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Geographically-Colocated Subgroups in Globally Dispersed Teams: A Test of the Faultline Hypothesis

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Abstract

Members of dispersed work teams may be located geographically in a variety of configurations. In fully-dispersed teams, each member resides in a unique location, whereas partially-dispersed teams are composed of some colocated and some distant members. Configurations in which team members are divided into geographically-distinct subgroups may create faultline dynamics, characterized by disruptive intergroup relations between the subgroups including diminished trust and increased conflict. In a study of 45 groups consisting of a total of 266 graduate students from 15 different schools, we examined three different configurations of geographical dispersion in 6-person teams: (1) fully dispersed, (2) three colocated subgroups with two people each, and (3) two colocated subgroups of three people each. Both group-level and dyad-level analyses supported the faultline hypothesis. The study suggests that various contextual factors stemming from team members' geographical locations may shift the dimensions of diversity that are most consequential for team functioning.

Diverse teams are turning up in a broad spectrum of organizational contexts to accomplish a variety of objectives (Ely & Thomas, 2001). Teams promise to foster coordination, information sharing, and integration of members' diverse perspectives, ultimately leading to better decisions and productivity (Mohrman, Cohen, & Mohrman, 1995). While the prevalence of diverse teams would seem to attest to their effectiveness, the potential value in diversity frequently goes unrealized (Tsui & Gutek, 1999). Paradoxically, team members' efforts to collaborate are often thwarted by the very differences that were supposed to be the source of their success. Many teams falter amid misunderstandings, destructive conflict, distrust, ineffective communication, and other problems related to members' differences (Pelled, 1996).

These two lines of thought—that team members' differences can contribute to either great insight or great misery—reverberate throughout research in this domain (e.g., Guzzo & Dickson, 1996; Williams & O'Reilly, 1998). Theoretically, the "value-in-diversity" hypothesis articulates how differences can contribute to team performance on some tasks (Jehn, Northcraft, & Neale, 1999). On the other hand, theories of self-categorization, social identity, and the link between similarity and attraction predict that differences will undermine group harmony and effectiveness (Byrne, 1971; Turner et al., 1987; Tajfel, 1982; Hogg & Terry, 2000). When fellow team members categorize each other using boundaries that divide them, they tend to derogate those whom they place into a different category, or "outgroup," reserving favorable biases only for members of their own "ingroup" (Brewer & Brown, 1998; Hewstone, Rubin, & Willis, 2002). Ingroup and outgroup memberships are not objectively determined, however. Instead, these distinctions depend on which boundaries become salient and psychologically activated in a particular group context. The more diverse a team, the higher the probability that

members will utilize one or more of their differences as the basis for social categorization and suffer from deleterious consequences (e.g., Smith et al., 1994; Tsui, Egan, & O'Reilly, 1992).

In this paper, we propose that geographically dispersed teams introduce physical distance as a form of diversity. Unique geographical locations may become salient boundaries that activate social categorization processes among team members. In the next section, we draw on the diversity literature to predict the effects of different configurations of geographic diversity.

THEORETICAL BACKGROUND

Understanding Diversity in Work Teams

Empirically, some researchers have marshaled evidence demonstrating that team members' differences can impede their ability to function effectively (e.g., Williams & O'Reilly, 1998). Yet the evidence is far from clear-cut, as many diverse groups find a way to capitalize on their differences to achieve superior performance (Watson, Kumar, & Michaelsen, 1993). Organizational scholars have responded to this puzzle by making more contextualized, fine-grained predictions about when diversity is likely to either undermine or enhance team functioning. Some have specified precisely how the consequences of certain types of diversity should vary across different types of group processes and outcomes, and that these patterns of effects may vary across different types of tasks (e.g., Pelled, Eisenhardt, & Xin, 1999; Jehn et al., 1999; Harrison, Price, Gavin, & Florey, 2002; Bunderson & Sutcliffe, 2002). Others have studied how diversity's consequences vary across time, making specific predictions for different stages of a team's life (e.g., Watson, Kumar, & Michaelsen, 1993). Conditions at the interpersonal, group, and organizational levels also moderate the effects of diversity, including interpersonal congruence (Polzer, Swann, & Milton, 2002), collectivistic versus individualistic

group culture (Chatman, Polzer, Barsade, & Neale, 1998), or the presence of an organizational "integration-and-learning" perspective (Ely & Thomas, 2001). These contextualized approaches, while maintaining that teams can avoid the problems associated with diversity under the right circumstances, also acknowledge that greater diversity makes groups more susceptible to disruptions.

Lau and Murnighan (1998) questioned this assumption that greater diversity increases susceptibility to dysfunctional behavior. These authors closely examined alternative group configurations in the context of the group's work environment. They reasoned that social categorization processes are likely to be strongest and most disruptive not when every group member is unique, but rather when team members' differences create dividing lines, or "faultlines," that separate them into distinct subgroups. A salient faultline causes people to categorize the members of their own subgroup as the ingroup while viewing other subgroups as outgroups. Once this categorization becomes activated, people are likely to be positively biased toward their own subgroup members while derogating the members of other subgroups (Brewer, 1979; Brewer & Brown, 1998; Hewstone et al., 2002). These biases lead to decreased trust and heightened conflict across subgroup boundaries, impeding interaction and decision-making processes (Kramer, 1991; Polzer, in press). The novelty of Lau and Murnighan's (1998) formulation is that groups in which diversity creates faultlines will experience more problems (e.g., greater dysfunctional conflict, less trust) than groups with greater diversity but weaker faultlines. Since subgroup distinctions are sharpest when people are similar within subgroups but different across subgroups, moderate levels of diversity are potentially more disruptive than either low or high levels.

A single dimension of diversity can create a faultline if it is salient enough to override other distinctions (Earley & Mosakowski, 2000; Lau & Murnighan, 1998). Moreover, the strongest faultline dynamics are likely to occur when the faultline divides the group into two subgroups of equal size and power. As Lau and Murnighan note: "Although turmoil among a number of internal subgroups may be debilitating, it may not generate as much intensity as two competing subgroups that can foment diametric opposition to one another" (1998: 331). Moreover, they expect a group composed of equally-sized subgroups to be most susceptible to faultline dynamics. Whether a potential faultline remains dormant or becomes psychologically activated depends on which diversity dimensions are highlighted by features of the context in which the group operates.

