When and Why "Alter" Cedes the Brokerage Position: A Relational Perspective

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There is an expanding body of work that considers how, when, and to what extent different forms of social network brokerage matter (see, e.g., Burt 1992, 2001, 2004; Gould and Fernandez 1989; Fernandez and Gould 1994; Obstfeld 2005; Hillman 2008; Bidwell and Fernandez-Mateo 2010; McEvily, Jaffee, and Tortoriello 2012; Stovel and Shaw 2012; Greenberg 2019, 2020). However, surprisingly little is known about how one becomes a social network broker in the first place (Kleinbaum, Jordan, and Audia 2015). The research that has focused on this question has focused almost exclusively on the characteristics and considerations of the broker. The *brokered* are largely ignored despite being important actors in the (relational) story.

Burt (2004), for example, highlights half of the "who becomes the broker" equation, arguing that individuals often lack incentives to fill structural holes given the immediate demands on their time and the benefits/costs associated with spanning activities. (See also Rider [2009] concerning constraints on returns to brokerage and Fernandez-Mateo [2007] on the distribution of costs/gains to the parties.) Research in social psychology focuses on the personality correlates of brokerage (see, e.g., Kilduff and Krackhardt1994; Oh and Kilduff 2008; Fang et al. 2015).

Brokerage entails control (Burt 1992, 2001) by one actor and, in important cases, the ascent of the "brokered" actors. This relational dynamic thus entails a host of processes of theoretical interest to sociologists including agency and structure, and power and dependency (Emerson 1962; Marsden 1983; Gould 1989; Emirbayer 1997; Bunderson and Reagans 2011). Brokerage dynamics also underlie important processes in small group, team and organizational settings (cf. Berger, Cohen, and Zelditch 1972; Katz, Lazer, Arrow, and Contractor 2004; Harrington and Fine 2006).

Consequently, brokerage is necessarily a story of several social actors and their social dynamics and conditions, not just a story about the focal broker. Hence, we think it fruitful to ask a different question that focuses on the other side of the brokerage equation: If brokerage positions offer the individuals who occupy them significant value and a potential basis of power over other social actors, why would those other actors cede the brokerage position?

The essence of this underlying social dynamic and the questions it provokes become particularly salient in settings in which brokerage is not a position created by formal reporting lines. This is especially the case when the actors involved in the dynamic are aware of the benefits and costs of brokerage.[1] Examples include small teams in setting with little hierarchical differences among

[1] See Hahl, Kacperczyk, and Davis 2016 for a case when awareness is absent.

actors, and cohorts that enter an organization at the same time with similar stocks of organization-specific social capital and human capital. In such settings, brokerage often entails a coordinating function within the team or cohort, along with a gatekeeping function to other teams and information sources (Gould and Fernandez 1989; Fernandez and Gould 1994; Reagans and Zuckerman 2001, Reagans, Zuckerman, and McEvily 2004, Schilling and Phelps 2007). Coordinating a group or team, in turn, is an intrinsically relational function (Gittell 2000. It requires the distribution, orchestration, and harmonization of tasks and actors. Effective coordination thus requires relational analysis and knowledge (Erikson 2013).

Hence, whenever brokerage results from uneven distribution of social resources across actors in (informal) teams we can inquire who has more structural holes, why some actors fill structural holes while others do not, and, as we argue here, why some actors cede to others as brokers when to do so entails deference and thus social and tangible costs.

In particular, this paper proposes theory and presents empirical tests of why some actors cede to others as coordinator-brokers (Gould and Fernandez 1989; Fernandez and Gould 1994) as a function of endogenous and exogenous network forces (Emirbayer 1997; Lazer 2001). We propose that the coordinator role will emerge out of social comparisons regarding the relational resources most relevant to being effective in that role. First, is the social capital within the team.

Here the relational information most relevant to effectiveness in the role would be strong ties to other team members, which would facilitate knowledge of the abilities and work patterns of the team. Second, is the social capital outside of the team—the capacity to access information relevant to the task, in order to efficiently distribute that information to individuals within the team. That is, the ideal coordinator on a team would have strong ties to all of their team members, and many informational ties outside the team (e.g., Reagans and Zuckerman 2001).

The tests we employ to substantiate this argument leverage data from three cohorts of students at a master's program of public policy at a prestigious private university in the northeastern region of the United States. The data include several characteristics that make them well suited to tease-apart endogenous and exogenous network processes: First, extremely few students in our study had any prior social relationships within the cohort before starting school, hence we have a sharp baseline with which to assess network processes and implications; there is also significant *within*-team and *within*-cohort variation in social networks. Second, the data include granular measures of three separate types of cohort-wide ("whole") network data. This enables us to separate various forms of network relationships and content (e.g., social, functional) directly (Burt 2008; but see Podolny and Baron 1997; Rodan and Galunic 2004; Yakubovich 2005; Greenberg 2019). Third, students were exogenously assigned to teams without regard for

their social relationships. This exogenous assignment provides us with an opportunity to estimate and compare how prior networks in the cohort, chance, and their interaction have a bearing on subsequent coordinator-broker or brokered positions. Fourth, in various models we can control for ego and alter-ego fixed effects, which significantly strengthens our inferences by accounting for fixed ego or alter-ego factors such as invariant elements of personality (Mehra, Kilduff, and Brass 2001; Burt 2012; Kleinbaum, Jordan, and Audia 2015; Fang et al. 2015) that may have a bearing on the underlying social processes of interest.

To preview the findings, our analyses reveal that when ceding to another team member, an individual socially considers their comparative stocks of internal (to the team) and external (whole network) network resources. In particular, individuals assess whether "alters" have comparatively more friendship ties within the team that can be regarded as a basis to foster trust, cooperation, and coordination of effort (see generally Coleman 1988), or more knowledge accessing ties (via gatekeeping) in the larger discussion network. The social networks that lead one to cede to another as broker are thus distinct locally and globally in form and content, and can be construed as specific status cues (Humphreys and Berger 1981) that also provide a useful link between individuals and collectives in organizations (Ibarra, Kilduff, and Tsai 2005).

The Strategic Research Site: Coordinator-Brokerage in High Human and Social Capital Teams

We focus on what can be termed emergent brokerage within temporary teams in a population with high human and social capital. This is a propitious research site to study deference processes that lead to network advantage because roles are socially negotiated, evaluated, and achieved as opposed to ascribed or structurally defined ex-ante (Blau 1960b, p. 546; for an analog concerning emergent leadership see: Katz and Kahn 1978; Bass 1981, 1990; Lord and Maher 1990; Hollander 1992; Day, Gronn, and Salas 2004).

As more work (including science) is organized in teams, and performance is adjudged based on team as well as individual performance (e.g., Sanchez and Mahoney 1996; Wuchty, Jones and Uzzi 2007; Wu, Wang, and Evans 2019), every member of the group has an interest in a clear resolution to the question of who plays the brokerage role. Individuals also have a vested interest in how effectively the broker handles that role. At the same time, every individual has an interest in retaining the control and deference-benefits inherent in that brokerage role. Successful convergence on a coordinator thus means that most members of a team (i.e., those not in the coordinator role) must cede that role to someone else. We consider here what relational factors inform the *brokered's* decision to cede the brokerage role.

Setting the Stage: Who Becomes a Social Network Broker?

Recent research concerning network evolution traces the origin of structural holes, which afford brokerage opportunities, to previous structural holes, status, and network centrality thereby revealing the endogeneity of this class of network phenomena (Zaheer and Soda 2009; Liu 2010; see also Shipilov, Li, and Greve 2009; Kleinbaum 2012; Burt, Merluzzi, and Burrows 2013; self-citations omitted). But this focus on prior network processes does not specify why an actor cedes to the broker. A separate literature in economics has proposed models of strategic network formation based on game theoretic concepts (see, e.g., Jackson 2003; 2004; Kleinberg, Suri, Tardos, and Wexler 2008; Christakis, Fowler, Imbens, and Kalyanaraman 2010). From this perspective ties are purposefully formed based on a consideration of costs and benefits (or utility generally defined). While the insights of the strategic network perspective are straightforward and often compelling, it is limited in its ability to explain critical social conditions[2] impacting broker-brokered dynamics beyond the control of the strategic actors (see generally Emirbayer and Goodwin 1994; Emirbayer and Mische 1998; see also Erikson and Occhiuto 2017), and has yet to provide

[2] A key insight of several streams of sociological theory is that actors are shaped and constrained by social structure in ways that inhibit agency and strategic choice (e.g., Wilson 1987; Mayer and Jencks 1989; Sampson 2001). These forces include: propinquity (e.g., Powell, White, Koput, and Smith 2005; Sorenson and Stuart 2008), institutional forces (Saxenian 1994; e.g., Almeida and Kogut 1999; Small 2009) or homophily (McPherson, Smith-Lovin, and Cook 2001, see also Rauch 1997) leading to a host of endogenous processes.

empirical evidence concerning the specific factors included in the calculus. Finally, research emanating from social-psychology has considered the personality correlates of the *broker* as emanating from psychological dispositions such as higher self-monitoring (Kilduff and Krackhardt1994; Oh and Kilduff 2008; Fang et al. 2015). This focus, too, cannot explain why the *brokered* cede the brokerage position.

