groups that competed against other groups during a negotiation exercise subsequently produced advertising slogans that were rated as more useful than those produced in groups in which members competed against each other. However, in contrast to the notion that intergroup rivalry fosters creativity, Beersma and De Dreu's results indicated that groups in which members competed against each other generated slogans that were rated as more original than those developed by groups that competed against other groups. As this study contrasted intergroup competition with within-group competition, rather than distinguishing between different levels of intergroup competition, the results only tangentially speak to the research question addressed in the current study. Moreover, previous work on the effects of intergroup rivalry on a variety of other group outcomes has found support for the notion that intergroup competition can foster collaboration and better performance (e.g., Bornstein & Erev, 1994; Erev, Bornstein, & Galili, 1993). For example, Mulvey and Ribbens (1999) found that intergroup competition increased productivity and decreased inefficiency.

Although social interdependence theory has important implications for understanding how groups respond in terms of creativity to increasing intergroup rivalry in static environments, it fails to address explicitly how groups faced with a change in membership may respond to increasing competition. To address this shortcoming, Johnson et al. (2006) recently proposed structural adaptation theory as an expansion of social interdependence theory to dynamic contexts. At the heart of this theory is the notion of "asymmetric adaptability," the idea that it is more difficult for groups to shift from a competitive to a cooperative mind-set than it is to do the reverse. Introducing the concept of "cutthroat cooperation," according to which the type of cooperation seen among past competitors is different from the type of cooperation observed in groups that have only worked cooperatively in the past, Johnson et al. showed that groups that switched from a competitive to a cooperative mind-set exhibited performance that mirrored that of competitive rather than cooperative groups. These groups had difficulty adopting their structural arrangement to the change in reward structure and continued to engage in their habitual interaction patterns. In particularly, after switching to intergroup competition

these groups appeared to struggle with sharing task-relevant information, an indication of reduced collaboration.

Developed to explain how groups adapt to changes in reward structures (from competitive to cooperative and vice versa), structural adaptation theory also has important implications for understanding creativity in groups that experience membership change under varying levels of intergroup competition. Specifically, resembling a group undergoing a change in reward structure, a group that exchanges a member with a rival group faces the challenge of shifting from a competitive to a cooperative mind-set with respect to the newcomer. According to structural adaptation theory, under such circumstances groups are likely to suffer from cutthroat cooperation, experiencing disruptions to group performance owing to difficulty overcoming the previously competitive attitude toward the new member. Because of this "us-versus-the-newcomer" mind-set, both collaborative idea generation and participative decision making are likely to suffer, with lowered group creativity ultimately resulting. This logic suggests that under conditions of increasing intergroup competition, membership change may undermine collaboration, particularly with respect to newcomers. However, exhibiting a collaborative attitude toward the newcomers is essential, as previous research has shown that introducing new members from other groups not only infuses groups with new perspectives but also provides them with opportunities for social learning, which can foster creativity (Choi & Thompson, 2005). Hence, instead of promoting these benefits, membership change under conditions of intergroup rivalry may limit the extent to which groups engage in collaborative idea generation as well as participative decision making and essentially result in the groups not taking advantage of some of their members, all of which should eventually decrease group creativity. Thus, although membership change has been demonstrated to positively affect creativity in *noncompetitive* environments, in which open groups regularly outperform closed groups (Choi & Thompson, 2005; Ziller et al., 1962), the arrival of new members from *competing* groups may become a liability eventually undermining group creativity.

Although we are not aware of any study that has explicitly examined the effects of intergroup competition on the creativity of open groups, a number of studies have highlighted the problems arising from newcomers joining existing groups (e.g., Gruenfeld, Martorana, & Fan, 2000; Lewis, Belliveau, Herndon, & Keller, 2007). For example, Hornsey, Grice, Jetten, Paulsen, and Callan (2007) demonstrated that criticisms and recommendations for change were received with more negativity and were less influential when introduced by a newcomer than by an existing member of a group.

Refining Social Interdependence Theory and Structural Adaptation Theory: Quadratic Effects of Intergroup Competition and Membership Change on Creativity

Thus far, we have argued that increasing competition may stimulate the creativity of closed groups but undermine the creativity of open groups. In the following section, we argue that the effects of intergroup competition on creativity depend not only on membership change but also on the *level of competition*.

Following social interdependence theory, we suggested that collaboration in closed groups benefits from increasing intergroup rivalry, resulting in elevated levels of creativity. Although this logic is valid for some levels of competition (i.e., competition increasing from low to intermediate levels), it may be that beyond some optimal, intermediate level increasing competition corrodes group creativity by constricting the recognition and consideration of alternative ideas (i.e., collaborative idea generation) and reducing participative decision making. This theorizing is consistent with the central tenets of the threat-rigidity perspective, according to which groups tend to respond to threats, such as fierce intergroup competition, with restricted information processing and centralization of decision-making authority (Staw et al., 1981). Similarly, work on the trade-off between social control and creativity in groups (Nemeth & Staw, 1989) has suggested that social pressures, such as those that may result from groups operating in a fiercely competitive environment, may corrode creativity by curtailing divergent thinking (Wiekens & Stapel, 2008) and restricting group members' expression of new ideas and the extent to which other group members act upon them (Goncalo & Staw, 2006)—that is, collaborative idea generation is restricted. Thus, although low to intermediate intergroup rivalry may weld groups together, thereby fostering collaboration and thus creativity, the increased gravitational pull that results from intergroup competition becoming increasingly fierce may undermine creativity by limiting the extent to which groups engage in collaborative idea generation and participative decision making (King & Anderson, 1990; Woodman, Sawyer, & Griffin, 1993). This line of argument suggests that the effects of intergroup competition on creativity in closed groups will be positive up to intermediate levels, after which they are expected to become

negative; an inverted U-shaped function will be the result.

We have also argued that intergroup competition reduces creativity in open groups because of problems associated with cutthroat cooperation, particularly with respect to newcomers. According to structural adaptation theory, underlying cutthroat cooperation is the problem that shifting from a competitive to a cooperative mind-set requires significant effort and energy resources—more effort and resources than are needed when groups shift from a cooperative to a competitive mind-set. Thus, for a group to overcome the problems associated with cutthroat cooperation, its members have to be motivated to invest the resources necessary to reconfigure their within-group structural arrangement to accommodate a newcomer, thereby harvesting the creative benefits typically associated with the arrival of a new member. Of course, intergroup competition is likely to provide such an impetus as long as the benefits associated with increasing competition (e.g., being number one) outweigh the costs of realigning a group's structural arrangement. This logic suggests that although at lower levels of competition the costs associated with structurally reconfiguring a group to accommodate a newcomer may outweigh the benefits following from competition, the opposite may be true when competition becomes increasingly fierce. This suggests that the problems associated with cutthroat cooperation may be limited to circumstances in which competition increases from low to intermediate levels and can be overcome by creating a fiercely competitive environment. Thus, we expect the effects of intergroup competition on the creativity of open groups to be negative up to intermediate levels, after which they should become positive. A U-shaped function will be the result. Overall, we propose:

Hypothesis 1. Membership change moderates the quadratic effects of intergroup competition on group creativity in such a way that the effects describe an inverted U-shaped function in the case of closed groups and a U-shaped function in the case of open groups.

The Mediating Role of Collaboration

Finally, we argue that collaboration (the active participation of all group members in the collaborative idea generation and decision-making process) may mediate the joint, quadratic effect of intergroup competition and membership change on group creativity. As mentioned earlier, for creativity in groups to flourish it is imperative not only that group members actively generate ideas but also that they share their ideas and attend to the ideas of others (Brown et al., 1998; Paulus, 2000; van Knippenberg et al., 2004). Only when ideas are communicated, carefully attended to, and actively processed, is it likely that members generate new associations in areas they did not previously consider, build on others' contributions, or combine them with ideas of their own (Paulus & Yang, 2000; Shin & Zhou, 2007)—all of which are vital for truly creative ideas to emerge (Hargadon & Bechky, 2006). In addition, active member participation in decision making ensures that multiple perspectives and opinions regarding which ideas to pursue and which to abandon are being discussed and considered. Discussing and considering decision-relevant information, in turn, is likely to ensure high decision quality, thereby allowing groups to focus their attention and time on those ideas that have the greatest promise to be novel and potentially useful.