Many types of differences can trigger harmful faultline dynamics. Hambrick, Li, Xin, and Tsui (2001) propose that management groups of international joint ventures are inherently coalitional because they are typically composed of representatives of the two parent companies. The faultline created by members' parent company affiliations should be especially powerful early in the life of the management group, as well as when the two subgroups are highly interdependent, share power, and differ on other dimensions such as nationality, age, or functional background. Such other potential differences are secondary, however, to the fact that the two subgroups represent the two parent companies' interests. Hambrick et al. (2001) argue that this overriding difference is often sufficient to trigger a schism between the two subgroups, and once activated, this faultline may lead to a downward spiral of dysfunctional conflict, behavioral disintegration, and ultimately reduced performance.

Earley and Mosakowski (2000) tested whether the configuration of a single diversity dimension—members' nationalities—created faultlines in transnational teams. They reasoned

that nationality is typically the most salient difference in transnational teams in part because it determines communication patterns and interaction styles. As a result, they expected faultline dynamics to be guided primarily by the configuration of members' nationalities, irrespective of members' secondary characteristics such as race, gender, religion, or profession. In an exploratory field study, they observed teams with two nationality-based subgroups encounter numerous difficulties communicating, managing conflict, and working effectively across subgroup lines, even though there was high cohesion *within* the respective subgroups. Comparatively, neither homogeneous nor highly heterogeneous teams suffered from these faultline dynamics. Earley and Mosakowski (2000) then manipulated team composition in a laboratory study and again found that teams with two nationality-based subgroups exhibited significantly lower team efficacy, lower team identity, poorer communication, and worse team performance than either homogeneous or highly heterogeneous teams. Of relevance for the present research, the members of the transnational teams that Earley and Mosakowski (2000) studied had the benefit of working together in the same place (see also Thatcher, Jehn, & Zanutto, 2003). Members of fully colocated teams have ample opportunities to work through their differences in face-to-face meetings, a luxury that many dispersed teams do not enjoy. The purpose of the current study is to test the faultline hypothesis in the context of geographically dispersed teams in which the configuration of team members' physical locations can create strong faultlines.

Diversity and Faultlines in the Context of Geographically Dispersed Teams

An increasingly common contextual feature of organizational teams is the differing locations of team members. Advances in communication technology, a trend toward globalization, and related forces are fueling the popularity of dispersed teams (Duarte & Snyder,

2001; Townsend, DeMarie, & Hendrickson, 1998). As a result, geographical location has become a highly salient difference among members of many teams. Although research on team diversity has remained largely separate from research on team dispersion, in this paper we treat geographical location as a key dimension along which team members can vary (O'Leary & Cummings, 2002).

The possible configurations of diversity in geographical location are nearly unlimited, with only the size of the team constraining the variety of locations in which members might reside. At one extreme are traditional, fully colocated teams in which all members reside in the same location. At the other extreme are fully dispersed teams in which every team member resides in a unique location. For our purposes, people in a "unique location" are far enough away from others to prohibit face-to-face interaction, whereas colocated people are in close enough proximity to make face-to-face interaction easily available (Olson & Olson, 2000; Monge et al., 1985). Between fully colocated and fully dispersed teams lie a wide variety of "partly dispersed" or hybrid configurations, differing in the number of people who are colocated, the distance between dispersed people, and whether there are multiple subgroups of colocated people (Griffith & Neale, 2001; O'Leary & Cummings, 2002). In partly dispersed groups, colocated subgroups of members can interact face-to-face like the members of traditional groups, but they rely on electronic media to communicate with group members who reside in different locations.

We compare three specific configurations of geographical diversity in six-person teams: 1) *fully dispersed* teams in which each person resides in a unique location; 2) partly dispersed teams composed of *three subgroups* of two colocated people each, and; 3) partly dispersed teams composed of *two subgroups* of three colocated people each (see Figure 1). As we explain in the

methods section, we selected these configurations because we judged them to provide the best test of the diversity and faultline hypotheses described next.

Insert Figure 1 about here.

The diversity hypothesis in geographically dispersed teams. The idea that similarity fosters interaction and communication (Byrne, 1971; Turner et al., 1987) has served as the foundation for understanding the effects of a variety of differences among team members, including demographic differences (e.g., race, age, sex, country of origin) and organizationally-defined differences (e.g., organizational tenure, functional background). Researchers have predicted that differences along these dimensions hinder effective communication and interaction even among group members who work in close proximity and therefore have no physical impediments to interacting. We apply the logic of these diversity arguments to the dimension of geographical dispersion. Group members who are similar on this dimension reside and work in the same location, while group members who are different on this dimension reside and work in distant locations.

Why is geographical location an important dimension of diversity in groups? People may base social categorizations and corresponding assessments of similarity on their own and others' geographical locations, much the same way they use other diversity dimensions to categorize others and assess similarity. In fact, because geographical differences are so immediately apparent, they potentially are a more salient basis for categorization than any other difference. Moreover, demographic characteristics that are otherwise immediately apparent may be invisible to people in different locations, especially those who communicate via text-based electronic

media. Categorizations and similarity assessments stemming from people's geographical locations may cause many of the same patterns of behavior that emerge from other diversity dimensions.

Unlike other types of differences, however, diversity in geographical location introduces an additional mechanism that should influence the amount and nature of interaction among group members—the differential availability of communication media. In short, fully dispersed group members cannot interact face-to-face in each other's physical presence, and instead must rely on electronic forms of communication. In partly dispersed groups, group members in the same location can communicate face-to-face, though they are still unable to do so with their distant counterparts. Face-to-face communication is characterized by higher synchronicity (i.e., simultaneity) and more nonverbal and paraverbal cues than other communication media (Baltes, Dickson, Sherman, Bauer, & LaGanke, 2002). Parties in a face-to-face interaction enjoy such advantages as rapid feedback, nuanced information transmitted continually through multiple channels (e.g., voice, facial expression, gestures, posture), a shared local context, and opportunities for impromptu communication before and after formal interaction (Olson & Olson, 2000; Nardi & Whittaker, 2002). Although synchronicity and nonverbal cues occur in varying degrees in non-face-to-face interaction (e.g., telephone, video conference, computer-mediated text), it is generally easier for people to establish "common ground"—a mutual understanding of the knowledge shared by communicating parties—through face-to-face interaction (Cramton, 2001). People who establish common ground, in turn, are better able to handle problems associated with group functioning (Clark, 1996; Krauss & Fussell, 1990).