Brokerage as an Emergent Process

We focus here on the emergence of brokerage. This focus has theoretical foundations in social psychology, sociometry, and to a lesser degree sociologically-grounded social network research (cf. Moreno 1934; Marak 1964; for some more recent examples concerning the concept of leadership as an imperfect analog to coordination-brokerage see Sparrowe, Liden, Wayne, and Kraimer 2001; Balkundi and Kilduff 2005). These research efforts represent an important movement away from individual and institutional explanations of role emergence towards one based on patterns of social relations (e.g., Fernandez 1991). This social network approach has important precedence in classic theory on leadership that identified its inherently social foundations. As Chester Barnard (2003 [1948], p. 85) put it more than sixty years ago: “Whatever leadership is, I shall now make the much oversimplified statement that it depends upon three

things—(1) the individual, (2) the followers, and (3) the conditions" (see also Farris and Lim 1969, Greene 1975).

In a similar vein we view the social position of broker as entailing influence and power (by the broker) and accession by the brokered that, in turn, results in cooperation and the coordination of efforts in pursuit of some objective (Marsden 1982; Fernandez and Gould 1989; on the coordination component of leadership see: Barnard 2003 [1948], p. 90). We argue further that these broker-brokered dyadic relationships of influence and deference are themselves embedded in larger social structures that establish the comparative social relational conditions used for evaluation at the dyadic level (Blau 1960b; Granovetter 1985).

We take the perspective of the brokered rather than the broker, testing whether extra-dyadic networks have a bearing on the direction and pattern of influence and deference within the dyad. An implication of this argument is that to understand brokerage as an emergent process requires consideration of not merely the distribution of social resources embedded in the network and the broker, but also the considerations of the brokered.

These dyadic assessments can be construed as the micro-level choices that lead to the meso- and organization-level patterns evident in research by Reagans and Zuckerman (2001). In particular, we peer inside teams and shows how

individual members evaluate each other, and cede the position of coordinator-broker to the person who is comparatively best suited to facilitate the network structure that Reagans and Zuckerman find impact team performance. Individuals also consider whether each of their teammates is well situated in organizational discussion networks beyond the team to access knowledge and information in absolute and comparative terms (i.e., gatekeeping). This is consistent with views of brokerage as a boundary or cluster spanning position (Burt 1992; see also Allen1966; Tortoriello, Reagans, and McEvily 2012). We expand on this point in the next section.

"Local" (within team) considerations in ceding the coordinator-brokerage role

Brokerage is typically understood as the act of connecting the unconnected (Stovel and Shaw 2012). Marsden (1982, p. 202) argued that brokerage is a process of intermediation between actors that lack either access or trust in one another. Simmel (1950) argued that brokerage entails distinct actions. First, it can be mediation of competing demands. Second, it may entail benefiting from the disconnection or conflict of others (*tertius gaudens*). Consistent with the latter notion, Gould (1989) found that the value in the brokerage relation is contingent on conflict between rivals. Research by Gould and Fernandez (1989), Fernandez and Gould (1994), and Burt (2004) provides further insight into the bases of brokerage depending on group affiliations in the former, and levels of information

arbitrage in the latter. This research considers the coordinator-broker role defined by Gould and Fernandez (1989) see Figure 1 below.

Insert Figure 1 about here

We argue that when there can be only one coordinator-broker in a team in which that role or social position is an emergent process, the position of broker is a function of an individual's direct (dyadic) relationships with other individuals on her team consistent with Fernandez (1991). We argue further that dyadic evaluations are contextualized by consideration of the other salient dyadic relations in which one is involved. This means that coordinator-broker attribution results from: interpersonal relationships of deference within a larger social structural context (Granovetter 1985). Importantly, the sum total of these interpersonal acts of deference (Blau 1960b) must suffice to support the status of coordinator-broker.[3] Social comparison processes (Festinger 1954, Homans 1958, 1961) are employed to assess whether and if so to whom deference should be accorded based on a comparative assessment of task-relevant resources and cues (e.g., Berger, Cohen, and Zelditch 1972); networks in this context.

[3] This discussion assumes a "democratic" voting system in which majority rules. If, however, votes are unequally weighted a revised voting system would be required that adjusts for these differences.

The dyadic view of leadership provides a good analogy for developing intuition about the dynamics of coordinated brokerage because coordination was once viewed as an important aspect of leadership. An important implication of classic definitions of a follower-leader view of leadership (e.g., Barnard 2003 [1948]) is the view that social comparative evaluations are intensified in situations involving more than a single dyad thus necessitating consideration of social conditions. In such cases influence and deference can no longer be viewed as simply a function of dyadic exchange processes between two parties (Simmel 1971). As Peter Blau put it when discussing team members' desires to be viewed favorably by their peers (1960b, p. 547): "Indeed, every member has three formal roles in the interaction: first, each member is ego, the person who seeks to impress others; second, each member is alter, one of the others to whom ego wants to become attractive; third, each member is also alter-ego, one of the individuals with whom ego competes for the attraction of alters."

Blau's statement implies that in situations of social evaluation and deference in teams the choice to defer to one alter creates structural conditions for consequential dyadic and team-level comparisons. Thus assume a team has five members: A, B, C, D, and E. Assume further that each team member can only "vote" for one individual as coordinator-broker (a reasonable supposition in many but clearly not all settings). Team-member A would need to secure the accession of two other members (B, C, D, E) to create a simple majority coordinator-broker

position. Acquiring this accession is not, however, simply a function of A's dyadic relationships with B, C, D, or E. Members B, C, D, and E have their own relationships that have a bearing on A's ability to secure exclusive position as coordinator-broker. As such, achieving coordinator-broker status in a context in which the social position of coordinator-broker is emergent or otherwise unspecified by organizational design (i.e., based on vertical position, horizontal position, tenure, socio-demographics) requires attending to both dyadic (Fernandez 1991) and comparative dyadic evaluations. What this means is that a team member, we will call him ego going forward, decides who to acknowledge, if anyone, as team coordinator-broker from a set of teammates ("alter-egos" henceforth), S={1 ,…, 5}. Ego can identify him or herself as coordinator-broker. In making this determination, ego considers each alter-ego's characteristic and selects as coordinator-broker the individual she evaluates as best suited to facilitate and coordinate the flow of resources within the team, and by implication help the team attain a favorable outcome (Blau 1960b). But what are these characteristics?

We argue that an important basis for the attribution of broker and the deference it entails is rooted in social structure. Social capital in teams has both *local* (i.e., intra-team) and *global* (i.e., inter-team or whole network) components (Reagans and Zuckerman 2001, Reagans, Zuckerman, and McEvily 2004, Schilling and Phelps 2007). We argue that team members who have greater stocks

of each are more likely to be regarded as coordinator-brokers given their comparative capacity to increase team performance. First, the ability to foster trust and coordinate activities is likely dependent on the relationships between and among team members (see generally Coleman 1988; Burt 2001; Reagans and Zuckerman 2001). Those with comparatively more strong (in the Granovetter 1973 sense) relationships within the team should thus be in an advantaged position to facilitate and coordinate the flow and recombination of information and knowledge because they are trusted by comparatively more teammates (Bavelas 1950; Leavitt 1951). Prior research suggests that trust (Macy and Skvoretz 1998; Buchan, Croson, and Dawes 2002; Welch, Sikkink, and Loveland 2007) and respect for one's judgment (Fernandez 1991) is more likely to be prevalent between or among friends. Moreover, having friends on a team may also increase the effort one exerts on the team's behalf (Karu and Kipling 1997). This line of reasoning implies that:

> *Hypothesis 1—Team members (egos) are more likely to consider as coordinator-broker the individual (alter-ego) on his/her team who has comparatively more friends on the team.*

It should be noted that if some notion of popularity is underlying deference, then deference to a coordinator-broker within the team should be based on global friendship ties and not just those at the local level. Similarly, if information access is the key "local" (i.e., within team) basis of evaluating alter-egos for the role of coordinator-broker we should observe that ego cedes to alter-ego who has more

informational ties to other team members. In the analyses below, we therefore control for local informational and global friendship ties.