These arguments suggest that collaborative idea generation and decision making are likely to affect group creativity positively. In addition, we have argued that intergroup competition and membership change are likely to have joint effects on collaborative idea generation and decision making. Specifically, in keeping with social interdependence theory, we suggested that collaboration in closed groups benefits from increasing intergroup rivalry, at least up to some intermediate level of rivalry. However, extending social interdependence theory, we hypothesized that as competition becomes increasingly fierce, collaboration and decision-making authority grow constricted. In keeping with structural adaptation theory, we hypothesized that open groups operating in a competitive environment suffer from cutthroat cooperation, at least as long as competition does not exceed intermediate levels. However, once intergroup rivalry becomes sufficiently fierce, competition provides a group with the necessary impetus to expend the effort and energy necessary to reconfigure its structural arrangement to accommodate a newcomer. Together, then, these arguments suggest that collaboration on idea generation and decision making is likely to mediate the joint effects of intergroup competition and membership change on creativity. Thus,

Hypothesis 2. Collaboration in idea generation and decision making mediates the joint quadratic effects of intergroup competition and membership change on group creativity.

METHODS

Experimental Design and Participants

We used a three-by-two (3 × 2) between-participants design (intergroup competition: low, intermediate, or high by membership change: closed vs. open), including a control group (no competition, closed). Participants were 280 undergraduate students at a large university. Their average age was 21 years; 49 percent were men; and 75 percent were business majors. Participants were randomly assigned to 70 four-person groups, which were then randomly assigned to the experimental conditions (10 groups per condition). In return for their participation, participants earned class credit and were eligible for cash prizes (see "Competition Manipulation").

Experimental Tasks

Groups completed two idea generation tasks (tasks 1 and 2), in between which 50 percent of the groups (excluding the control groups) experienced a change in membership. For both tasks, groups assumed the role of a four-person task force that was assigned by the College of Business the mission of developing a strategy to make the university more attractive to students. The specific goal of the mission was to generate creative (i.e., original and potentially useful) ideas that addressed two issues related to student life: (1) improving the transition from high school to college for entering students and (2) improving the quality of life for students once they arrived on campus.

For participants to produce creative ideas, they needed to find these tasks at least moderately interesting (McGraw, 1978; Shalley & Oldham, 1997). To examine the level of interest in the tasks, we conducted a pretest with 63 undergraduate students. Participants first read a description of the two tasks. Next, using a scale ranging from "strongly disagree" (1) to "strongly agree" (7), they rated the tasks on two items developed for this study: "I would be interested in completing the tasks described in this scenario" and "I find the tasks described in this scenario interesting." The interitem reliability estimate for this measure was satisfactory ($\alpha = .80$), and we created an index by averaging scores for the two items. A mean rating of 5.10 (s.d. = 1.31) indicated that participants perceived the tasks to be moderately interesting, thereby suggesting their suitability for eliciting creative responses during the experiment.

Procedures

To allow for the manipulation of membership change, we ran two groups simultaneously in different rooms. Both were assigned either to the closed condition or to the open condition. Upon participants' arrival in the reception area of the laboratory, an experimenter randomly assigned them to one of the two four-person groups. To foster distinct group identities, different colors were associated with the two groups, and members were instructed to write their first names on name tags that matched the color of their group (Kane, Argote, & Levine, 2005). Participants were then instructed to go to their respective rooms and to complete the first section (containing a consent form and questions about their background) of a booklet. After six minutes, the experimenter entered the first room and read aloud the instructions for the first task. In all conditions, the instructions were identical, apart from the competition manipulations. Specifically, we told all groups that there was a chance that a group member would be asked to switch groups after the first task. We indicated that in actual organizations, membership in task forces often changes over time and that we wanted to simulate such group recomposition in the laboratory (Choi & Thompson, 2005). In keeping with accounts of brainstorming in organizations, in our instructions we highlighted the importance of the groups producing truly creative ideas suitable for subsequent adoption (Sutton & Hargadon, 1996).

We asked groups to list their ideas for the first task in a booklet that was located at the center of the table around which members sat. The experimenter then left the room and repeated the instructions to the second group in the adjacent room. After 15 minutes, the experimenter reentered both rooms and instructed groups to complete the next section of their booklets, which contained the first manipulation check. The experimenter then randomly selected a member from each group in the open group condition and asked him or her to switch rooms and to join the other group. Groups in the closed condition received no such instruction. Thus, groups in the open condition consisted of three original members and one newcomer after the member recomposition, and groups in the closed condition continued with the same members who had worked together on the first task.

Following this, the experimenter read aloud the instructions for the second task and then repeated the competition manipulations. In all conditions, the level of competition was identical for both tasks and for both teams that competed against each other. The groups then worked for 15 minutes on the second task. After this time period, participants completed the final section of their booklets, containing the second manipulation check. We then debriefed and dismissed participants.

Competition Manipulation

Competition arises from the confluence of several factors, including evaluation, reward, and a win-lose aspect that is unique to competitive situations (Amabile, 1996). We manipulated the win-lose aspect by creating what Deutsch termed "contriently interdependent goals" (1949: 132). With such goals, achievement by any one group reduces other groups' ability to reach their goals. In line with this definition, we elicited increasing levels of intergroup competition by reducing the proportion of groups that, given goal accomplishment by any one group, could simultaneously reach that same goal. Specifically, we told participants in the *low competition* condition that their opportunity to win a cash prize and to have their ideas forwarded to the associate dean of the College for further consideration required their group to be among the top 50 percent of the most creative groups in the experiment. We told participants in the *intermediate competition* condition that their opportunity to win a cash prize and to have their ideas forwarded required their group to be among the top ten creative groups in the experiment. We informed the members in the *high competition* condition that their opportunity to win a cash prize and to have their ideas forwarded required their group to be the number one creative group in the experiment.

Addressing the evaluation and reward aspects of competition, we told groups that we would determine the top-performing groups by evaluating the creativity of the ideas developed by each group in response to both tasks 1 and 2 (see Beersma, Hollenbeck, Humphrey, Moon, Conlon, & Ilgen, 2003; Kane et al., 2005). Groups judged to have creative ideas were eligible for cash prizes that would be shared equally among the members. Specifically, groups in the low, intermediate, and high competition conditions were eligible for cash prizes of $4, $40, and $400, respectively. In addition, we told those in the high competition condition that each member of the winning group would receive a letter of appreciation from the associate dean. The control groups did not operate under a win-lose structure, and there was no mention of financial rewards or idea evaluation. Instead, we told the participants in the *control condition* that we would combine the ideas generated by all groups in response to both tasks and then forward these ideas to the associate dean for further consideration.[1]

[1] Although the use of rewards to elicit different levels of intergroup competition is consistent with the literature (e.g., Amabile, 1996), our systematic variation of the size of the financial reward with different levels of competition may raise concerns regarding whether any observed effects are due to intergroup competition or to the increasing monetary incentive. To address this issue, we subsequently collected data from an additional ten groups (in the closed condition). Like our high competition groups, these groups were offered the opportunity to earn a $400 reward. However, in contrast to the groups in the high competition condition, these additional groups were told that we would award the $400 on the basis of their absolute creativity rather than their creativity relative to other groups. If our effects were a result of the size of the financial incentive rather than competition, we would expect the opportunity to earn a $400 reward without the win-lose aspect that is unique to competition to produce results similar to those obtained in our high competition condition. If, however, the results mirrored those of our control condition, we could conclude that effects were the result of competition and not the size of the financial incentive. Comparing both the level of perceived competition and creativity between the financial reward/no competition condition and the control and the high competition conditions showed that the new condition (means = 2.71 and 5.73) produced results that mirrored those in the control condition (means = 2.64 and 5.60, $p > .05$) rather than those in the high competition condition (means = 3.74 and 6.60, $p < .05$). Thus, it appears that our manipulation was successful and that observed effects can be attributed to competition rather than the increasing value of the financial incentive.

Measures

Creativity. We developed our measure of creativity following a two-step procedure. In the first step, three external raters (i.e., graduate students in the area of organizational behavior) underwent training conducted by one of the authors. As have previous researchers (Amabile, 1996; Baer & Oldham, 2006), we defined creativity as ideas that are both novel and potentially useful. After being presented with this definition, the raters were instructed to individually rate approximately 5 percent (randomly selected) of the ideas generated by all groups for each of the two tasks using a scale ranging from "not at all creative" (1) to "extremely creative" (9). After completing their individual evaluations, the three raters jointly discussed their ratings and resolved any discrepancies.