These considerations suggest that face-to-face interaction among group members should facilitate effective group functioning. A recent meta-analysis supported this hypothesis, showing

that groups communicating face-to-face made faster and more effective decisions than groups using computer-mediated communication (Baltes et al., 2002). The availability of face-to-face interaction, then, may work in conjunction with social categorization processes to explain why teams with more colocated members should function more effectively than teams that are more dispersed (Griffith & Neale, 2001; Lipnack & Stamps, 2000).

We consider the impact of geographical dispersion on two indicators of group functioning—conflict and trust—that are widely studied by group researchers (e.g., Jehn, 1995 and 1997; Pelled, Eisenhardt, & Xin, 1999; Poole, Holmes, & Desanctis, 1991; Jarvenpaa & Leidner, 1999; Jarvenpaa, Knoll, & Leidner, 1998). We define conflict as disagreements (manifested or latent) among group members that stem from perceived incompatibilities or discrepant views and goals (Jehn, 1995; Robey et al., 1993; Boulding, 1963). Trust is defined as the "willingness to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party" (Mayer, Davis, & Schoorman, 1995: 712). Group functioning typically is impaired by conflict but improved by trust (McGrath, 1991; De Dreu & Weingart, 2003). Both conflict and trust have been proposed and found to have an instrumental impact on the performance of globally dispersed teams (Montoya-Weiss, Massey, & Song, 2001; Kanawattanachai & Yoo, 2002). The reasons outlined above suggest that groups with a higher proportion of members who can interact face-to-face will experience less conflict and more trust than groups with a lower proportion of members who can interact face-to-face:

Hypothesis 1a: Fully dispersed teams will experience more conflict and less trust than three-subgroup teams (composed of three subgroups of two colocated people each),

which will in turn experience more conflict and less trust than two-subgroup teams (composed of two subgroups of three colocated people each).

We should note that many conflict researchers have distinguished between task and relational conflict, yet we do not utilize this distinction in our hypotheses and instead favor a more general conception of conflict. This choice is consistent with the observation that task and relational conflict are often highly interrelated (Simons & Peterson, 2000) and are especially likely to be so in dispersed teams (Mannix, Griffith, & Neale, 2002).

The faultline hypothesis in geographically dispersed teams. The theoretical logic underlying hypothesis 1a does not take into account the potential for faultlines between geographical subgroups to disrupt group functioning. According to the faultline hypothesis, colocated members within a geographical subgroup should benefit from all the advantages associated with face-to-face communication along with the positive biases people bestow upon ingroup members. Therefore, relations within colocated subgroups should be harmonious and productive due to the same mechanisms that benefit fully colocated groups. The greater the solidarity among members of a subgroup, however, the more likely they are to categorize as outgroup members those teammates who do not belong to their subgroup (Lau & Murnighan, 1998; Polzer, in press). When such an intergroup categorization is psychologically activated, relations between the subgroups are more likely to be negative and unproductive (Brewer & Brown, 1998).

Interestingly, these problems are expected to arise in part because of the same social categorization processes that can disrupt interaction among categorically different individuals on a highly diverse team. An integral part of the faultline logic, however, is that the intergroup dynamic between *subgroups* from different social categories should be stronger than the

intergroup dynamic between *individuals* from different social categories. This notion is supported by research on an "interindividual—intergroup discontinuity" showing that relations between groups (or, in this case, subgroups) tend to be more competitive than relations between individuals (e.g., Insko et al., 1990; Schopler & Insko, 1992). In groups with a strong faultline, the negative intergroup dynamics across subgroups are expected to overshadow the positive dynamics within colocated subgroups to negatively influence members' perceptions of the group overall.

Subgroups strengthen their demarcations when their boundaries are explicit and when they meet by themselves, apart from the larger team (Lau & Murnighan, 1998). These circumstances inherently characterize subgroups organized by geographical location. It seems natural for colocated subgroup members to meet and work together face-to-face and then report their joint activities to the other subgroup in a summary correspondence. After all, this pattern of interaction has all the apparent hallmarks of an efficient group process. Yet, even the language of such correspondence (e.g., the likely use of "we" and "they" to refer to the subgroups), coupled with the actual relationships that develop within but not across subgroups, are likely to strengthen the subgroup structure. When free-riding is a possibility, even the mere knowledge that members of another subgroup are communicating amongst themselves may raise suspicions in others that reduce cooperation with the larger group (Polzer, Milton, & Gruenfeld, 2002). Moreover, when subgroups reside in different countries, cultural and language differences may strengthen subgroup identification and further exacerbate the rift between subgroups (Earley & Mosakowski, 2000).

These considerations suggest that the net negative consequences of a geographical faultline might undermine group functioning. The stronger the basis for subgroup formation, the

more likely it is for the resulting faultline to disrupt group functioning. In our study, fully dispersed groups have the weakest basis for subgroup formation, while groups with two subgroups have the strongest basis for subgroup formation.

Hypothesis 1b: Two-subgroup teams (composed of two subgroups of three colocated people each) will experience more conflict and less trust than three-subgroup teams (composed of three subgroups of two colocated people each), which will in turn experience more conflict and less trust than fully dispersed teams.