"Global" (network) considerations in ceding the coordinator-brokerage role

Team performance often requires resources located outside of the team (e.g., knowledge, topical expertise). From this perspective, team members with comparatively axial positions in the cohort, a greater number of structural holes in the cohort, or boundary spanning positions have advantageous access and timing to information, as well as the opportunity to broker its flow or recombine it in valuable ways (Burt 1992, 2004; Lin 2001; Mehra, Dixon, Balkundi, and Harrison 2006; Brass, and Robertson 2006; Fleming and Waguespack 2007; Fleming, Mingo, and Chen 2007). Such positions imply networks that include numerous weak-ties (Granovetter 1973), and suggest a comparative advantage of such ties vis-à-vis stronger ties. This follows given the tendency of friends-of-friends to know each other (i.e., triadic closure), and friends to be alike, i.e., homophilous (Granovetter 1973; McPherson, McLovin, and Cook 2001). Access to distinct pools of knowledge or information beyond one's team's boundary is a comparative resource that should increase the likelihood of being ceded to as coordinator-broker. Consistent with this intuition, Mintzberg (1973) found that leaders spent a considerable time engaging in external networking activities (see also Burt 2000, p. 360). Position in a social network may also lead to coordinator-

broker attribution by refracting status. From this perspective networks act as "prisms" (Podolny 2001; see also Kilduff and Krackhardt 1994). Teammates thus extrapolate social standing by observing each other's positions in the web of social relations, which can lead to deference because of cumulative advantage or preferential attachment (Merton 1968, 1988, Barabási and Albert 1999). In light of prior theorizing and empirical work we should expect to observe that ego's selection of a coordinator-broker from a set of alternatives is driven in part by a social comparison of perceived stocks of social capital that can be used to advance the team's interests, and those of ego by implication (Blau 1960b: Ch. 4, Emerson 1962; Coleman 1990). These comparisons should be dyadic (Festinger 1954; Homans 1958; Majory and Forcey 1985), and should account for the relative standing of each alter-ego relative to others in the team and larger social structures (e.g., the organizational context). We should thus expect to observe that:

> *Hypothesis 2— Team members (egos) are more likely to consider as coordinator-broker the individual (alter-ego) on his/her team who is more central in the global informational network.*

The key point here is that it is not centrality qua centrality that is driving results, but rather centrality within one specific type of "global" network—the one that is best suited to provide valuable information. If popularity or some other social process relating to centrality in the cohort friendship network is driving results

then we should observe that centrality in other cohort wide networks (e.g., friendship) should also be positively associated with coordinator-broker attribution, not just the network pertaining to information.

Analytical Method

Empirically assessing these hypotheses requires data that: (1) Include meaningful outcomes of ceding to one as a coordinator; (2) include measures that capture the dyadic social relationships of team members prior to and after team formation to mitigate concerns of simultaneity bias; (3) include data on the whole social network of individual team members to capture their individual stocks of social capital in the organizational context; and (4) help address various endogeneity issues and antecedent social processes (e.g., how prior network structures can affect contemporaneous ones).

Data

The data we use to test our arguments have several desirable elements that make them well-suited to address the demands outlined above, to wit: they are derived from a context where the role of team coordinator-broker is not determined *ex ante* by hierarchy, i.e., it is an emergent social process; individuals who may achieve the position of coordinator have the same organizational tenure and were all selected in a rigorous admission process, which minimizes differences and ensures that teammates constitute a close comparison group for

the purpose of social comparison (Festinger 1954; Major and Forcey 1985); individuals were exogenously assigned to teams of fixed size without regard for their prior social relationships or observable human capital; relational data on team members' dyadic relationships within the team, as well to all other individuals in the organizational context (the whole network) *prior* to team assignment were collected to help establish temporal ordering of effects; all cohort members were newcomers to this specific social network, which significantly reduces the possibility that prior social network processes are contaminating contemporaneous findings; there is significant variation in the size of students' friendship ties within the team (few students have more than two friends on a team, and the modal response is no friends on a team) to which they were assigned; and a direct measure of coordinator-broker attribution was included. As a consequence of this research design we can be more confident that the relative social factors we study are not spuriously related to deference as coordinator-broker (see figure 2 for a schematic of the data collection).

Insert Figure 2 about here

During the springs of 2003, 2004, and 2008 data were collected from first year master's degree students at one of the most elite private graduate school of public policy in the northeastern region of the United States. Students participated in a two-week exercise that was the culmination of their first year's coursework.

This exercise entailed two interrelated components: The first week of the exercise entailed a task each student performed individually (the "individual memo"). The assignment involved reviewing and analyzing more than 1,000 pages of briefings and related material and then composing a short policy brief based on their assessment of the evidence.

In the second week students were exogenously assigned to work teams of four or (mostly) five members. Students were not able to select their teammates. Rather, students were assigned to teams without knowledge of, or regard for, the analytical objectives of this research. The sole basis for team assignment was international student status with the objective of ensuring that some teams were not made up entirely of individuals who were not native English speakers. That is, students were "blocked" (Fisher 1935) by nativity, team size was fixed, and other factors were not considered in the assignment process. Nativity was considered because of the emphasis on reading, comprehending, analyzing, synthesizing, and drawing conclusions from hundreds of pages of English text. It was assumed that students from countries that speak a language other than English would be at a comparative disadvantage in such a situation. To the extent that this assignment strategy is associated with the social composition of a team—and to the extent that homophily processes operate in terms of nativity—it is likely to result in a lower proportion of friends on teams as international/US students are assigned to different teams. This assignment rule should result in a lower frequency of

friendship ties and homogeneity on teams, which is what is empirically observed. Indeed, intra-class correlations for the variables of interest indicate that variability is overwhelmingly within rather than between teams. For example: coordinator attribution (ICC=0.00, F=0.16) and the difference between the number of friends ego has on the team vis-à-vis alter ego (ICC=0.00, F=0.12 (within teams); ICC=0.13, F=1.66 (within individuals)) evidence as much. This assignment procedure, coupled with the fact that few students knew each other prior to starting the program, means that teams are overwhelmingly made up of strangers and acquaintances.

Teams were instructed to write a briefing book based on the same material from which they created their individual memos. Teams were then required to present their briefs to a panel of faculty judges. This team project required students to debate and synthesize their individual assessments of a substantial amount of information in a creative and cogent manner (on creativity and brokerage see Cattani and Ferriani 2008). Thus the product of this team project entailed interdependent, complex tasks, something that is often lacking in laboratory-based research (Mennecke and Valacich 1998; Bradley, White, and Mennecke 2003). Importantly for the purpose of this research, the role of team coordinator-broker was not pre-determined by any structural feature. The coordinator position was thus emergent and often contested.

It should be noted that the team project accounted for a substantial proportion of each student's grade thus providing a significant incentive above and beyond personal motivation to perform well on this task. It similarly provides personal incentive to ensure that one's team members do likewise (see, e.g., Wageman 1999; Wageman and Gordon 2004). Teams could thus be regarded as what Coleman (1990, p. 188) referred to as "communities of mutual trust." Coleman argued that trust relations in such situations arise because: "[…] (a group I will call a community here for convenience) are all engaged in an activity that produces an outcome in which all have a similar interest. In addition, each [member] has an interest in not sacrificing other interests to engage in the activity of common interest." Because each team member has a significant interest in collective success—and all students in this elite master's program represent "cases" in a population selected with higher than average individual aptitude, accomplishment, and/or motivation—this setting is one in which one would expect that students make highly (boundedly) rational decisions. This research setting thus provides an appealing context in which to evaluate the arguments outlined above concerning social structure and brokerage attribution.