In the second step, the three raters were instructed to independently rate all ideas generated by all groups in response to both tasks. The ideas were presented in random order but separately for tasks 1 and 2. We asked the raters to rate each idea on the same scale described above. To construct our measures of creativity, we averaged the ratings of the three raters for each idea. To examine whether aggregation was justified, we calculated the median interrater agreement coefficient ($r_{wg[j]}$;

James, Demaree, & Wolf, 1984) and two intraclass correlation coefficients (ICC[2,1] & ICC[2,*k*]; McGraw & Wong, 1996; Shrout & Fleiss, 1979).[2] All measures were acceptable, suggesting adequate levels of agreement and reliability, thereby justifying aggregation of ratings across raters ($r_{wg[3]}$ = .80; ICC[2,1] = .37; ICC[2,3] = .64) (Bliese, 2000; LeBreton & Senter, 2008).

Organizations are generally not interested in groups generating a large number of only mediocre ideas but instead typically charge their project groups with producing a few great ideas that are suitable for further development and later implementation (Cooper, 2001; Sutton & Hargadon, 1996; Wheelwright & Clark, 1992). In keeping with this emphasis, in our instructions we highlighted the importance of groups producing truly creative ideas suitable for subsequent adoption by the College of Business, rather than a large number of ideas. Given these instructions, in operationalizing creativity we focused on groups' most creative ideas as opposed to their fluency (i.e., number of nonredundant ideas) or average creativity (Rietzschel, Nijstad, & Stroebe, 2006). Specifically, we identified the idea (or ideas) that received the highest creativity ratings from the three raters and then took this score to represent a group's creativity.

Collaboration. To derive indicators of both collaborative idea generation and decision making, we video-recorded the group interaction process during both tasks. Two additional raters (again, organizational behavior graduate students), who were blind to the experimental conditions and the hypotheses of the study, coded the videotapes. To examine the effects on the mediating variable of not only intergroup competition but also membership change—an intervention that occurred after groups completed their first task—we instructed raters to only code the group interaction process during the second task. Unfortunately, of the 70 video recordings, 35 were not usable owing to technical difficulties with one of the two video cameras. Fortunately, however, the 35 recorded interactions captured groups in each condition (i.e., half of the total number of groups in each condition were available). A single rater coded these interactions. To establish agreement and reliability, we had a second rater code a (random) subset of 15 groups. Given the high levels of agreement and reliability (see below), we used the ratings of the rater who had coded all recordings in our analysis.

Collaborative idea generation captures the extent to which all group members actively participate in their group's idea generation effort; that is, it taps the extent to which members not only generate and share ideas but also attend to others' ideas and consider them as valuable inputs into their own generative processes. Accordingly, after being presented with this definition, coders indicated the number of members in each group who actively participated in idea generation (mean = 3.43, s.d. = 0.88). To determine interrater agreement for this count variable, we calculated the correlation between the scores of the two raters. It was positive and significant ($r = .78$, $p < .01$), indicating adequate agreement.

To capture *participative decision making*, we asked the coders to rate a single item assessing the extent to which decision-making authority was equally distributed among the members of each group (1, "strongly disagree," to 7, "strongly agree"): "Everyone in the group had the same say—there was no one who dominated the decisions that were made" (mean = 4.97, s.d. = 1.25). We examined convergence between raters by estimating the median $r_{wg[j]}$ coefficient for the 15 groups as well as two ICCs. All three measures were acceptable, suggesting adequate levels of agreement and reliability ($r_{wg[2]}$ = .88; ICC[2,1] = .52; ICC[2,2] = .68).

Since both variables were substantially correlated ($r = .57$, $p < .01$), we combined them, after standardization, to create an index ($\alpha = .73$). We termed this index "collaboration" as it captured both the extent to which a group's members collaborated on generating ideas and the extent to which the decision-making process within the group was collaborative—that is, shared among all members of the group.

Manipulation Check

After completing task 1 and again after task 2, participants responded to four questions developed for this study using a scale ranging from "strongly disagree" (1) to "strongly agree" (7): "This assignment created quite a bit of competition between my own group and the other groups that participated in this study," "This assignment involved very little competition between the groups that took part in

[2] Following Shrout and Fleiss (1979), the first number in each bracket indicates whether the ICC is based on a one-way (1) or two-way (2) analysis of variance (ANOVA). We used a one-way ANOVA in cases in which each target was rated by a *different* set of *k* judges, randomly selected from a larger population of judges (i.e., manipulation check ratings). We used a two-way ANOVA when each target was rated by the *same* set of *k* judges, randomly selected from a larger population of judges (i.e., creativity and participative decision-making ratings). The second number in each bracket indicates whether the unit of analysis is an individual rating (1) or the mean of several ratings (*k*) ($k = 3$ for creativity; $k = 2$ for participative decision making; $k = 4$ for perceived intergroup competition).

TABLE 1
Cell Means and Standard Deviations for Creativity and Collaboration as a Function of Intergroup Competition and Membership Change[a]

		Intergroup Competition					
		Low		Intermediate		High	
Variables	Membership Change	Mean	s.d.	Mean	s.d.	Mean	s.d.
Creativity	Closed	5.42	0.82	6.43	1.14	6.60	0.97
	Open	6.77	0.94	5.90	0.67	6.83	0.86
Collaboration	Closed	−0.25	1.17	0.82	0.34	0.06	0.34
	Open	0.00	0.75	−0.47	0.93	0.11	0.80

[a] The means and standard deviations in the closed groups/low competition condition are based on the values of two conditions, the control condition (means = 5.60 and −0.31, s.d.'s = 0.84 and 1.08 for creativity and collaboration, respectively) and the low competition condition (means = 5.23 and −0.20, s.d.'s = 0.80 and 1.38 for creativity and collaboration, respectively).

this study" (reverse-scored), "There was a good deal of competition about which group produced the most creative idea," "While completing this assignment, I felt a high degree of competition." The interitem reliability estimates for this measure were satisfactory (α's = .80 and .81 for tasks 1 and 2, respectively), and we created indexes by averaging scores on the four items for both tasks 1 and 2.

Since we measured perceived intergroup competition at the individual level, we aggregated it to the group level by averaging scores for the members of each group. Estimates of interrater agreement were acceptable; the median $r_{wg[4]}$ across the 70 groups was .86 for both tasks 1 and 2. Reliability (ICC[1,1] = .23 and .17; ICC[1,4] = .54 and .44 for tasks 1 and 2, respectively) was also acceptable. These statistics justified aggregation of group members' ratings.

RESULTS

Manipulation Checks

An ANOVA conducted on the manipulation check measures yielded statistically significant main effects for tasks 1 and 2 ($F[3, 66] = 13.46$, $p < .01$, $\eta^2 = .38$, and $F[3, 66] = 6.95$, $p < .01$, $\eta^2 = .24$). Planned comparisons between the four different groups, however, indicated no statistically significant differences between the control and the low competition conditions for tasks 1 and 2 ($t[66] = 1.62$, $p > .05$, and $t[66] = 0.82$, $p > .05$). Thus, we combined the control and low competition groups in subsequent analyses.[3]

An ANOVA conducted on the manipulation check measures comparing the now three levels of competition yielded statistically significant main effects ($F[2, 67] = 18.30$, $p < .01$, $\eta^2 = .35$, and $F[2, 67] = 10.14$, $p < .01$, $\eta^2 = .23$ for tasks 1 and 2, respectively). The planned comparisons between the low and intermediate groups ($t[67] = 3.44$, $p < .01$, and $t[67] = 2.31$, $p < .05$), the low and high groups ($t[67] = 5.94$, $p < .01$, and $t[67] = 4.47$, $p < .01$), and the intermediate and high groups ($t[67] = 2.28$, $p < .05$, and $t[67] = 1.97$, $p < .05$) were statistically significant for both tasks 1 and 2. In keeping with our manipulation, groups in the low competition condition reported the lowest level of competition (means = 2.72 and 2.78 for tasks 1 and 2, respectively), followed by the groups in the intermediate (means = 3.32 and 3.21) and in the high competition conditions (means = 3.75 and 3.61). These results suggested that our manipulation was successful and, because there were no statistically significant interactions involving the membership change variable, we felt confident that the manipulations had the intended effects.

Descriptive Statistics

To examine the effects of membership change—an intervention that occurred *after* groups completed their first task—we used the creativity indicator for the second task as our dependent variable. Table 1 summarizes the cell means and standard deviations for this measure as well as collaboration as a function of intergroup competition and membership change.