The effect of faultlines on dyadic trust, conflict, and evaluation. Faultlines are a property of the group. Therefore, our primary test of the faultline hypothesis is at the group level of analysis, as stated in hypotheses 1a and 1b. Nevertheless, the rationale for hypothesis 1b suggests a particular pattern of conflict and trust between the various pairs of individuals within a team based on whether they belong to the same or different subgroups. Specifically, in teams composed of multiple subgroups, the activation of a faultline should cause people to experience less conflict and more trust with fellow subgroup members (i.e., those in their same location) than with those in a different subgroup (i.e., in a different location). Research on intergroup biases suggests that this pattern should hold for a variety of dependent variables, including evaluations of members' contributions to the group's work as well as conflict and trust (Hewstone et al., 2002). When viewed solely at the dyadic level of analysis, this pattern would be consistent with the rationale that face-to-face interaction between the two parties in a dyad will lead to less conflict and more trust than computer-mediated interaction (McGinn & Keros, 2002). Taken together with support for hypothesis 1b at the group level of analysis, evidence of this dyadic pattern would further support the hypothesis that a faultline was operative in teams with colocated subgroups.

METHOD

Participants and Study Design

Two hundred sixty-six (266) graduate business students from 15 universities in 8 countries participated in the study. (See Table 1 for a list of participating universities and locations.) Subjects' average age was 28.34; they represented 30 different nationalities; and 70 participants (26 percent) were women.

Insert Table 1 about here.

We assigned each participant to one of 45 teams.[1] Aside from varying the pattern of colocation (as described below), the assignment procedure attempted to maximize demographic heterogeneity within teams, based on each member's sex and nationality, and to equalize this demographic heterogeneity across teams. That is, teams differed in that they had members at 2, 3, or 6 different locations, but all teams had 1 or 2 females and at least 4 different nationalities represented. This approach was necessary to avoid confounding geographic and demographic diversity. In addition, since the tasks required teams to focus on one contemporary business innovation (e.g., electronic commerce, knowledge management, enterprise information systems, etc., as described below), the team assignment matched participants' self-reported interest in one of these topics.

After introductory team-building activities, teams completed two required deliverables during the seven-week project. First, each team selected one business innovation topic, and members researched the status of that innovation in different countries. The team then compiled

a report about the critical success factors for the business innovation in four countries of the team's choosing. Second, each team conceived an idea for a business on that topic and prepared a business plan for a company operating in the countries researched. We offered a monetary prize for the best business plan; in addition, most of the students had a grade-based participation incentive as part of a course at their local university.

We supported team collaboration in several ways. A website available to all participants provided the task schedule and instructions as well as additional collaboration resources (e.g., links to websites that explained how to prepare a business plan). One of the authors served as the coordinator for all teams, a role that involved answering questions, resolving technical problems, and providing general announcements such as reminders about approaching deadlines. Each team had its own listserve designed so that every email message sent to the team's listserve was distributed to all members of that team. Other means of team communication were not offered or encouraged, and the coordinator reminded participants that only communication through the listserve provided a record of member participation that would be shared with instructors for evaluation purposes.[2]

Participants completed web-based surveys at the beginning, middle, and end of the project (although data from only the beginning and ending surveys were used for the current study). They were assured that their responses were confidential, would be seen only by the researchers (and not by their instructors), and that their survey responses would in no way

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[1] All teams were composed of six members, except four fully-dispersed teams had five members each.

[2] Self-reported usage of communication media revealed that 19 teams (42 percent) had at least moderate usage of other means of electronic communication, such as chat (2 teams), bulletin board (4 teams), or regular email (14 teams). Since this communication was still electronic and we did not hypothesize specific technology effects, we have not attempted to control for technology effects in the analysis. Also, members of 22 of the 28 teams with some collocation (79 percent) agreed that face-to-face communication was more important than electronic communication for interactions among collocated members. This additional means of communication was expected and was also not controlled for in the analysis.

influence their grade on the project. We summarize measures of the independent, dependent, and control variables in Appendix A.

Independent Variables

We manipulated geographical dispersion by assigning participants to a team in one of three conditions. We maximized geographic dispersion in *fully dispersed* teams consisting of six group members who each resided in a unique location. In the *three subgroups* condition, we built teams of six members, with two members residing in each of three unique locations. In the *two subgroups* condition, the six-person teams had three members residing in each of two unique locations. We operationalized "unique location" as a unique university, such that students who were colocated were physically in the same school (and most shared a specific class), allowing them ample opportunity to communicate face-to-face. Team members who were not colocated attended different universities and resided in different cities, often in different countries. For the dyadic analyses, colocation was measured dyadically as a binary variable.

Note that unique location in this study could be confounded with differences stemming from organizational membership (university and class) and possibly other variables that differ by location. Such factors, however, should exacerbate location similarities and differences to the same degree for participants in fully dispersed groups (amplifying the arguments used to support H1a) and for those in partly dispersed groups (amplifying the arguments used to support H1b). Thus, potential confounding factors do not favor either hypothesis, nor do they detract from our ability to make inferences about the theoretical underpinnings of the hypotheses.

Our rationale for deploying these three conditions in particular was that we wanted to compare fully dispersed groups to groups with colocated subgroups, and we wanted subgroups within a team to be of equal size. In six-person groups, only two possible configurations of

equally-sized subgroups exist: two subgroups (of three members each; 40% of dyads are colocated, or 6 out of 15) and three subgroups (of two members each; 20% of dyads are colocated, or 3 out of 15). In any given group, the maximum number of locations is equal to the number of group members, such that a six-person group is fully dispersed when the members reside in six different locations (see Figure 1).

We did not include fully colocated groups in our design because the diversity and faultlines hypotheses do not differ for this condition; both predict the lowest conflict and most trust when all parties are colocated. Only as diversity increases do the predictions diverge.

Dependent Variables

Participants rated the amount of conflict and trust in their groups on the survey administered at the end of their project. We used Jehn's (1995) scales to measure affective and task conflict, but a factor analysis revealed that the eight items loaded together on a single factor. Consequently, we averaged all eight items from these two subscales to create a single group conflict score (alpha = .85). To compare our results to prior conflict research, however, we also computed separate scores for affective and task conflict to use in supplemental analyses. We measured trust using the Schoorman, Mayer, and Davis (1996) scale, which emphasizes identification-based trust.[3] These items showed substantial reliability (alpha = .82), so we averaged them. We determined that group membership (i.e., nesting of members in teams) accounted for a significant amount of variance in both conflict (intraclass correlation = .59, $F_{(44,173)} = 3.10$, $p < .01$) and trust (intraclass correlation = .22, $F_{(44,173)} = 1.62$, $p < .05$).