Students were given a network survey based on a roster of every member of the first year class in which they were matriculated. These data thus constitute the "whole networks" of the first year cohorts (on network boundary specification issues see Laumann, Marsden, and Prensky 1989). To aid recall, a picture of each

student was provided along with students' names. Employment of a complete list of names along with pictures to aid recall ameliorates problems associated with free recall such as recollection based on social proximity that may bias results towards relatively "stronger" or more prominent ties (Brewer 1995).

Respondents were then asked to indicate whether they engaged in any of the following activities with each of their cohort mates: (a) worked with on a previous class-related team project during the academic year; (b) engaged in discussions of academics (outside of the classroom); or (c) got together with for non-academic reasons (socialize with). Focusing on concrete activities for the whole network is beneficial because it reduces the high likelihood of expansiveness bias or inaccuracy resulting from the gap between perceptions and behavior that would result if respondents were asked to identify less concrete ties such as those based on affect (Bernard, Killworth, and Sailer 1981; Feld and Carter 2002).

The unit of analysis for this study is a decision set S={1 ,…, N} for each respondent, *R*, where N ranges from 4 to 5 options (depending on the size of his/her team), resulting in N**R* observations. The analytical sample size varies by analysis ranging from 1729 individual ego-alter alternative-specific choice-options for 409 respondents to 1128 individual ego-alter alternative-specific choice-options for 251 egos collected in decision sets. Variation in analytical sample sizes is due to: variation in the conditional belief that one's team has a

coordinator-broker; a lack of within respondent variation (in fixed-effects models); and missing responses on various variables. The employment of various modeling techniques suggests that these variations do not alter results.

Measures

Dependent variable. The primary outcome measure is a dyadic metric of coordinator-broker attribution. Respondents were asked the following questions: "Sometimes one person on a team takes on more of a coordinating role than other team members. Did any member take on such a role? (yes/no). If yes, who? The risk set included all members of the team, including ego. Formally, y_{ijk} denotes that actor *i* identified actor *j* as the coordinator-broker of team, *k,* to which they both belonged (y_{ijk} = 0 or 1) conditional on believing there was a coordinator-broker on the team. Given the directed nature of deference processes (see, e.g., Fernandez 1991), and the question used in this study to capture it, $y_{ijk} \neq y_{jik}$. Because team members could identify themselves as the team coordinator-broker, reflexive arcs, y_{iik}, are defined. Second, respondents were asked to indicate which, if any, member of their team took on a coordinator-broker role. This question implies a conditional model in which coordinator-broker attribution is contingent on the belief that the team had a coordinator-broker. To ensure that no selection bias is introduced by ignoring those respondents who did not believe that their teams had a coordinator-broker, we specify a trichotomous outcome measure that

includes the possibility that ego did not believe the team had a coordinator-broker. As will be demonstrated below results are consistent across models.

This operationalization of the *role* of broker as coordinator focuses on ego's perception of alter-ego's actual behavior. This measurement is different than network-based metrics that measure brokerage opportunity. We believe the direct measurement we use is more reasonable because of our focus on ceding of the brokerage role by one party to another. Inferring such behavior from opportunity and not actual action seems problematic. In terms of construct validity, the question underlying these measures taps a key functional and instrumental aspect of coordinator-brokerage: oversight of efforts to harmonize, integrate, and combine distinct resources within and outside the team for goal oriented purposes. Inherent in this conceptualization is ceding on the part of the follower. This definition coheres with Gould and Fernandez's (1989, p. 92) definition of coordinator brokerage: "all three actors may belong to the same group, so that the brokerage relation is completely internal to the group. Because this kind of exchange involves the services of an agent who is a member of the same group as the principals, and individual or organization who occupies this role can be seen as a *local broker* or *coordinator*" (emphases in the original).

Independent variables. Hypothesis one concerns the impact of social comparison of stocks of social capital embedded in networks within the team on

coordinator-broker attribution (this is graphically illustrated in figure 2 as within team (circle) comparisons). Hypothesis two implies an absolute test of the impact of centrality in the whole network discussion network outside the team on coordinator-broker deference within team (represented by directed arrows emanating from outside the team). To calculate our key predictors indegree measures ($d_I(n_{ik})$) were created to assess each team members' stock of social capital. Alternative measures of centrality were considered and evaluated. These included closeness and eigenvector (Bonacich 1972; Freeman 1979). Because of the high correlation among these metrics (Bolland 1988; Faust 1997) and the relative ease of interpretation of the indegree metric along with research that shows its comparative predictive power in organizational outcomes vis-à-vis other network measures (Fang et al. 2015), we calculate modified versions of indegree measures below to test the hypotheses. We focus on first-order social relationships rather than those including "friends-of-friends" because prior research suggests that brokerage advantages flow from direct connections (Burt 2007).

As noted above, questions were used to elicit the number of the entire cohort (i.e., the whole network of students) with whom ego or alter-ego: (a) worked with on a previous class-related team project during the academic year; (b) engaged in discussions of academics (outside of the classroom); or (c) got together with for non-academic reasons (i.e., socialized with). The first measure

quantifies the number of individuals in the cohort each student has firsthand experience working with, which, in turn, should offer a good opportunity to assess their relative expertise that can potentially be drawn upon for advice or assistance, as well as a means of observing and thus understanding the manner and mode in which they work. The second measure captures the size of students' knowledge and information networks. The last question captures the number of classmates students socialized with, i.e., their friends.[4] As noted above, a nice feature of collecting data on three networks is that they enable us to account for the content of various types of networks, which has been a limitation of prior work (Granovetter 1973; Burt 2008). Moreover, it enables us to hold constant ego and alter-ego's stable characteristics such as personality that transfer across networks (Burt 2012; Fang et al. 2015).

A first class of social relational predictors captures dyadic differences in the number of friends, individuals previously worked with, or discussed academic matters with *on the team* compared with each of his teammates, e.g.: ($d_{I(friends)}(n_{jk})$ - $d_{I(friends)}(n_{ik})$). The mean of this measure is -.137 (SD = 1.44; range = -4 to 4; skewness = 2.09; kurtosis = 2.9).[5] This measure assesses the extent to which

[4] The ability to distinguish these three bases of social affiliation and interaction addresses a limitation often encountered in social network studies that presuppose that the "substance of advantage" flowing across network is some generic notion of information (Burt 2008) that is contextually valuable.

[5] We also specified this measure as a dummy variable indicating that alter-ego had more friends on the team than ego (mean=.308; SD=.462). The results are substantively the same regardless of the measure used.

ceding a valued position is a function of interpersonal comparisons of all teammates in a specific social relational context. As argued above, we should expect to see *i* cede to *j* if *j* has more friendship ties on the team than *i*, which should enable her to more efficiently and effectively gain trust and coordinate activities within the team.

In terms of local social capital, we identified the individual on each team who had the maximum indegree: (max[$d_I(n_k)$]), and specified a dummy variable equal to one when $d_I(n_{jk}) = \max[d_I(n_k)]$, zero otherwise.[6] These metrics indicate that respondent, *j*, has the most social ties of various types (i.e., prior team members, discussion partners, or friends) in the *whole network* on her respective team. The logic here, following hypothesis 2, is that an individual, *i*, is more likely to evaluate a teammate as a coordinator-broker if that teammate has the greatest stock of informational ties outside of the team. The measures calculated above contrast ego and alter-ego's actual stocks of ties embedded in networks. These metrics are based on data provided by ego and alter-ego separately. While this measurement strategy has its virtues, it also has an important limitation for the task at hand, to wit: ego may have difficulty observing let alone calculating the difference in her stock of social capital vis-à-vis alter-egos. With respect to

[6] Alternative metrics (e.g., $d_I(n_{ik})/\max[d_I(n_k)]$) were also calculated and yielded similar results, but are slightly more difficult to interpret in an intuitive manner, and exhibit slightly less predictive power.

comparative relationships within the team, given the size of the teams (n=5) and duration and frequency of contact among team members it is reasonable to presume that students have a reasonably accurate sense of the number of friends they have on the team as compared with other team members. In terms of whole network evaluations this is far less defensible. However, to the extent that there is bias in this measure it is likely in the direction of overestimating ego's network due to self-enhancement bias (Zuckerman and Jost 2001). This bias plays against our hypotheses making the tests presented below more conservative.