[3] We later repeated all analyses excluding the ten control groups from the low competition condition. These results are virtually identical to those reported in Table 2 and are available from the authors upon request. Given that the results were robust with different analytic strategies, we decided to present the results based on the entire sample rather than disregarding the information collected in the control condition.

Test of Hypotheses

Following previous research (Humphrey, Moon, Conlon, & Hofmann, 2004), we used hierarchical regression analysis to test for nonlinear interactive effects of intergroup competition on group creativity (Cohen, Cohen, West, & Aiken, 2003). We first introduced into a regression equation the two main effect variables (competition, membership change). To control for any linear interactive trends and for any simple quadratic trends, we then entered the linear interaction term (competition by membership change) in step 2, followed by the quadratic intergroup competition term (competition squared) in step 3. Finally, to test Hypothesis 1, we introduced the quadratic-by-linear interaction (competition squared by membership change) in the last step.

Table 2 presents the results of the analysis. Hypothesis 1 states that membership change moderates the quadratic effects of intergroup competition on group creativity in such a way that the effects describe an inverted U-shaped function in the case of closed groups but a U-shaped function in the case of open groups. Supporting this hypothesis, the competition squared by membership change interaction term was statistically significant (β = 1.78, $t[64] = 2.75$, $p < .01$).

In further support of Hypothesis 1, results of post hoc analyses (Aiken & West, 1991) revealed that in open groups, increasing competition had a negative effect on creativity at first but, after exceeding an intermediate level, resulted in elevated creativity ($b = -1.77$, $t[64] = -2.43$, $p < .05$, $b = 0.03$, $t[64] = 0.17$, $p > .05$, and $b = 1.83$, $t[64] = 2.53$, $p < .05$, at low, intermediate, and high levels of intergroup competition, respectively). However, with respect to closed groups, these analyses provided only partial support for our arguments. Although increasing competition resulted in the expected increase in creativity, the hypothesized negative effect of high intergroup competition on creativity was not found ($b = 1.44$, $t[64] = 2.19$, $p < .05$, $b = 0.59$, $t[64] = 3.40$, $p < .01$, and $b = -0.26$, $t[64] = -0.36$, $p > .05$ at low, intermediate, and high levels of competition, respectively).

In addition, planned comparisons suggested that closed groups were less creative than open groups at low levels of competition ($b = -1.35$, $t[64] = -3.88$, $p < .01$). At intermediate and high levels of competition, however, there were no differences between these groups ($b = 0.53$, $t[64] = 1.33$, $p > .05$, and $b = -0.24$, $t[64] = -0.58$, $p > .05$). Overall, then, these results partially support Hypothesis 1. Although intergroup competition had the predicted U-shaped effects on creativity in the case of open groups, we found limited support for the prediction that the effects of competition on creativity would describe an inverted U-shaped function in the case of closed groups. Rather, our results suggest that in these circumstances, the effects of intergroup competition on creativity described the shape of an *attenuated*, inverted U: creativity increases were more pronounced at lower levels of competition than at higher levels. Figure 1 graphically represents this quadratic interaction.[4, 5]

To supplement these results, we developed a second indicator of creativity, *number of highly creative ideas*, by counting the number of ideas produced by a group that received a rating of 7 or higher on the creativity rating scale (i.e., a rating in the upper third of the scale; mean = 0.34, s.d. =

TABLE 2
Results of Hierarchical Regression Analysis of Creativity on Competition, Membership Change, and Their Interactions[a]

	Creativity		
Independent Variables	β	ΔR^2	ΔF
Step 1		.16	3.91*
Intergroup competition	0.31**		
Membership change	0.21		
Step 2		.05	4.56*
Intergroup competition × membership change	−0.42*		
Step 3		.01	0.52
Intergroup competition squared	0.34		
Step 4		.08	8.10**
Intergroup competition squared × membership change	1.78**		

[a] $n = 70$ groups. R^2 and F for the model are .30 and 5.58**, respectively.

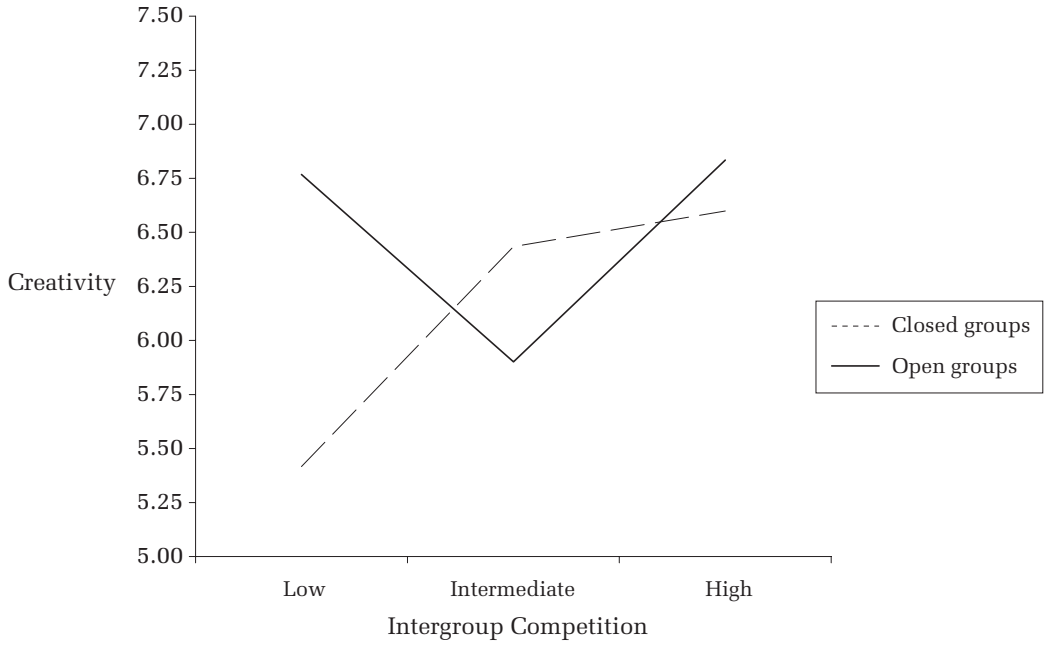
* $p < .05$

** $p < .01$

[4] Repeating the analysis reported in Table 2 using the creativity score derived from the first task as the dependent variable revealed, as might be expected, no significant main or interactive effects of membership change ($p > .05$).

[5] Although we emphasized the importance of producing ideas with a potential for implementation, we acknowledge that previous research has frequently measured creativity by simply counting nonoverlapping ideas, irrespective of their originality or usefulness, or by averaging the creativity of all ideas produced by a group (e.g., Goncalo & Staw, 2006; Rietzschel et al., 2007). For reasons of comparability, we repeated the analysis presented in Table 2 using these indicators of *fluency* and *average creativity*. No statistically significant quadratic interaction between intergroup competition and membership change emerged in these analyses ($p > .05$).

FIGURE 1
Quadratic Interaction of Intergroup Competition and Membership Change on Creativity



0.56) (Diehl & Stroebe, 1991; Goncalo & Staw, 2006). Repeating the analysis using this count measure produced results that were virtually identical to those reported in Table 2 ($\beta = 2.05$, $t[64] = 2.05$, $p < .01$, for the interaction of competition squared and membership change).