[3] We used this measure of identification-based trust because we thought the identification emphasis might tap into the categorization processes of interest to this study and because it is a parsimonious scale (4 items) that could be easily adapted for both a group and dyadic referent. With the group as the referent, we also measured trustworthiness using Jarvenpaa, Knoll, and Leidner's (1998) scale. Trustworthiness and identification-based trust were highly correlated (r=.80), suggesting this was an appropriate measure of the trust concept.

Accordingly, we computed the mean level of conflict and trust for all members of the group as measures of team conflict and team trust, respectively.

For the dyadic measures, participants also answered questions in the final survey about each individual teammate. Dyadic conflict consisted of one item on a five-point scale (strongly disagree to strongly agree) for each teammate: "I have experienced a considerable amount of conflict with Teammate X." We measured dyadic trust in each teammate with four items on a five-point scale (strongly disagree to strongly agree) that mirrored the identification-based trust items from the group measure. The evaluation of teammate contribution consisted of one item on a five-point scale (no contribution to excellent contribution) for each teammate.

Control Variables

We controlled for several factors to eliminate alternative interpretations of the effects of geographical dispersion. We asked participants in the initial survey a variety of questions about their previous experiences working in groups (e.g., "Each member took responsibility."). We calculated the mean of these nine items for each person (alpha = .79) and then summed these mean scores across group members to create a group score for team experience. We counted the number of messages each participant sent to his or her teammates during the course of the project and summed these by group to create a score of total messages sent for each group. We then computed a heterogeneity score for each group for participants' nationality (i.e., home country), sex, and age. We used Blau's (1977) heterogeneity index to compute nationality heterogeneity and sex heterogeneity and the coefficient of variation to compute age heterogeneity. To control for the difficulties that time zone differences might cause, we included a heterogeneity measure for the members' time zones (based on Greenwich Mean Time).

For the dyadic analyses, we created dyadic control measures using the same variables that were aggregated to form the corresponding group level measures for 1) messages sent by the rater and ratee, 2) rater and ratee sex, as well as dyadic sex similarity, 3) rater and ratee age, along with dyadic age similarity, 4) rater and ratee group experience, 5) dyadic nationality similarity, and 6) absolute value of the difference between the rater and ratee's time zones.

Analyses

To test our hypotheses using the group-level measures, we conducted Analyses of Covariance (ANCOVAs) in which group conflict and group trust were the dependent variables and the key independent variable of interest denoted the three conditions of geographic dispersion. We then proceeded to analyze the dyad-level data to test whether people had different levels of conflict and trust with those in distant locations compared to colocated team members. To account for the interdependencies due to team membership and each person rating multiple team members in the dyadic analyses, we employed regression analyses with fixed effects for group membership that incorporated a Quadratic Assignment Procedure to account for non-independence among observations across dyads (Krackhardt, 1987, 1988; Manley, 1992

RESULTS

Means, standard deviations, and correlations among all continuous team-level variables are reported in Table 2.

Insert Table 2 about here.

Hypotheses Tests

An ANCOVA controlling for team experience, messages sent, nationality heterogeneity, sex heterogeneity, age heterogeneity, and time zone heterogeneity revealed that total group conflict differed significantly across the three conditions of geographical dispersion ($F_{(2,36)}$ = 3.71, $p < .05$). The post hoc pairwise comparisons reported in Table 3 revealed that total conflict (adjusted for the covariates) in the fully dispersed condition (M = 2.25, s.e. = 0.17) was significantly lower than in the two subgroups condition (M = 3.03, s.e. = 0.18), with the three subgroups condition (M = 2.55, s.e. = 0.13) significantly different from only the two subgroups condition. This pattern of results supported the faultline hypothesis (H1b), as the most conflict occurred in the two-subgroups condition and the least conflict occurred in the fully dispersed condition. A one-way ANOVA excluding the control variables showed an identical pattern of conflict differing significantly across the three conditions ($F_{(2,42)}$ = 3.52, $p < .05$).

Insert Table 3 about here.

The analyses of team trust, again controlling for team experience, messages sent, nationality heterogeneity, sex heterogeneity, age heterogeneity, and time zone heterogeneity, also supported the faultline hypothesis. Trust was significantly higher in teams in the fully dispersed condition (M = 3.31, s.e.= 0.15) than in either the three subgroups condition (M = 2.84, s.e.= 0.11) or the two subgroups condition (M = 2.66, s.e.= 0.16; $F_{(2,36)}$ = 3.54, $p < .05$). The latter two conditions did not significantly differ from one another according to a post hoc comparison. This effect for geographical dispersion was also significant without the control variables in a one-way ANOVA ($F_{(2,42)}$ = 4.48, $p < .05$).

The results of supplemental analyses of the team-level data bear on the diversity and faultline hypotheses. First, none of the control variables, including messages sent and the heterogeneity indices, significantly affected either conflict or trust, indicating the effect of geographic dispersion was not simply a spurious result caused by one of these factors. Second, the geographic dispersion conditions did not significantly affect the number of messages sent by group members ($F_{(2,42)} = 1.32$, n.s.), indicating that communication volume did not account for the effect of geographic dispersion. Third, when we split conflict into its two component types, the effect of geographical dispersion remained significant for affective conflict ($F_{(2,36)} = 4.55$, $p < .05$) but not for task conflict ($F_{(2,36)} = 2.08$, n.s.). For affective conflict, pairwise comparisons revealed that the fully dispersed condition (M = 2.25) had significantly lower conflict than the two subgroups condition (M = 3.21), suggesting that the conflict caused by colocated subgroups tended to be of a dysfunctional nature (Jehn, 1995). Table 3 shows the means for each type of conflict across conditions.