Controls. We include a dummy variable indicating reciprocity in coordinator-broker deference ($y_{ji}=y_{ij}=1$). Roughly 4% of individuals regarded as coordinator-brokers reciprocated this attribution (LR-$\chi^{2(1)}$= 20.19, p <.000). In terms of reflexive ties (y_{ii}), descriptive results suggest roughly 28% of coordinator-broker votes are by and for ego (LR-$\chi^{2(1)}$ = 16.77, p <.000). A measure of the difference in ego and alter-ego's individual memo grade is also calculated ($X_j - X_i$). This measure captures the difference in (lagged) task-specific human capital. We also calculate cohort fixed-effects to account for variation in the social structure and cultural climate of the different cohorts that may have a bearing on interpersonal evaluations. Descriptions and summary statistics for the measures outlined above are presented in Table 1 below. Table 2 presents pair-wise correlations between the measures.

Insert Table 1 about here

Insert Table 2 about here

Statistical Procedures

Each member of the team had the opportunity but not the obligation to identify one team member (including herself) as the team coordinator-broker. Teams averaged roughly 4.6 members. Each team member thus had one coordinator-broker vote and roughly 5 alternative choices. Conceptualizing this as an adjacency matrix with directed ties is problematic because these figures imply a sample likely too small, and matrix too sparse, for accurate estimation. Pooling responses across teams (i.e., creating an adjacency matrix including all students in a cohort) makes little theoretical sense because students could only select as coordinator-broker (and be selected coordinator-broker by) members of their teams. On the other hand, team members' choice-sets are likely non-independent (Dempster, Selwyn, Patel, and Roth 1984; Raudenbush and Bryk 2002). Alternatives are clustered within individuals and teams. To address this issue and ensure robustness, we use several statistical techniques. First, we consider the coordinator-broker choice as analogous to other choices "consumers" broadly construed make. We thus specify a McFadden choice model (Manski and McFadden 1981).[1] For our purposes, the "response problem" is a set of candidates

for the role of broker as coordinator, S = {1 ,…, N} who are mutually exclusive alternatives with characteristics used for evaluation that are either alternative-specific or constant within alternative but varying over ego-alter-ego dyads. The specification of ego fixed-effects account for ego's unobserved preferences that do not vary across alters. Second, we specify random effects to all for variation between egos. Finally, we also specify multinomial HLM models with ego-alter choice options, *i*, nested in team member, *j*, in team, *k* with a fixed (Θ_{ijk}) or random component (γ_{ijk}) included as appropriate. Fixed effects in various models for ego or alter-ego account for stable characteristics such as personality (see, e.g., Burt 2012), charisma, and various forms of human capital. A general representation of the model is:

$$Pr\{\mathrm{Y} = 1|\mathrm{Alter}, \mathrm{Ego}, \mathrm{Alter} - \mathrm{ego}, \mathrm{X}\}$$

$$= G[\beta_0 + \sum_{p=1}^{P} \beta_1(Ego)_{ijk} + \beta_2(Alter)_{ijk} + \beta_3(Alter - ego)_{ijk}$$

$$+ \beta_4(Cohort)_{ijk} + \beta_5(X)_{ijk} + \Theta_{ijk} + \mathcal{E}_{ijk}]$$

In relevant models standard errors are robust and cluster-adjusted at the individual (ego)-team level. Clustering around alters (i.e., the person considered for the coordinator position), egos, or teams makes no substantial substantive or statistical difference. As a robustness check we also specify models with two-way clustered standard errors (Cameron, Gelbach, and Miller 2006; Kleinbaum, Stuart,

and Tushman 2013), as well as two-level HLM models treating choices as level-1 and ego-alter dyad within teams as level-2.[7] See table A1 in the Appendix for additional tests.[8] Results are consistent across model specifications and clustering strategies.

Presentation of Findings

Insert Table 3 about here

Table 3 above presents results from several sets of regression models predicting the likelihood that ego defers to alter-ego as coordinator-broker. The table is oriented as follows: First, note that for each set of models three types of statistical results are tabulated to ensure robustness: conditional fixed-effects (FE), random-effects (RE), and hierarchical, multinomial logistic regression. Second, all models include the key controls. Second, for ease of interpretation we will discuss them in terms of marginal effects ($\frac{\partial y}{\partial x_i}$). To interpret these effects, we set continuous covariates at their means and those in a dummy variable metric to

[7] An LR- χ^2 test comparing a full model HLM logistic regression model with two random effects vis-à-vis a logistic regression model did not reveal a significant difference ($\chi^{2(2)}$=2.96, p =0.23). Results of these logistic regression HLM models are omitted to conserve space but available upon request.

[8] As yet another check of robustness we modeled the choice to acknowledge a coordinator-broker or not and, if so, who, with bivariate probit models to account for the potential correlation between the two stages of the choice. The results were consistent statistically and substantively. However, likelihood-ratio tests do not contradict the null hypothesis of independent equations. Results omitted to conserve space but available upon request.

zero. Finally, note that in the appendix we present unconditional models corresponding to those presented in table 3 to assess model fit and robustness, and also present supplemental models to assess robustness (e.g., those including two-way clustered standard errors). Substantive conclusions remain consistent across models.

"Global" and "Local" Social Capital Coordinator-broker Attribution

The first three lines include the measures capturing whether alter-ego has comparatively more social connections (discussion, friendship, prior group work) than any other individual on the team. Results suggest that when evaluating alter-egos for coordinator-broker attribution, ego only considers the comparative size of his teammates' discussion networks in the whole organizational network (b=0.51, Z-ratio=2.6, p <.01). This coefficient implies a marginal effect of coordinator-broker attribution of 0.12 (SE= 0.05, z-ratio=-2.63, p <.01; predicted probability =.49), which is a substantively and statistically significant effect.[9] Comparatively larger friendship and prior work experience (group project) networks have no significant bearing on the decision. This finding is consistent with the intuition that when attributing coordinator-broker, individuals view

[9] An LR-χ^2 tests comparing the task-specific human capital measure and the relative size of discussion networks indicates a statistically significant difference ($\chi^{2(1)}$=11.85, p < .0001).

favorably alter-ego's ability to access knowledge and information beyond the boundaries of the team.

Rows four through six present coefficient estimates concerning within team, dyadic comparisons of social connections. Row four, for example, provides a comparison of the number of intra-team discussion ties each alter-ego has compared with ego. Results across models consistently show that the comparative relationships that matter within a team are those of friendship (estimates range from 0.14 (model 5) to 0.2 (model 12)). The coefficient estimate in model 4, for example, implies a marginal effect of 0.04 (SE=0.02, z-ratio=2.23, $p < .05$). These results support hypothesis one which argued that ego compares her friendship (strong-tie) connections within the team vis-à-vis each alter-ego as a positive basis of deferring to a teammate as coordinator. The ability to leverage existing relationships within the team to foster trust and coordination is clearly a valued attribute when considering whom to defer to.

Finally, rows seven through nine include coefficients denoting alter-ego's network centrality (indegree) across the various types of networks. The results consistently show that the key type of network ego considers when identifying a teammate as coordinator-broker is that pertaining to ties in the whole network (beyond the team) that can help with knowledge, information, and know-how

acquisition.[10] Networks pertaining to friendship ties, on the other hand, have no statistical effect. This effect lends support to our second hypothesis, and is consistent with the broader literature (at the team level) that reveals the importance of boundary spanning work for team performance. This result thus helps provide a micro-macro link from individual interests and choice to team-level outcomes thus connecting individuals and collectives in organizational research (Ibarra, Kilduff, and Tsai 2005).[11]

Summary and Conclusion

Brokerage and coordination as a form of brokerage have long been topics of practical importance and scholarly interest (Gould and Fernandez 1989; Burt 1992; Fernandez and Gould 1994). However, to-date, research has primarily focused on the consequences of having the most brokerage opportunities in one's network and, to a lesser degree, the origin (e.g., Zaheer and Soda 2009) and underlying motive for the formation (Kleinberg, Suri, Tardos, and Wexler 2008). In this paper we flip the question and ask why, if brokerage opportunities are

[10] There was no statistical evidence of nonlinear effects. Note further that various transformations (e.g., min, max, mean) of whole network measures of discussion ties and prior individuals worked with were estimated. Results were consistent with those presented. These results are omitted to conserve space but available upon request.