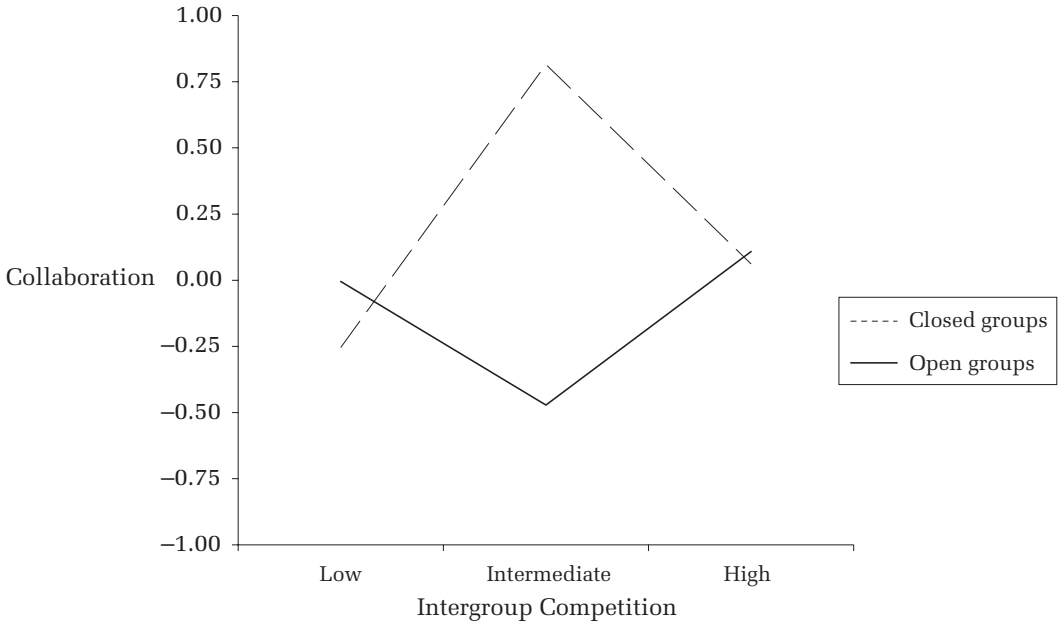
In keeping with previous research, we defined creativity as ideas that are both novel *and* potentially useful. However, some research suggests that the dimensions of novelty and usefulness are not always aligned and are sometimes even negatively related (Beersma & De Dreu, 2005; Rietzschel, Nijstad, & Stroebe, 2007). To explore the possibility that the observed effects were the result of either novelty or usefulness, we decomposed the overall creativity measure into these two subdimensions (i.e., raters evaluated each idea in terms of novelty and usefulness). Given our instruction for groups to develop ideas that were both novel and useful and for raters to evaluate only those ideas as highly creative that embodied both features, not surprisingly, we found both dimensions to positively correlate with each other ($r = .40$, $p < .01$) as well as with creativity (r's = .78 and .82, $p < .01$, for novelty and usefulness, respectively). Repeating the regression analysis for novelty and usefulness produced results that were virtually identical to those presented in Table 2 ($\beta = 1.40$, $t[64] = 2.20$, $p < .05$, and $\beta = 1.53$, $t[64] = 2.15$, $p < .05$, for novelty and usefulness, respectively). These results suggest that the observed effects were the result of both novelty and usefulness.

To test Hypothesis 2, stating that collaboration would mediate the joint, quadratic effects of intergroup competition and membership change on creativity, we employed the procedure outlined by Baron and Kenny (1986). We had already demonstrated that the independent variables affected creativity as hypothesized (see Table 2). Second, we found that intergroup competition and membership change also exhibited joint, quadratic effects on collaboration ($\beta = 2.28$, $t[29] = 2.20$, $p < .05$) and that the pattern of this interaction (see Table 1 and Figure 2) was consistent with our theoretical arguments, albeit for a sample of 35 groups. In addition, the mediating variable related positively and statistically significantly to creativity ($\beta = 0.35$, $t[28] = 2.18$, $p < .05$). Lastly, when we controlled for the effects of collaboration, the statistically significant quadratic effects of intergroup competition and membership change on creativity became statistically nonsignificant ($\beta = 0.61$, $t[28] = 0.63$, $p > .05$). This reduction approached statistical significance according to Sobel's (1982) test ($Z = 1.55$, $p = .06$), suggesting mediation and providing some support for Hypothesis 2.

DISCUSSION

Given the increasing reliance of organizations on various forms of intergroup competition to stimulate the production of creative ideas in groups and the trend toward more fluid, project-based groups,

FIGURE 2
Quadratic Interaction of Intergroup Competition and Membership Change on Collaboration



in the present study we set out to examine the joint effects of intergroup competition and membership change on group creativity. Specifically, we hypothesized that the effects of intergroup competition on group creativity in closed (no membership change) groups, although positive up to intermediate levels, would become negative once such levels have been exceeded, resulting in an inverted U-shaped function. In addition, we hypothesized that the effects of intergroup competition on creativity in open (membership change) groups, although negative up to intermediate levels, would become positive at higher levels, resulting in a U-shaped function. In addition, we examined collaboration as a mediator of these effects.

In line with our general line of theorizing, we found that the effects of intergroup competition on group creativity were indeed contingent upon membership change and level of competition. Specifically, supporting Hypothesis 1, results revealed that open groups declined in their creativity as competition increased from low to intermediate, because of problems associated with cutthroat cooperation. This negative trend, however, was reversed once competition exceeded intermediate levels and became increasingly fierce; the expected U-shaped function resulted. Thus, in keeping with our extension of structural adaptation theory, it appears that although at lower levels of competition, the negative consequences of a new member joining a group may outweigh the benefits of intergroup competition, the opposite is true once competition becomes fierce. Facing fierce intergroup rivalry provides groups struggling with cutthroat cooperation with the impetus to expend the effort and energy necessary to reconfigure the within-group structural arrangement to accommodate a newcomer and to thereby harvest the creative benefits typically associated with the arrival of a new member.

In addition, results confirmed our arguments that closed groups' creativity would benefit from increasing competition, but only up to an intermediate level of intensity. However, we found no support for our refinement of the implications of social interdependence theory that such groups, once competition exceeded intermediate levels, will experience a decline in their creativity resulting in an inverted U-shaped function. Rather, our results suggested that in these circumstances, the effects of intergroup competition on group creativity described the shape of an *attenuated*, inverted U; creativity increases were more pronounced at lower levels of competition than at higher levels.

One possible explanation for this latter finding is that despite our efforts to induce high levels of intergroup competition, we only partially succeeded in doing so. Specifically, although our manipulation check revealed that we successfully induced three different levels of intergroup competition, and although competition in the high-level condition appeared to be fierce enough to overcome the negative consequences associated with cutthroat cooperation in open groups, it may be that it still was not fierce enough to cause partici-

pants in closed groups to feel threatened and, thus, the predicted, negative effects of competition never emerged. Although there is some support for this argument, the joint effects of competition and membership change on collaboration suggest that closed groups did suffer from restricted collaborative idea generation and a centralization of decision-making authority when operating in a fiercely competitive environment.

Another possible explanation is that increasing intergroup competition has benefits, in addition to those captured by our mediator, that may have offset the decline in collaboration in closed groups as competition increased from intermediate to high. In other words, it is possible that other mediating mechanisms, in addition to the one assessed in the present research, may be responsible for transmitting the joint effects of intergroup competition and membership change on group creativity. Evidence for this possibility can be found in our mediational analysis. Although collaboration appears to have been responsible for some of the effects we observed (that is, the reduction in the regression coefficient associated with the interaction of competition squared by membership change approached statistical significance), the coefficient was not zero, indicating that some additional mechanisms may have been operative. Future research could address this issue by identifying supplementary mediators transmitting the effects observed in this study.

Our results highlight the importance of collaboration not only for the production of creative ideas (Gilson & Shalley, 2004), but also as a mediator of the effects of intergroup competition and membership change on group creativity. Thus, the present research extends previous work on social interdependence theory and structural adaptation theory by establishing collaboration, particularly, collaborative idea generation and decision making, as a mechanism underlying differences in creativity at different levels of competition and in both closed and open groups. Although this finding is consistent with our theoretical arguments and previous research suggesting that collaboration in the form of information sharing mediates the effects of competition/collaboration on general performance (Johnson et al., 2006), the results of our mediation analysis should be interpreted with some caution. Because of the malfunction of one of the video-recording devices, we only had data for 35 of our 70 groups, and our results may have been different had we been able to code the interactions of all 70 groups. In addition, because our sample size was relatively moderate, given the complex set of predictions, we cannot rule out the possibility that sampling error may have affected the pattern of results observed in this study. Both of these issues potentially limit the robustness of our findings, thereby creating a need for future research to replicate our results. Thus, we call for future research to reexamine the joint, quadratic effects of intergroup competition and membership change on both within-group collaboration and group creativity using larger sample sizes and producing more complete information on the relevant mediating mechanisms transmitting the effects.

Limitations

Our study has a few additional limitations that are worth noting. First, our use of a laboratory setting involving undergraduate students raises questions about the external validity of our findings. However, the generalizability of any study is determined not by its setting but by how well it captures the necessary dimensions of that setting (Campbell, 1986). Although we attempted to operationalize competition and membership change in ways reflective of the real world, it may be that we did not capture all of the necessary dimensions. Future research is needed to investigate the generalizability of our results beyond the laboratory and the undergraduate student population.