Turning to our analyses of the dyadic data, we continued to find support for the faultline hypothesis. As shown in Table 4, group members who were colocated reported experiencing significantly less conflict ($\beta = -.29$, $p<.05$) and more trust ($\beta = .83$, $p<.01$) with one another than group members who were geographically distant. Moreover, people evaluated their colocated group members' contributions significantly more positively ($\beta = .62$, $p<.01$) than the contributions of those in different locations. The control variables we used in these analyses ensured that the deleterious effects of geographic distance were not spurious results of the rater or ratee's prior team experience, amount of communication, sex, age, or differences between the rater and ratee in sex, age, nationality, or time zone.

Insert Table 4 about here.

Complementary Archival Case Analysis

How did faultline dynamics unfold in teams with two subgroups? To shed some light on this question, we inspected the archival messages of a representative team in the two subgroups condition.[4] This team consisted of three people from a Brazilian university (Kika, Claudio and Andre) and three others from an Australian university (Jenni, Derrick and Abhay). These team members got off to a slow start communicating with one another, with Claudio and Derrick sending the majority of early messages as they completed the team's first deliverable while trying to establish some communication guidelines (e.g., Claudio's proposal to use a chatroom never materialized due to Derrick's concern about finding a time when they were all simultaneously available to chat).

During the next few weeks of the project, team members sent sporadic messages and made little progress until Claudio stated that "the three of us would like to do the research on electronic commerce…" This was the first explicit mention of a subgroup and the first time anyone clearly wrote a message on behalf of the others at their location. This arrangement apparently resonated with the other subgroup, because the next day Abhay replied from Australia with his agreement about using electronic commerce as their topic, and then stated: "Now all we have to figure out is 'how to go about it?' The fact is that Derrick, Jenni, and I happen to be in the same UNI [University]. This means that we can actually divide a lot of the work between us and come up with a nice looking document, which can be forwarded to you. Is it alright if we

[4] This team was randomly selected and serves as an illustration of potential team dynamics that can occur with two equally-sized, colocated subgroups. Team trust for this team was near the mean of all teams. The identities of the individuals in this case have been disguised.

split up some of the areas and send you a combined copy of our work?" Andre responded with his own agreement about the topic and added that he would help Claudio on their end. Two days later, Jenni sent her first message to the team listserve, citing technical problems for her late introduction. She had been corresponding offline with her colocated teammates, however, which was clear from her reference to the plan that "Derrick, Abhay, and I suggest" and her request to her counterparts in Brazil to "let us know immediately if this plan is acceptable to you."

After the members of each colocated subgroup agreed to complete their own portion of the tasks, the subgroups proceeded to accomplish their work while coordinating their divided efforts via messages to the listserve. The content of many of these messages revealed small wedges that could easily have contributed to a growing geographical faultline between the subgroups. Examples include a message from Jenni addressed to "Claudio and other team members," a message from Derrick announcing that "we at UWA decided to stick to the current [topic]," and several messages near the project deadline from a member of one subgroup requesting that the other subgroup perform some particular action. As time pressure increased, some of these requests went unanswered, culminating in the team turning in a final business plan that one of the subgroups had not reviewed. We interpret these qualitative data in light of our quantitative results in the discussion section that follows.

DISCUSSION

We found that geographic configurations of dispersed teams created divisions, or faultlines, that separated team members into distinct subgroups. The faultlines were most apparent in "partly dispersed" configurations composed of two equally-sized subgroups of colocated people. These configurations represented a medium level of geographic diversity rather than the highest level found in "fully dispersed" teams. These results are consistent with

the faultline hypothesis that predicts that group dynamics will suffer when group members divide into two equally powerful subgroups (Lau & Murnighan, 1998). Because members within subgroups tend to be similar to one another, this prediction implies that moderate rather than higher levels of diversity are likely to create dividing lines and separate team members into distinct subgroups.

Our study builds on the dimensions of diversity that can generate faultlines. Researchers have typically characterized diversity either as demographic differences like sex and race or as underlying psychological differences like personality or beliefs. To this point, the faultline hypothesis had only been tested with demographic diversity (Earley & Mosakowski, 2000; Thatcher et al., 2003). Our study shows that the faultline hypothesis occurs with diversity that is not tied to demographic factors or underlying psychological differences. Even after measuring and controlling for several dimensions of demographic heterogeneity, we found support for the faultline hypothesis with geographic diversity, a dimension that stems from the context surrounding team members.

Our inspection of the messages sent by members of a representative team helps to illustrate how geographical distance can trigger faultline dynamics. Taken singly, many of the messages described above seem innocuous and even rational. After all, it is easier for colocated subgroups to coordinate, conduct collaborative work, discuss emergent problems in real time, and carry out all the integrating activities that characterize effective teams, simply because they can do these things face-to-face. When team members divide up their work, as team experts recommend that they do (Hackman, 2002), it is very natural for members to use colocation as the overriding decision rule regarding who should work with whom on discrete subtasks. As rational and intuitive as this may seem, however, the very advantage that leads to this allocation

of tasks—the ease and speed of face-to-face communication—can place into stark relief the relative difficulty of communicating and coordinating virtually across subgroups.

Once the real work of the team commences in colocated subgroups, many decisions and discussions occur that do not include all team members. Members at one location often do not even know whether or when discussions and decisions have occurred in the other subgroup (see Cramton, 2001 for consideration of such problems). Moreover, cross-subgroup communication that does occur is naturally framed in terms of "us" and "them." These conditions increase the chances that team members will perform redundant work, make conflicting decisions, formulate perceptions of uneven participation, make requests of the other subgroup that will come across as domineering, and the like. Any one of these events, and especially several of them taken together, could activate and strengthen subgroup-based social categorization processes that heighten perceived differences across subgroups. These can elicit an "us versus them" mentality that serves as a lens through which subsequent actions get interpreted, leading to a negative spiral of inter(sub)group conflict (Zander, 1994).