[11] An LR-χ^2 tests comparing the two indegree measures (in model 7) of discussion networks indicates a statistically significant difference ($\chi^{2(1)}=18.72$, $p < .0001$).

valuable, and entering into a transaction with a broker can entail costs, do social actors defer the brokerage role? More precisely, what specific social resources do they consider when deferring this favorable role? This paper thus endeavored to provide an initial answer to this question by proposing a theory and attendant empirical test of how interpersonal comparisons (Festinger 1954; Homans 1958; 1961) of social capital embedded in networks (e.g., Lin, 2001, p. 19) are used for emergent coordinator-broker attribution.

We find that dyadic social comparisons of stocks of social-capital embedded in distinct types of networks are important factors in coordinator-broker attribution. Interpersonal evaluations and comparisons of coordinator-broker attribution are contingent on different types of social capital embedded in social networks that have two distinct purposes: First, individuals consider whether each of their teammates are well situated in organizational discussion networks beyond the team to access knowledge and information in absolute and comparative terms. This is consistent with views of coordinator-broker as a boundary or cluster spanning function and position. Second, teammates also assess whether alters have comparatively more social capital within the team to help foster trust, cooperation, and coordination of effort. The social networks that lead to coordinator-broker attribution are thus distinct locally and globally in form and content. This research also demonstrates how endogeneous network processes

and small institutional design features (see, e.g., Small 2009) and chance can combine to advantage some actors at the cost of others.

The findings of this research help weave a coherent story concerning the structure of team, social networks, and coordinator-broker attribution. For example, Freeman, et al. (1980) conducted an experimental study of various forms of centrality on human communication and leadership in small groups. The experiments were inspired (and largely followed in structure) the pioneering MIT experiments reported by Bavelas (1950). The Freeman experiments showed that a measure of betweeness centrality within the group was most strongly associated with leadership attribution.

Our research looked at the comparative structural positions of individuals both within and outside teams. Findings suggest that "control" is an important determinant of coordinator-broker attribution. However, the type of content underlying centrality and coordinator-broker attribution varies within team networks and without. Consistent with the guiding intuition of Reagans and Zuckerman (2001), we find that having comparatively more friendship ties within the team—a proxy for stronger ties (Granovetter 1973)—is associated with coordinator-broker attribution. Importantly, these ties preceded coordinator-broker attribution (indeed team formation). Prior theory and empirical work suggest that the ability to facilitate trust, cooperation, and coordination is more likely with such ties (Macy and Skvoretz 1998; Buchan, Croson, and Dawes

2002; Welch, Sikkink, and Loveland 2007). Second, team performance also requires resources located outside of the team (e.g., topical expertise, information), as noted above. Here a different type of network is important—one which facilitates access to non-redundant knowledge, know-how, and information (Burt 1992, 2004). We find that centrality in the information network is advantageous in this respect, and increases the likelihood of coordinator-broker attribution to the alter-egos who are better positioned in such networks.

Two workplace trends have increased the importance of coordinator-brokerage at different levels of an organization: Firstly, work is increasingly conducted in teams. This is especially true in knowledge intensive industries. Secondly, many organizations—particularly those in knowledge intensive industries—have organizational structures that are increasingly horizontal. Identifying, fostering, and developing coordinator-brokers are thus of increasing challenge and importance.

This research was conducted in a context created to educate the next generation of leaders in public policy and management. Thus all of our study participants began with the credentials, drive, and aptitude to become the sorts of employees many organizations seek to hire and develop. This research shows that even in this context, structural issues had a significant bearing on whether individuals emerged as coordinator-brokers in their teams. Among the strongest determinants of coordinator-broker emergence was one's centrality in discussion

networks in the whole network. Networks clearly matter. Or more precisely, networks that help foster knowledge sharing matter at the global level. “Local” team-specific social conditions also matter. Individuals who have by luck (in our setting) or structural design (as is common in real-world settings) comparatively more strong-ties such as friends on the teams to which they are assigned are more likely to emerge as coordinator-brokers. Taken together these findings suggest two views of coordinator-broker emergence: Those deferred to as coordinator-brokers are those who are best suited, as a consequence of their comparative social relationships in the team, to foster and maintain trust; secondly, those best situated in the larger organization’s network of knowledge and information are also more likely to be ceded to as coordinator-brokers. Coordinator-broker attribution is thus based on two characteristics—the ability to foster closure internally or explore the organizational landscape outside the team’s boundary. Organizations interested in fostering coordinator-brokers must thus attend to structural factors that create conditions conducive to these ends.

The data used in this paper have some appealing features. First, the structural design of the context and research helps block for several processes that can complicate estimation and interpretation of network effects. Few networks are ever truly exogenous. Rather, contemporaneous networks are the product of prior networks and social processes. Collecting data on a population that has just formed (i.e., we are able to view their intra-organizational networks from the

beginning) and is similar in many achieved and ascribed characteristics mitigates some but certainly not all of these issues. It does, however, minimize network autocorrelation processes. Additionally, whole-network data were collected concerning several types of social relationships. Students were exogenously assigned to teams, and the social relationships of team members were also measured. Exogenous assignment drastically reduces the likelihood of selection based on homophily or other factors. However, it does not yield results as strong as those made possible with full random assignment—something that future research could certainly employ. Additionally, the data used here have relatively few socio-demographic measures. In analyses not reported here but available upon request, we conducted sensitivity analyses using one cohort in which gender was available as a covariate (unfortunately this question was not asked in other cohorts). Results reveal no statistical differences in the key measures, which suggest that gender is not associated with either coordinator-broker attribution or its social relational predictors. That said, given the evidence in the literature concerning gender, race, or other factors impacting interpersonal evaluation (see, e.g., Ridgeway and Smith-Lovin 1999) future research employing a research design suited to test these issues directly would be useful. Measures that assess interpersonal attraction (e.g., physical characteristics) along other dimensions would also help address potential threats to validity. Finally, this research focused on one dimension of brokerage—coordination within teams. There are other

forms of brokerage (Gould and Fernandez 1989, Fernandez and Gould 1994). Determining the extent to which comparative network considerations have a bearing on the attribution of these other forms of brokerage would be a considerable contribution in our estimation.

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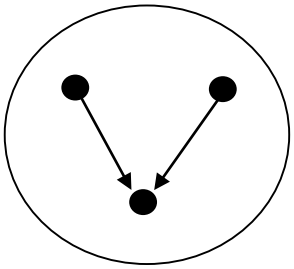
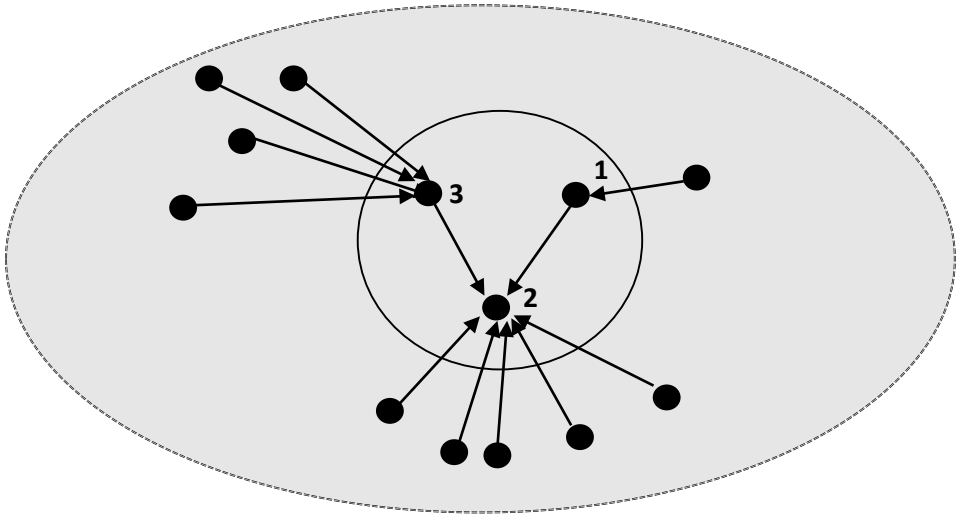
FIGURE 1A
COORDINATOR AS LOCAL BROKER
(*IGNORING* TEAM EMBEDDEDNESS IN LARGER NETWORKS)