Next, our conceptualization and measurement of creativity as referring to a group's most creative ideas may also limit the generalizability of our results. Despite research suggesting that intergroup settings such as ours have the potential to spur motivational gains that have direct implications for the sheer number of ideas groups generate (e.g., Lount & Phillips, 2007), and despite previous work that has measured creativity in terms of such fluency or the average creativity of all the ideas generated by a group, additional analyses involving these measures produced no significant effects (see footnote 5). One explanation for our fluency results may involve our instructions. Going against traditional brainstorming instructions (Osborn, 1953), but following practice in some contemporary organizations (Sutton & Hargadon, 1996), we did *not* explicitly encourage quantity but, rather, encouraged groups to focus their efforts on truly creative ideas with a potential for subsequent implementation. Thus, although our instructions may have fostered a type of idea generation that mirrors the brainstorming found in contemporary organizations, they may also have curtailed fluency.

Our analysis also failed to produce results for average creativity. This may appear surprising, given that average creativity and our measure of creativity were significantly correlated ($r = .55$, $p <$

.01). One possible explanation may be that these groups, given our emphasis on highly creative ideas, combined some of their ideas or built upon them in an effort to develop truly creative ones. Given the potential for synergistic increases in creativity under these conditions (that is, the creativity of a group's most creative idea may be more than the average creativity of its component ideas), it is conceivable that the joint effects of competition and membership change were only observed when we considered a group's most creative idea. Future work is needed that examines the effects of competition and membership exchange on average creativity using alternative instructions. Nevertheless, as organizations typically assemble groups to foster the production of truly creative ideas rather than ideas of average creativity, our results do have important implications for organizational practice.

Next, the overall level of creativity in our study was modest; the average creativity of the groups' most creative contributions in all conditions was 6.20 (s.d. = 1.04) on a 9-point scale. One reason for this modest outcome may again be our instructions, which highlighted the importance of ideas that were not only novel but also implementable. Although our focus on both the novelty *and* usefulness components of creativity is consistent with our definition of creativity and with the conceptualization of creativity embraced in contemporary research (see Shalley, Zhou, & Oldham, 2004), highlighting the usefulness component may have caused groups to dismiss ideas of greater originality but with little obvious or immediate potential for implementation, thereby restricting overall creativity levels. In addition, compared to brainstorming groups in organizations, our groups had less time available to develop their ideas. More time may have allowed groups to develop not only more ideas but also ideas of greater creativity. Thus, in the future researchers may want to extend the time available to groups to develop their ideas.

Theoretical Implications

Despite these limitations, our research has a number of theoretical implications. First, this study has advocated, and its results supported, a nuanced view of the effects of intergroup competition on creativity in groups. Specifically, the results support the view that the effects of intergroup competition on creativity vary not only as a function of the competitiveness of the intergroup environment, but also as a function of membership change. For example, we found that for both open and closed groups, the effects of intergroup rivalry on group creativity described a nonmonotonic pattern (a U-shaped function in the open case and an attenuated, inverted U-shaped function in the closed case). These findings unambiguously suggest that a comprehensive understanding of the effects of intergroup rivalry on group creativity requires researchers to consider the nonlinear effects of competition. Theories and models of the implications of intergroup competition therefore need to move beyond linear arguments to accommodate such nonlinear effects.

By examining the nonmonotonic effects of competition, the present study extends work on both social interdependence theory and structural adaptation theory. Refining the implications of social interdependence theory, our findings suggest that there are limits to the creative benefits that can be expected from instilling a cooperative mind-set via intergroup competition and that fierce rivalry (i.e., intergroup competition increasing from intermediate to high levels) offers few added benefits and may even undermine creativity by constricting collaboration. Refining structural adaptation theory, our findings suggest that problems associated with cutthroat cooperation are limited to circumstances in which competition between groups is moderate (i.e., competition increases from low to intermediate levels) and can be overcome by creating a fiercely competitive intergroup environment.

Next, scholars have contended that the effects of intergroup competition on performance are contingent on a number of factors, such as the performance dimension of a task, the composition of a group, and the characteristics of individual group members (Beersma et al., 2003). For example, Beersma et al. found that the collaborative benefits suggested by social interdependence theory as emerging from the use of reward structures designed to facilitate intergroup competition only resulted in the expected performance increases when group performance was evaluated in terms of accuracy versus speed and when groups were composed of individuals likely to perform well in collaborative settings (i.e., individuals with high extraversion and agreeableness). Our research is consistent with and extends this contingency view of social interdependence theory by suggesting that stability/change in membership composition may also play a vital role in regulating the effects of intergroup competition on different outcome variables.

Finally, in keeping with previous work on the effects of membership change on group creativity (Choi & Thompson, 2005; Ziller et al., 1962), our results confirmed that open groups produced more creative ideas than closed groups in noncompeti-

tive environments. Introducing a new member from a noncompeting group not only infuses a group with new perspectives but also provides the group with opportunities for social learning; the arrival of a new member may cause existing members to reflect upon and revise their work processes and ultimately result in the development of more effective task strategies (Arrow & McGrath, 1993), thereby fostering creativity (Choi & Thompson, 2005). Although our open groups were significantly more creative than the closed groups in noncompetitive environments, these advantages vanished as the intergroup environment became increasingly competitive, mainly as a result of the closed groups now generating ideas of greater creativity. These results suggest that theories of membership change must move beyond a straightforward change-promotes-creativity logic to incorporate intergroup environment as an important factor shaping the effects of membership change on creativity.

Practical Implications

Our study also has a number of practical implications. Specifically, the findings suggest that the use of intergroup competition to stimulate the creativity of groups requires managers to calibrate competition with whether groups are likely to encounter membership change. Our results suggest that open groups are unlikely to benefit from intergroup competition and may even experience declines in creativity when such competition is limited to intermediate intensity. However, open groups in a competitive environment are an organizational reality, especially in organizations that depend on the introduction of new products and services. Specifically, as the production of new products and services is typically the result of a process consisting of multiple stages (e.g., Cooper, 2001; Leenders et al., 2007), in between which group composition may change to accommodate the changing requirements for expertise, it is not uncommon for members of a previously competing team to join a new team during the later stages of the innovation process. Our results suggest that such competition during the early stages of the process may have the potential to undermine creativity during subsequent stages, at least in cases in which competition is of moderate intensity. Thus, as a rule of thumb, we would suggest that when faced with fluid, project-based groups involved in innovative pursuits, managers avoid using intergroup competition as a *primary* vehicle for promoting creativity.

Our results regarding the effects of intergroup competition on the creativity of open groups may also have organization-level implications. Companies frequently acquire or merge with other organizations in their industry to gain competitive advantage. When such organizations share a somewhat competitive past, however, our research suggests that these mergers and acquisitions (M&A) are unlikely to produce the intended returns, partially because of the restricted collaboration and creativity that are likely to emerge as a result of problems associated with integrating members from a previously competing entity. Thus, organizational leaders should not underestimate the difficulties and adverse effects on collaboration and creativity that result from M&A activities involving former competitors (Johnson et al., 2006).

When group membership is stable, however, engaging groups in some form of intergroup competition has clear benefits. Nevertheless, managers should keep in mind that only intermediate levels of competition are required to stimulate elevated creativity and that creating a fiercely competitive environment offers few added benefits (and perhaps even costs, as indicated by our findings regarding collaboration). In addition to constricting within-group collaboration and, potentially, creativity, intense intergroup competition may also lead to costs that are more indirect, by stifling collaboration *between* groups or subunits. That is, animosity between competing groups is likely to undermine the free flow of information and other important resources between these entities. However, as group creativity depends, at least to some extent, on the accessibility of resources provided by other groups or units (e.g., Ancona & Caldwell, 1992; Wong, 2004), intergroup competition is likely to undermine creativity not only by constraining within-group collaboration but also by restricting collaboration between groups and units. In addition, to the extent that the achievement of organizational goals depends on the collaborative effort of *all* groups or units in an organization, intergroup competition is also likely to negatively impact organization-level performance. Thus, the benefits associated with intergroup competition may easily be outweighed by its costs, even in more stable environments, and we encourage managers to carefully consider these costs and benefits before using competition to promote the creativity of their groups.