These dynamics can occur simply as a result of geographical distance between subgroups that curtails face-to-face communication. Imagine, then, how much more likely faultlines are to occur between subgroups that differ on many other substantive dimensions. Consider that local contexts often differ in cultural norms, holidays, time zones, dominant languages, and related factors. The task itself may be of differential importance to people at different sites, information and expertise may be unevenly distributed across the sites, colocated members are more likely to have prior relationships than are distant members, and even the technology used to communicate may differ across geographical locations. Such differences, and the communication difficulties they present, make it even more sensible in some respects for team members to divide work

along geographical lines. This task allocation, however, may unintentionally increase the likelihood that these differences will contribute to a strong and dysfunctional faultline.

As these examples illustrate, advances in communication technology and the globalization of organizations have increased the range of contextual factors that can vary among team members. Many of these factors have been either constant or irrelevant in the past. For example, as long as a transnational team meets together face-to-face to do most of its work, the work location of the members is constant and coalitions form around nationality or other demographic or psychological factors. However, when dispersed teams stop convening in the same location and rely primarily on electronic communication for their interaction (e.g., Maznevski & Chudoba, 2000; Kanawattanachai & Yoo, 2002), members vary in terms of their geographic locations. Ironically, while the diversity of locations in a team can now become salient, other factors in diverse teams may become less salient. Electronic communication makes factors such as age and gender less salient due to the lack of visual cues and information contained in many forms of nonverbal communication. These considerations suggest that researchers should conduct fine-grained analyses of the context(s) in which interaction among team members takes place. Additional research is also needed to understand the dynamics and tactics that might prevent the potential negative consequences of geographic faultlines.

Although the increase in dispersed collaborative work brought about by advances in technology has introduced greater variety in contextual factors, the related literatures largely dismiss the importance of contextual factors such as geography and time and assume that technology allows team members to transcend them (Olson & Olson, 2000). Besides underscoring the importance of contextual factors, our results suggest that particular configurations of geographic diversity differentially affect group functioning. This study

therefore calls for more attention to the configuration of dispersed teams along with the development of contextualized theories and analyses.

A managerial implication of this study is that colocated subgroups within a dispersed team have a potential downside. Organizations frequently deploy teams that resemble the configurations used in the current study (Espinosa et al., 2003; O'Leary & Cummings, 2002). Even in globally dispersed teams, organizations often try to maximize the number of people in the team who can interact face-to-face in order to counteract some of the limitations associated with electronic communication. As organizations start to bridge distance by putting dispersed people into teams, two locations is the most natural progression away from a single location, which had been the traditional work arrangement for most teams. A small number of locations is consistent with the conventional prescription to aim for a moderate level of diversity, as too many differences may be viewed as insurmountable. Our results suggest that these conventional practices create faultlines that might harm group functioning in unanticipated ways.

Limitations

These implications must be considered in light of the methodological strengths and weaknesses of this study. We limited our consideration to one group size (six members), a finite number of geographic configurations (fully dispersed, three colocated subgroups, and two colocated subgroups), one type of task (business plan), and temporary, ad hoc teams (seven week duration). Examination of teams with other attributes will provide evidence of the generalizability of our findings. The technological environment was limited to asynchronous email, web technology, and for a handful of teams synchronous chat rooms—none of which take advantage of videoconferencing or more complex group collaboration tools. Although videoconferencing remains a novelty in many parts of the world and email is still the most

common tool used in many situations, we recommend further investigation into ways in which the use of various technologies minimize or exacerbate geographic faultlines. For example, the use of a listserve in our study may have limited some of the problems that Cramton (2001) observed in teams using separate email addresses for each member.

One might also question whether student groups are appropriate for studying diversity in dispersed teams. In the study's defense, the average age of the sample was 28, and the majority of the students worked full-time or part-time or had significant prior work experience. Moreover, for nearly all of the students, the exercise had real consequences in the form of project grades. Nevertheless, researchers should test these hypotheses with different samples of organizational members.

Lastly, the current study treated the geographical location of each member as a stable circumstance, assumed to be known to other members. Geographic location depends, however, on the mobility of the person, time of day, and other activities of the member. A person's geographical location is not always readily apparent to others in the team as long as members communicate electronically and do not disclose their location. Perceptions of members' geographical locations, however, are likely to be influenced by certain pieces of information such as their host organization, email address, and related signals. We suggest that researchers should study mobile workers and how the diversity in the perceptions of location rather than actual location affect group functioning.

Conclusion

The study highlights a new dimension of diversity, geographic diversity, which can affect group functioning. Geographic diversity remained irrelevant as long as organizations relied on face-to-face work teams. Although global corporations have long utilized transnational teams,

they typically did so by drawing experts from different parts of their operation and bringing them together to face-to-face meetings in one location. Contextual factors such as location did not drive how members categorized themselves and others into ingroups and outgroups; instead, nationality and other demographic factors guided social categorizations because these factors varied across members and were most salient in face-to-face teams. Only recently have advances in communication media allowed corporations to reduce colocation and travel and to rely on dispersed teams taking on a variety of configurations. Geographic diversity is becoming increasingly important as more organizations rely on dispersed work teams to perform their core work activities. In dispersed teams, differences in location may override many other types of differences that would otherwise be more apparent in a face-to-face team. Various configurations of dispersed members may elicit very different team dynamics, however. As this study demonstrated, configurations that may seem advantageous on the surface, like those that allow face-to-face communication within colocated subgroups, may have unintended, yet predictable, negative consequences.