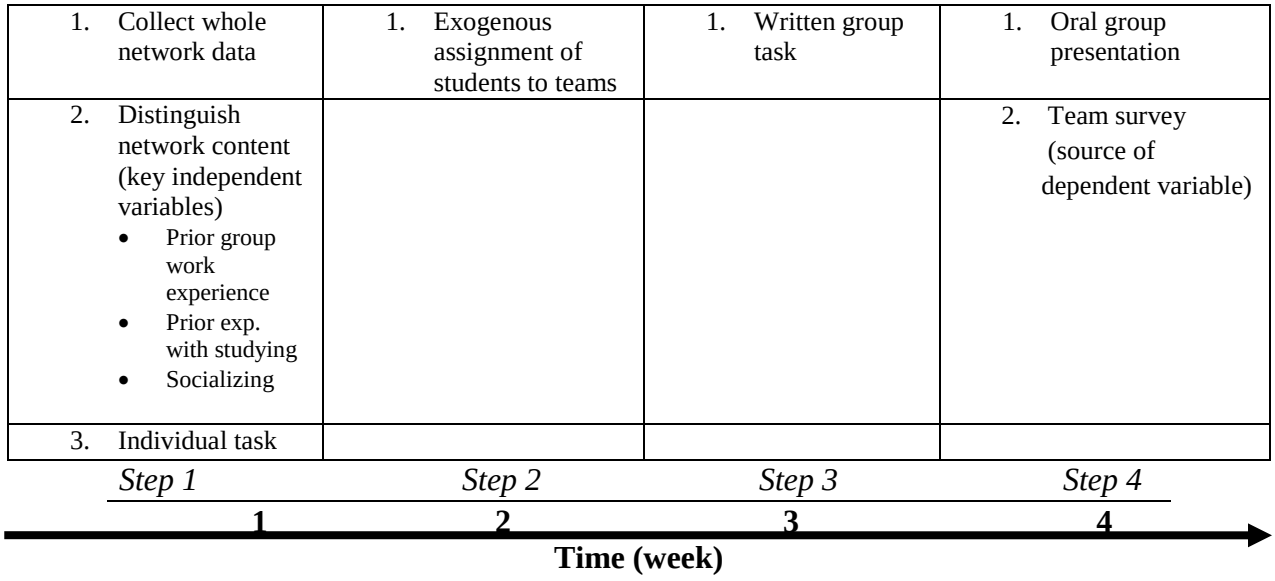
Source: Gould and Fernandez 1994

FIGURE 1B
LOCAL AND GLOBAL BASES OF SOCIAL CAPITAL
(TEAM MEMBERS ARE ACTORS IN "GLOBAL" AND LOCAL NETWORKS)



Notes: (1) Numbers denote team members 1, 2, and 3 respectively.
(2) Arrows indicate directed relationships
(3) Inner (solid) circle denotes the boundary of the team
(4) Outer (dashed) boundary denotes the "whole" network.

FIGURE 2
SCHEMATIC OF DATA COLLECTION TO CLARIFY NETWORK CONTENT AND ORDERING



Note: Figure depicts the temporal ordering of the research design across time (weeks on the horizontal access) and steps (vertical access) within week

TABLE 1
Description and Summary of Key Variables

Variable	Mean	SD	Min	Max
Ceded to alter as coordinator-broker (y_{ijk} = 0 or 1)	0.20	0.40	0	1
s				
Alter has most discussion ties in whole network of all on team $d_I(n_{jk}) = \max[d_I(n_k)]$	0.22	0.41	0	1
Alter has most friendship ties in whole network of all on team $d_I(n_{jk}) = \max[d_I(n_k)]$	0.22	0.42	0	1
Alter has most prior team work ties in whole network of all on team $d_I(n_{jk}) = \max[d_I(n_k)]$	0.25	0.44	0	1
Alter-ego - ego discussion ties within team ($d_{I(discussion)}(n_{jk}) - d_{I(discussion)}(n_{ik})$])	-0.12	1.48	-4	4
Alter-ego - ego friendship ties within team ($d_{I(friends)}(n_{jk}) - d_{I(friends)}(n_{ik})$])	-0.13	1.44	-4	4
Alter-ego - ego group exp. ties within team ($d_{I(group\ exp.)}(n_{jk}) - d_{I(group\ exp.)}(n_{ik})$])	-0.06	1.46	-4	4
Indegree, alter-ego discussion ties ($d_{I(discussion)}(n_{jk})$)	45.21	18.19	6	102
Indegree, alter-ego friendship ties ($d_{I(friendship)}(n_{jk})$)	52.97	22.35	6	126
Indegree, alter-ego group exp. ties ($d_{I(group\ exp.)}(n_{jk})$)	15.12	5.51	2	33
Reflexive tie (y_{ii})	0.19	0.39	0	1
Reciprocated tie (y_{ji}=y_{ij}=1)	0.01	0.11	0	1
Individual memo grade diff. (X_j-X_i)	0.04	1.15	-4	4
Cohort = 2003	0.36	0.48	0	1
Cohort = 2004	0.19	0.39	0	1

SOURCE: Unique data collected from three cohorts of first year master's degree students enrolled in an elite private university in the northeastern United States

TABLE 2
Pair-wise Correlations Between Key Variables

	VARIABLE	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Deferred to alter as coordinator-broker (y_{ijk} = 0 or 1)	1.00													
2	Individual memo grade diff. (X_j-X_i)	-0.06*	1.00												
3	Alter has most discussion ties in network on team	0.09***	-0.07**	1.00											
4	Alter has most friendship ties in network on team	0.04	-0.05*	0.49***	1.00										
5	Alter has most prior team wk. ties in network	0.02	-0.05*	0.37***	0.21***	1.00									
6	Alter-ego discussion ties within team	0.03	0.04*	0.12***	0.11***	0.05**	1.00								
7	Alter-ego friendship ties within team	0.07**	0.00	0.14***	0.13***	0.08***	0.55***	1.00							
8	Alter-ego group exp. ties within team	-0.02	0.07***	0.06**	-0.04+	0.05*	0.41***	0.36***	1.00						
9	Indegree alter-ego discussion ties ($d_{I(discussion)}(n_{jk})$	0.11***	-0.06**	0.46***	0.34***	0.29***	0.10***	0.13***	0.00	1.00					
10	Indegree alter-ego friendship ties ($d_{I(friendship)}(n_{jk})$)	0.05+	-0.06**	0.40***	0.53***	0.26***	0.14***	0.23***	0.01	0.81***	1.00				
11	Indegree alter-ego group exp. ties ($d_{I(group\ exp.)}(n_{jk})$)	0.08**	-0.05*	0.34***	0.25***	0.53***	0.08***	0.11***	0.01	0.76***	0.65***	1.00			
12	Reflexive tie (y_{ii})	0.36***	0.00	0.02	0.03	0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.02	1.00		
13	Reciprocated tie (y_{ji}=y_{ij}=1)	0.15***	0.00	-0.04	0.00	0.03	0.03	0.02	0.02	0.04	0.04	0.04	-0.01	1.00	
14	Cohort = 2003	0.00	0.00	0.00	-0.03	-0.01	-0.01	-0.02	-0.01	-0.19***	-0.09***	-0.11***	0.01	-0.04	1.00
15	Cohort = 2004	-0.02	0.00	0.03	0.05***	0.03	0.03	0.04+	0.02	-0.38***	-0.23***	-0.26***	0.01	-0.05+	-0.4***

SOURCE: Unique data collected from three cohorts of first year master's degree students enrolled in an elite private university in the United States.