Finally, our results also suggest that in noncompetitive environments, membership change is a valid mechanism for enhancing group creativity. Thus, organization leaders interested in stimulating group creativity in such circumstances may purposefully design interventions requiring groups to engage in regular membership exchange. How-

ever, caution regarding the frequency and timing of such interventions has to be exercised, as membership change in this study occurred only once and during a natural break point between two tasks and, thus, it could be that change that occurs frequently or in the middle of a task may prove to be too disruptive and ultimately undermine the creativity of groups (Choi & Thompson, 2005). Nevertheless, occasional membership change during natural break points appears to be a legitimate mechanism for boosting the creativity of ad hoc groups in noncompetitive environments.

REFERENCES

Aiken, L. S., & West, S. G. 1991. ***Multiple regression: Testing and interpreting interactions.*** Newbury Park, CA: Sage.

Amabile, T. M. 1988. A model of creativity and innovation in organizations. In B. M. Staw & L. L. Cummings (Eds.), ***Research in organizational behavior,*** vol. 10: 123–167. Greenwich, CT: JAI Press.

Amabile, T. M. 1996. ***Creativity in context.*** Boulder, CO: Westview.

Ancona, D. G., Bresman, H. M., & Kaeufer, K. 2002. The comparative advantage of X teams. ***Sloan Management Review,*** 43(3): 33–39.

Ancona, D. G., & Caldwell, D. F. 1992. Bridging the boundary: External activity and performance in organizational teams. ***Administrative Science Quarterly,*** 37: 634–665.

Ancona, D. G., & Caldwell, D. F. 1998. Rethinking team composition from the outside in. In M. Neale, E. Mannix, & D. Gruenfeld (Eds.), ***Research on managing groups and teams,*** vol.1: 21–38. Stamford, CT: JAI Press.

Arrow, H., & McGrath, J. E. 1993. How member change and continuity affects small group structure, process, and performance. ***Small Group Research,*** 24: 334–361.

Baer, M., & Oldham, G. R. 2006. The curvilinear relation between experienced creative time pressure and creativity: Moderating effects of openness to experience and support for creativity. ***Journal of Applied Psychology,*** 91: 963–970.

Baron, R. M., & Kenny, D. A. 1986. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. ***Journal of Personality and Social Psychology,*** 51:1173–1182.

Beersma, B., & De Dreu, C. K. W. 2005. Conflict's consequences: Effects of social motives on postnegotiation creative and convergent group functioning and performance. ***Journal of Personality and Social Psychology,*** 89: 358–374.

Beersma, B., Hollenbeck, J. R., Conlon, D. E., Humphrey, S. E., Moon, H., & Ilgen, D. R. 2009. Cutthroat cooperation: The effects of team role decisions on adaptation to alternative reward structures. ***Organizational Behavior and Human Decision Processes,*** 108: 131–142.

Beersma, B., Hollenbeck, J. R., Humphrey, S. E., Moon, H., Conlon, D. E., & Ilgen, D. R. 2003. Cooperation, competition, and team performance: Toward a contingency approach. ***Academy of Management Journal,*** 46: 572–590.

Birkinshaw, J. 2001. Strategies for managing internal competition. ***California Management Review,*** 44(1): 21–38.

Bliese, P. D. 2000. Within-group agreement, non-independence, and reliability: Implications for data aggregation and analysis. In K. J. Klein & S. W. J. Kozlowski (Eds.), ***Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions:*** 349–381. San Francisco: Jossey-Bass.

Bornstein, G., & Erev, I. 1994. The enhancing effect of intergroup competition on group performance. ***International Journal of Conflict Management,*** 5: 271–283.

Brown, V., Tumeo, M., Larey, T. S., & Paulus, P. B. 1998. Modeling cognitive interactions during group brainstorming. ***Small Group Research,*** 29: 495–526.

Campbell, J. 1986. Labs, fields, and straw issues. In E. Locke (Ed.), ***Generalizing from laboratory to field settings: Research findings from industrial-organizational psychology, organizational behavior, and human resource management:*** 269–279. Lexington, MA: Lexington Books.

Choi, H.-S., & Thompson, L. 2005. Old wine in a new bottle: Impact of membership change on group creativity. ***Organizational Behavior and Human Decision Processes,*** 98: 121–132.

Clydesdale, G. 2006. Creativity and competition: The Beatles. ***Creativity Research Journal,*** 18: 129–139.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. 2003. ***Applied multiple regression/correlation analysis for the behavioral sciences.*** Mahwah, NJ: Erlbaum.

Cooper, R. G. 2001. ***Winning at new products: Accelerating the process from idea to launch.*** Jackson, TN: Perseus.

Deutsch, M. 1949. A theory of co-operation and competition. ***Human Relations,*** 2: 129–152.

Diehl, M., & Stroebe, W. 1991. Productivity loss in idea-generating groups: Tracking down the blocking effect. ***Journal of Personality and Social Psychology,*** 61: 392–403.

Dineen, B. R., & Noe, R. A. 2003. The impact of team fluidity and its implication for human resource management research and practice. In J. Martocchio & G.

Ferris (Eds.), ***Research in personnel and human resource management,*** vol. 22: 1–37. Greenwich, CT: JAI Press.

Erev, I., Bornstein, G., & Galili, R. 1993. Constructive intergroup competition as a solution to the free rider problem: A field experiment. ***Journal of Experimental Social Psychology,*** 29: 463–478.

Fiedler, F. E. 1967. The effect of inter-group competition on group member adjustment. ***Personnel Psychology,*** 20: 33–44.

Gilson, L. L., & Shalley, C. E. 2004. A little creativity goes a long way: An examination of teams' engagement in the creative process. ***Journal of Management,*** 30: 453–470.

Goncalo, J. A., & Staw, B. M. 2006. Individualism-collectivism and group creativity. ***Organizational Behavior and Human Decision Processes,*** 100: 96–109.

Griffin, A. 1997. PDMA research on new product development practices: Updating trends and benchmarking best practices. ***Journal of Product Innovation Management,*** 14: 429–458.

Gruenfeld, D. H., Martorana, P. V., & Fan, E. 2000. What do groups learn from their worldliest members? Direct and indirect influence in dynamic teams. ***Organizational Behavior and Human Decision Processes,*** 82: 45–59.

Hackman, I. R., & Morris, C. G. 1975. Group tasks, group interaction processes, and group performance effectiveness: A review and proposed integration. In L. Berkowitz (Ed.), ***Advances in experimental social psychology,*** vol. 8: 47–99. New York: Academic Press.

Hargadon, A. B., & Bechky, B. A. 2006. When collections of creatives become creative collectives: A field study of problem solving at work. ***Organization Science,*** 4: 484–500.

Hornsey, M. J., Grice, T., Jetten, J., Paulsen, N., & Callan, V. 2007. Group-directed criticisms and recommendations for change: Why newcomers arouse more resistance than oldtimers. ***Personality and Social Psychology Bulletin,*** 33: 1036–1048.

Humphrey, S. E., Moon, H., Conlon, D. E., & Hofmann, D. A. 2004. Decision-making and behavior fluidity: How focus on completion and emphasis on safety changes over the course of projects. ***Organizational Behavior and Human Decision Processes,*** 93: 14–27.

James, L. R., Demaree, R. G., & Wolf, G. 1984. Estimating within-group interrater reliability with and without response bias. ***Journal of Applied Psychology,*** 69: 85–98.

Johnson, D. W. 2003. Social interdependence: Interrelationships among theory, research, and practice. ***American Psychologist,*** 58: 934–945.

Johnson, M. D., Hollenbeck, J. R., Humphrey, S. E., Ilgen, D. R., Jundt, D., & Meyer, C. J. 2006. Cutthroat cooperation: Asymmetrical adaptation to changes in team reward structures. ***Academy of Management Journal,*** 49: 103–119.

Kane, A. A., Argote, L., & Levine, J. M. 2005. Knowledge transfer between groups via personnel rotation: Effects of social identity and knowledge quality. ***Organizational Behavior and Human Decision Processes,*** 96: 56–71.

Kanter, R. M., Kao, J. J., & Wiersma, F. D. 1997. ***Innovation: Breakthrough ideas at 3M, DuPont, GE, Pfizer, and Rubbermaid.*** New York: Harper.

King, N., & Anderson, N. 1990. Innovation in working groups. In M. A. West & J. L. Farr (Eds.), ***Innovation and creativity at work:*** 81–100. Chichester, U.K.: Wiley.

Kramer, R. M., & Brewer, M. B. 1984. Effects of group identity on resource use in simulated social dilemma. ***Journal of Personality and Social Psychology,*** 46: 1044–1057.