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Figure 1: Research Design

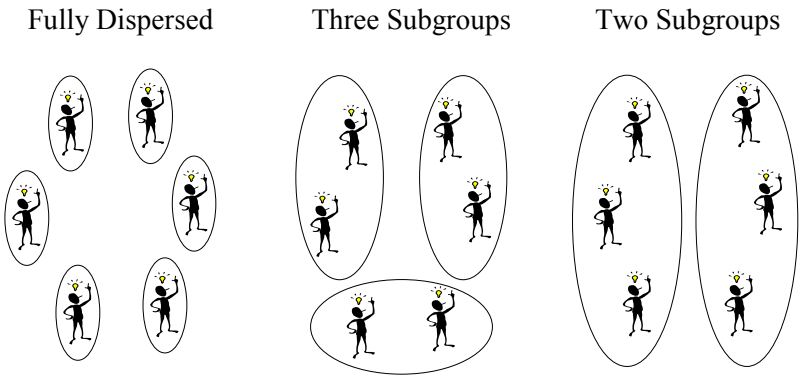

TABLE 1
Location of Participants

University	Country	Students
Aarhus School of Business	Denmark	47
Copenhagen Business School	Denmark	22
EAESP - Fundação Getúlio Vargas	Brazil	59
ITESM	Mexico	2
Louisiana State University	United States	33
University College Dublin	Ireland	10
University of Berne	Switzerland	4
University of Jyväskylä	Finland	13
University of Maribor	Slovenia	3
University of São Paulo	Brazil	10
University of Tampere	Finland	12
University of Twente	Netherlands	2
University of Vaasa	Finland	9
University of Western Australia	Australia	40
	Total	266

TABLE 2
Means, Standard Deviations, and Correlations among Continuous Team-level Variables

Variable	Mean	s.d.	1	2	3	4	5
1. Prior Team Experience	3.75	0.36					
2. Team Communication	17.65	9.06	-0.26				
3. Sex Heterogeneity	0.34	0.15	0.02	0.33*			
4. Age Heterogeneity	0.19	0.08	-0.08	0.08	0.12		
5. Nationality Heterogeneity	0.72	0.06	-0.04	0.18	-0.05	-0.09	
6. Time Zone Heterogeneity	0.00	0.88	-0.07	0.15	0.37*	0.26	0.15
7. Team Conflict	2.57	0.49	-0.08	0.00	0.13	-0.04	-0.19
8. Task Conflict	2.51	0.49	-0.07	0.02	0.27	-0.06	-0.09
9. Affective Conflict	2.64	0.56	-0.07	-0.01	0.00	-0.02	-0.25
10. Team Trust	2.96	0.45	-0.13	0.29	0.16	0.18	0.24

Table 1 (continued)

	6	7	8	9
7. Team Conflict	0.05			
8. Task Conflict	0.12	0.92**		
9. Affective Conflict	-0.03	0.94**	0.74**	
10. Team Trust	0.18	-0.59**	-0.56**	-0.54**

* $p < .05$, ** $p < .01$ N = 45 teams

TABLE 3
Mean Team Conflict and Trust by Geographic Dispersion Condition

	Fully Dispersed (N=17)	Three Subgroups (N=15)	Two Subgroups (N=13)
Team Conflict:			
Mean	2.25 [a]	2.55 [a]	3.03 [b]
Std. Error	0.17	0.13	0.18
Team Trust:			
Mean	3.31 [a]	2.84 [b]	2.66 [b]
Std. Error.	0.15	0.11	0.16
Affective Conflict:			
Mean	2.25 [a]	2.58 [a]	3.21 [b]
Std. Error	0.19	0.15	0.21
Task Conflict:			
Mean	2.24 [a]	2.51 [a]	2.85 [a]
Std. Error	0.17	0.13	0.18

Note: Means are adjusted for the covariates included in the ANCOVA, and we therefore report standard errors rather than standard deviations. Means with different superscript letters are significantly different at $p<.05$.

TABLE 4
Regressions with Quadratic Assignment Procedure Testing Dyadic Colocation

Variable	Dyadic Conflict	Dyadic Trust	Dyadic Evaluation
Rater prior team experience	-0.13*	0.02	0.07
Rater communication	0.01*	0.00	0.00
Rater sex	-0.20*	0.23*	-0.04
Rater age	0.00	0.01	-0.01
Ratee prior team experience	-0.02	0.07	0.12
Ratee communication	-0.01**	0.03**	0.06**
Ratee sex	-0.15	0.23*	0.10
Ratee age	-0.01*	0.01	0.01
Sex similarity	-0.03	0.11	0.00
Age similarity	0.02*	-0.01	0.00
Nationality similarity	0.09	0.09	-0.14
Time zone difference	0.01	-0.03**	-0.04**
Colocation	-0.29*	0.83**	0.62**
R^2	0.04	0.22	0.36

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

Appendix A

Measures of Independent, Dependent, and Control Variables

Independent Variables

Team location	Treatment conditions: two locations=1; three locations=2; fully dispersed=3
Dyadic colocation	Location is the university and country where a member resides (members at same location=1; different location=0).

Dependent Variables

Team conflict	Average of team responses to task and affective conflict items below:
Task conflict	There is a great deal of disagreement in my team member's opinions regarding the work being done. There has been a great deal of conflict about ideas on my team. There has been no disagreement in my team regarding who should do what [R]. We had to work through several disagreements to get the job done on my team.
Affective conflict	There has been a great deal of anger in my team. There has been no personal friction in my team [R]. There has been no tension in my team [R]. There have been no personality clashes evident in my team [R].
Team trust	Average of team responses to: My teammates and I have the same basic values and concerns. My teammates and I identify with each other. My teammates can effectively make decisions for me and act as my agent. My teammates and I have the same goals.
Dyadic conflict	I have experienced a considerable amount of conflict with Teammate X.
Dyadic trust	Teammate X and I have the same basic values and concerns. Teammate X and I identify with each other. Teammate X can effectively make decisions for me and act as my agent. Teammate X and I have the same goals.
Dyadic evaluation	Please rate the overall participation and effort Teammate X showed while participating in the GVT Exercise. [1=no participation or effort; 5= excellent participation and effort]

Control Variables

Prior team experience	Members were committed. Good results came out of conflict. Members listened to one another. Everyone participated. People could disagree without fear. Members liked each other. The group discussed goals. Members helped each other. Each member took responsibility.
Team communication	Average number of email messages sent to team listserve per team member.
Team heterogeneity:	
Sex	Blau's (1977) heterogeneity index of team members' sexes [male=0, female=1].
Age	Coefficient of variation of team members' years of age when the GVT

	exercise began (“What is your date of birth?”).
Nationality	Blau’s (1977) heterogeneity index of team members’ nationalities (“What is your home country?”).
Dyadic similarity:	
Sex	Members of the same sex=1; different sex=0.
Age	Difference in years of age. Absolute difference of rater minus ratee.
Nationality	Members of the same nationality=1; different nationality =0.