NOTE: **P* <.05
***P* <.01
****P*<.001(two-tailed)
+*P*<.05 (one-tailed)

TABLE 3
Regression Coefficients Predicting Deference as Coordinator-Broker

	Alter-ego *intra-team whole network* comparisons			Alter-ego *within* team comparisons			Alter-ego *whole network* centrality			Full models		
Model type:	**1. FE Logistic**	**2. RE Logistic**	**3. HLM MLR**	**4. FE Logistic**	**5. RE Logistic**	**6. HLM MLR**	**7. FE Logistic**	**8. RE Logistic**	**9. HLM MLR**	**10. FE Logistic**	**11. RE Logistic**	**12. HLM MLR**
Variable	b(SE)	b(SE)	b(SE)	b(SE)	b(SE)	b(SE)	b(SE)	b(SE)	b(SE)	b(SE)	b(SE)	b(SE)
Alter-ego has most discussion ties in whole network on team	0.51**	0.64***	0.72**							0.12	0.32	0.22
	(0.19)	(0.20)	(0.24)							(0.23)	(0.24)	(0.28)
Alter-ego has most friendship ties in whole network on team	-0.06	-0.05	-.011							0.17	0.16	0.12
	(0.19)	(0.20)	(0.24)							(0.24)	(0.24)	(0.28)
Alter-ego has most group exp. ties in whole network on team	-0.13	-0.14	-0.03							-0.19	-0.25	-0.15
	(0.18)	(0.19)	(0.21)							(0.24)	(0.23)	(0.27)
Alter-ego - ego discussion ties within team				-0.01	-0.02	-0.01				-0.06	-0.07	-0.05
				(0.06)	(0.06)	(0.08)				(0.07)	(0.06)	(0.08)
Alter-ego - ego friendship ties within team				0.15*	0.14**	0.178*				0.17*	0.16*	0.2*
				(0.07)	(0.06)	(0.08)				(0.07)	(0.07)	(0.08)
Alter-ego - ego group exp. ties within team				-0.09	-0.07	-0.1				-0.07	-0.06	-0.08
				(0.06)	(0.06)	(0.07)				(0.06)	(0.06)	(0.07)
Indegree, alter-ego discussion ties							0.04***	0.04***	0.05***	0.03***	0.03***	0.04***
							(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)
Indegree, alter-ego friendship ties							-0.01**	-0.01**	-0.02**	-0.02**	-0.02***	-0.02**
							(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)
Indegree, alter-ego group exp. ties							-0.01	-0.01	-0.00	-0.01	-0.00	-0.00
							(0.02)	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)
Reflexive tie	0.48**	0.74***	1.21***	0.37*	0.65***	1.09***	0.47**	0.73***	1.22***	0.37*	0.67***	1.09***
	(0.16)	(0.17)	(0.21)	(0.16)	(0.17)	(0.20)	(0.16)	(0.18)	(0.21)	(0.17)	(0.18)	(0.21)
Reciprocated tie	2.81***	2.84***		2.68***	2.73***		2.82***	2.94***		2.98***	3.06***	
	(0.67)	(0.67)		(0.67)	(0.68)		(0.68)	(0.69)		(0.69)	(0.7)	

Individual memo grade difference	-0.2*	-0.14*	-0.223*	-0.23*	-0.15*	-0.24**				-0.19*	-0.13+	-0.21*
	(0.09)	(0.07)	(0.09)	(0.09)	(0.07)	(0.09)				(0.09)	(0.07)	(0.09)
Cohort = 2003	-0.79	-0.03	-0.02	-0.92	0.01	0.03	-0.82	0.5*	0.64+	-0.87	0.37+	0.5
	(1.38)	(0.17)	(0.32)	(1.35)	(0.17)	(0.31)	(1.37)	(0.21)	(0.35)	(1.37)	(0.22)	(0.35)
Cohort = 2004	-1.81	-0.11	-0.01	-2.01	0.03	0.12	-1.75	0.56*	0.85*	-1.97	0.44+	0.7+
	(1.36)	(0.20)	(0.36)	(1.32)	(0.21)	(0.35)	(1.35)	(0.25)	(0.40)	(1.35)	(0.27)	(0.41)
CONSTANT		-1.69***	-1.53***		-1.56***	-1.39***		-2.67***	-2.93***		-2.15***	-2.29***
		(0.14)	(0.23)		(0.12)	(0.22)		(0.32)	(0.42)		(0.39)	(0.51)
Log likelihood	-328.15	-551.75	-1434.7	-322.73	-548.1	-1415.71	-326.36	-549.7	-1438	-312.57	-535.26	-1402
Wald-χ^2 (df)	48.98	47.93		45.34	39.39		57.72	55.4		65.66	61.58	
	(8)***	(8)***		(8)***	(8)***		(7)***	(7)***		(14)***	(14)***	
N(clusters)	1072	1163	1709	1042	1128	1651	1083	1175	1729	1042	1128	1651
	(229)	(251)	(408)	(229)	(251)	(407)	(229)	(251)	(409)	(229)	(251)	(407)
Mean # of obs per group	4.7	4.6		4.6	4.5		4.7	4.7		4.6	4.5	
BIC	712.12	1174.09	2995.9	701.06	1166.4	2957.39	701.64	1163	2988.6	722.43	1182.98	3018.73
AIC	672.31	1123.5	2903.36	661.47	1116.12	2865.43	666.73	1117.3	2906.8	653.15	1102.52	2861.87
Variance component			4.71			4.27			4.89			4.36
			(0.69)			(0.64)			(0.71)			(0.65)
IIA: Hausman test, χ^2 (df)			0.196(8), ns			na			1.9(7), ns			1.59(14), ns

SOURCE: Unique data collected from three cohorts of first year master's degree students enrolled in an elite private university in the United States.

NOTE: FE denoted fixed-effects (conditional) regression; RE denotes random-effects regression. HLM MLR denotes hierarchical multinomial logistic regression. Dependent variable for HLM MLR is a trichotomy: not coordinator-broker (=0, 51.4%); coordinator-broker (=1, 18.5%); and no coordinator-broker on team (=2, 30.1%).

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

***p <.001 (two-tailed tests)

+p <.1

APPENDIX
TABLE A
Robustness Tests: Regression Coefficients Predicting Attribution of Coordinator-Broker

		MODEL TYPE:								Controls
Model #	Description of Model	Conditional (fixed-effects) logistic		Random effects logistic		HLM MLR		Logistic with two-way clustered SEs		
		b	SE	b	SE	b	SE	b	SE	
A1	Unconditional models of individual memo grade difference (*Xj-Xi*)	-0.21**	(0.08)	-0.14*	(0.06)	-0.16*	(0.08)	-0.14+	(.08)	No
A2	Models including only comparative whole network measures:									No
	Alter-ego has most discussion ties in whole network on team	0.45*	(0.18)	0.56**	(0.2)	0.85***	(0.25)	0.56+	(0.31)	No
	Alter-ego has most friendship ties in whole network on team	-0.05	(0.18)	-0.03	(0.2)	-0.12	(0.250)	-0.03	(0.29)	No
	Alter-ego has most group exp. ties in whole network on team	-0.06	(0.17)	-0.07	(0.18)	-0.04	(0.23)	-0.07	(0.28)	No
A3	Models including only comparative intra-team measures:									
	Alter-ego - ego discussion ties within team	0.01	(.064)	0.00	(.062)	0.02	(0.08)	0.01	(.08)	No
	Alter-ego - ego friendship ties within team	0.16*	(.066)	0.15*	(.062)	0.20**	(0.08)	0.15*	(.08)	No
	Alter-ego - ego group experience ties within team	-0.11	(.062)	-0.08	(.055)	-0.12+	(0.07)	-0.08	(.06)	No
A4	Models including only centrality measures:									
	Indegree alter-ego discussion ties	0.03***	(0.01)	0.02*	(0.01)	0.04***	(0.01)	0.02*	(0.01)	No
	Indegree alter-ego friendship ties	-0.01*	(0.00)	-0.01*	(0.00)	-0.01*	(0.01)	-0.01	(0.01)	No
	Indegree alter-ego group exp. Ties	0.00	(0.02)	0.00	(0.02)	0.01	(0.02)	-0.00	(0.03)	No
	Models includes main effects and interaction term between:	(interaction term)		(interaction term)		(interaction term)		(interaction term)		
A5	*Alter-ego - ego friendship ties within team * Alter-ego has most discussion ties in whole network on team*	0.00	(0.12)	0.04	(0.12)	0.05	(0.150)	0.04	(0.13)	No
A6	*Alter-ego - ego friendship ties within team * individual memo grade difference (Xj-Xi)*	0.00	(0.05)	0.01	(0.04)	0.02	(0.050)	0.02	(0.04)	No
A7	*Alter-ego - ego friendship ties within team * Indegree, discussion ties in whole network*	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	No

SOURCE: Unique data collected from three cohorts of first year master's degree students enrolled in an elite private university in the United States.

NOTE: FE denoted fixed-effects (conditional) regression; RE denotes random-effects regression. HLM MLR denotes hierarchical multinomial logistic Regression. Dependent variable for HLM MLR is a trichotomy: not coordinator-broker (=0, 51.4%); coordinator-broker (=1, 18.5%); and no coordinator-broker on team (=2, 30.1%).

* p <.05, ** p <.01 , ***p <.001 (two-tailed tests), +p <.1