Larson, J. R. 2007. Deep diversity and strong synergy: Modeling the impact of variability in members' problem-solving strategies on group problem-solving performance. ***Small Group Research,*** 38: 413–436.

Lawler, E. E., Mohrman, S. A., & Ledford, G. E. 1995. ***Creating high performance organizations: Practices and results of employee involvement and total quality management in*** **Fortune** ***1000 companies.*** San Francisco: Jossey-Bass.

LeBreton, J. M., & Senter, J. L. 2008. Answers to 20 questions about interrater reliability and interrater agreement. ***Organizational Research Methods,*** 11: 815–852.

Leenders, R. Th. A. J., van Engelen, J. M. L., & Kratzer, J. 2007. Systematic design methods and the creative performance of new product teams: Do they contradict or complement each other? ***Journal of Product Innovation Management***, 24: 166–179.

Lewis, K., Belliveau, M., Herndon, B., & Keller, J. 2007. Group cognition, membership change, and performance: Investigating the benefits and detriments of collective knowledge. ***Organizational Behavior and Human Decision Processes,*** 103: 159–178.

Lount, R. B., & Phillips, K. W. 2007. Working harder with the out-group: The impact of social category diversity on motivation gains. ***Organizational Behavior and Human Decision Processes,*** 103: 214–224.

Marino, A. M., & Zábojník, J. 2004. Internal competition for corporate resources and incentives in teams. ***RAND Journal of Economics,*** 35: 710–727.

McGrath, J. E., Arrow, H., & Berdahl, J. L. 2000. The study of groups: Past, present, and future. ***Personality and Social Psychology Review,*** 4: 95–105.

McGraw, K. 1978. The detrimental effects of reward on performance: A literature review and a prediction model. In M. Lepper & D. Greene (Eds.), ***The hidden costs of reward:*** 33–60. Hillsdale, NJ: Erlbaum.

McGraw, K. O., & Wong, S. P. 1996. Forming inferences

about some interclass correlation coefficients. ***Psychological Methods,*** 1: 30–46.

Mulvey, P. M., & Ribbens, B. A. 1999. The effects of intergroup competition and assigned group goals on group efficacy and group effectiveness. ***Small Group Research,*** 30: 651–677.

Nemeth, C. J., & Ormiston, M. 2007. Creative idea generation: Harmony versus stimulation. ***European Journal of Social Psychology,*** 37: 524–535.

Nemeth, C. J., & Staw, B. M. 1989. The tradeoffs of social control and innovation in small groups and organizations. In L. Berkowitz (Ed.), ***Advances in experimental social psychology,*** vol. 22: 175–210. New York: Academic Press.

Oldham, G. R., & Cummings, A. 1996. Employee creativity: Personal and contextual factors at work. ***Academy of Management Journal,*** 39: 607–634.

Osborn, A. F. 1953. ***Applied imagination.*** New York: Scribner's.

Paulus, P. B. 2000. Groups, teams, and creativity: The creative potential of idea-generation groups. ***Applied Psychology: An International Review,*** 49: 237–262.

Paulus, P. B., & Yang, H.-C. 2000. Idea generation in groups: A basis for creativity in organizations. ***Organizational Behavior and Human Decision Processes,*** 82: 76–87.

Peters, T. J., & Waterman, R. H. 1988. ***In search of excellence: Lessons from America's best-run companies.*** New York: Warner Books.

Rietzschel, E. F., Nijstad, B. A., & Stroebe, W. 2006. Productivity is not enough: A comparison of interactive and nominal brainstorming groups on idea generation and selection. ***Journal of Experimental Social Psychology,*** 42: 244–251.

Rietzschel, E. F., Nijstad, B. A., & Stroebe, W. 2007. Relative accessibility of domain knowledge and creativity: The effects of knowledge activation on the quantity and originality of generated ideas. ***Journal of Experimental Social Psychology,*** 43: 933–946.

Shalley, C. E., & Oldham, G. R. 1997. Competition and creative performance: Effects of competitor presence and visibility. ***Creativity Research Journal,*** 10: 337–345.

Shalley, C. E., Zhou, J., & Oldham, G. R. 2004. The effects of personal and contextual characteristics on creativity: Where should we go from here? ***Journal of Management,*** 30: 933–958.

Sherif, M., & Sherif, C. W. 1953. ***Groups in harmony and tension: An introduction to studies in intergroup relations.*** New York: Harper & Brothers.

Shin, S. J., & Zhou, J. 2007. When is educational specialization heterogeneity related to creativity in research and development teams? Transformational leadership as a moderator. ***Journal of Applied Psychology,*** 92: 1709–1721.

Shrout, P. E., & Fleiss, J. L. 1979. Intraclass correlations: Uses in assessing rater reliability. ***Psychological Bulletin,*** 86: 420–428.

Sobel, M. E. 1982. Asymptotic intervals for indirect effects in structural equations models. In S. Leinhart (Ed.), ***Sociological methodology:*** 290–312. San Francisco: Jossey-Bass.

Staw, B. M., Sandelands, L. E., & Dutton, J. E. 1981. Threat-rigidity effects in organizational behavior: A multilevel analysis. ***Administrative Science Quarterly,*** 26: 501–524.

Sundstrom, E. 1999. ***Supporting work team effectiveness: Best management practices for fostering high performance.*** San Francisco: Jossey-Bass.

Sutton, R. I., & Hargadon, A. 1996. Brainstorming group in context: Effectiveness in a product design firm. ***Administrative Science Quarterly,*** 41: 685–718.

Taggar, S. 2002. Individual creativity and group ability to utilize individual creative resources: A multilevel model. ***Academy of Management Journal,*** 45: 315–330.

Van der Vegt, G. S., & Bunderson, J. S. 2005. Learning and performance in multidisciplinary teams: The importance of collective team identification. ***Academy of Management Journal,*** 48: 532–547.

Van de Ven, A. H. 1986. Central problems in the management of innovation. ***Management Science,*** 32: 590–607.

Van Knippberg, D., De Dreu, C. K. W., & Homan, A. C. 2004. Work group diversity and group performance: An integrative model and research agenda. ***Journal of Applied Psychology,*** 89: 1008–1022.

Vera, D., & Crossan, M. 2005. Improvisation and innovative performance in teams. ***Organization Science,*** 16: 203–224.

Wheelwright, S. C., & Clark, K. B. 1992. ***Revolutionizing product development.*** New York: Free Press.

Wiekens, C. J., & Stapel, D. A. 2008. I versus we: The effects of self-construal level on diversity. ***Social Cognition,*** 26: 368–377.

Wong, S.-S. 2004. Distal and local group learning: Performance trade-offs and tensions. ***Organization Science,*** 15: 645–656.

Woodman, R. W., Sawyer, J. E., & Griffin, R. W. 1993. Toward a theory of organizational creativity. ***Academy of Management Review,*** 18: 293–321.

Ziller, R. C. 1965. Toward a theory of open and closed groups. ***Psychological Bulletin,*** 65: 164–182.

Ziller, R. C., Behringer, R. D., & Goodchilds, J. 1962. Group creativity under conditions of success or failure and variation in group stability. ***Journal of Applied Psychology,*** 46: 43–49.

Markus Baer (baer@wustl.edu) is an assistant professor of organizational behavior at the Olin Business School, Washington University in St. Louis. He earned his Ph.D. from the University of Illinois at Urbana-Champaign. His current research examines the determinants of the various activities (i.e., problem formulation, idea generation, solution implementation) underlying creativity and innovation in organizations.

Roger Th. A. J. Leenders (r.t.a.j.leenders@rug.nl) is a professor of business studies, in particular networks in market and product innovation, at the University of Groningen in The Netherlands. He received his Ph.D. from the Interuniversity Center for Social Science Theory and Methodology (ICS) in The Netherlands. His research focuses on social network effects in innovation and especially on the role social networks play in the performance of innovation teams and projects.

Greg R. Oldham (goldham@tulane.edu) is the J. F., Jr., and Jesse Lee Seinsheimer Chair in Business at the A. B. Freeman School of Business at Tulane University. He received his Ph.D. from Yale University. His research focuses on the contextual and personal conditions that prompt the creativity of individuals and teams in organizations.

Abhijeet K. Vadera (avadera2@gmail.com) is an assistant professor of business in organisational behaviour at the Indian School of Business. His research focuses on examining the antecedents, processes, and consequences of constructive (e.g., creativity, whistle-blowing) as well as destructive (e.g., workplace crimes, white-collar crime) deviance.