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Differentiated cooperation and competition within teams

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DIFFERENTIATED COOPERATION AND COMPETITION WITHIN TEAMS

by

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CERTIFICATE OF APPROVAL

PH.D. THESIS

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ABSTRACT

My dissertation challenges the dominant situational theory developed by Deutsch (1949) that conceptualizes cooperation and competition as situational factors equally shape all team members' behaviors. Based on interdependence theory and social network techniques, I offer a configural theory that accounts for the complex, nonlinear patterns of within team cooperation and competition. Acknowledging the tension between team setting and conventional competition, I argue that within team competition is a restrained form of competition as its participants are bonded together by the team membership. Instead of competing for limited prizes or ranks that place individuals against each other, in typical team settings, team members compete for within team status. It has three dimensions, including demonstrating superiority over each team member on competence, participation and connection. I also argue that within team cooperation has three dimensions – sharing, helping and voicing that are directed towards each team member.

I developed and validated social network-based measures of within team cooperation and competition based on a student sample in Study 1. The theoretical factor structure was supported. I then tested the overall research model in a field sample in Study 2. Utilizing quadratic assignment procedures, I found that characteristics of each dyad, including dependence, similarity and liking, are able to influence the cooperative behaviors within the dyad. However, why within team competition is differentiated was less consistent with what I expected. The overall pattern of within team cooperation and competition, captured by three network indices, density (i.e., overall connectedness), centralization (i.e., tie distribution), and subgrouping (i.e., disconnection), did not predict team performance. Future research directions are discussed.

PUBLIC ABSTRACT

My dissertation challenges the dominant approach in prior research that conceptualizes team members as being either all collaborative with everyone else or all competitive with everyone else. Instead, I offer a social network-based theory that suggests team members' cooperative and competitive behaviors are differentiated across different pairs of individuals within teams. From this perspective, teams can have varying levels and distributions of cooperative and competitive behaviors going on among team members. I also formulate a novel conceptualization of within team competition by arguing that within team competition is a restrained form of competition, as its participants are bonded together by the team membership. Instead of competing for limited prizes or ranks that place individuals against each other, in typical team settings, team members compete for within team status. I developed and validated new measures of within team cooperation and competition, and found that characteristics of each pair of team members, such as dependence, similarity and liking, are able to influence how much they cooperate with each other. Why within team competition is differentiated was less consistent with what I expected. The overall pattern of within team cooperation and competition did not predict team performance. Future research directions are discussed.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Cooperation and competition are two major forms of how individuals relate the self to one or a few chosen others. In very general terms, cooperation refers to the attempts of maximizing the collective outcomes, while competition refers to the attempts of maximizing the difference with others in rivalry for supremacy or prize. Cooperation and competition are often conceptualized as products of social interdependence (Deutsch, 1949; Kelley & Thibaut, 1978; Johnson & Johnson, 1989). For cooperation or competition to occur, there must be more than one individual or entity involved, and the individuals or entities must be able to influence each other – the change in one's actions causes a change in others' outcomes. Cooperation and competition are thus major ingredients in team settings, where individuals are made socially interdependent with each other, and team outcomes are largely influenced by how team members interact with each other (Cohen & Bailey, 1997; Johnson & Johnson, 1989).

The major theoretical framework to study within team cooperation and competition is Deutsch (1949)'s situational theory of cooperation and competition. It defined cooperation as a goal structure where individuals' goals are positively related (i.e., your success is my success) and competition as negatively related (i.e., your failure is my success). Different goal structures shape different within team interaction patterns. Based on this theory, the dominant approach in the literature is to create a cooperative condition and a competitive condition by experimental manipulation, and then study differences across conditions in team processes and outcomes (see a review at Stanne, Johnson, & Johnson, 1999). For example, Beersma, Hollenbeck, Humphrey, Moon, Conlon, and Ilgen (2003) created a cooperative condition by offering the best team a reward split evenly among the team members. The

competitive condition, on the other hand, was created by reward the best several individuals no matter which team they were from. Tauer and Harackiewicz (2004)'s manipulation of competitive condition is to ask participants to independently complete an assigned task. At the conclusion of the study, participants were evaluated individually against an individual performance goal. In the cooperative condition, participants were asked to work in teams for the same assigned task and teams were evaluated against a team performance goal.

Although this situational approach advanced our understanding of cooperative and competitive teams, it is an oversimplification to theorize and operationalize cooperation and competition as equally distributed among team members. Even if the overall goal structure implies cooperation, such as when team members are rewarded equally, it's still possible that one individual will act cooperatively to one teammate but not to another. Failure to account for such differentiation may mask how exactly within team cooperation and competition influence team performance. For example, as shown in Figure 1, these two hypothetical teams have similar aggregated level of individual activities (e.g. both have four cooperative or four competitive relationships), but they have entirely different configurations of interaction patterns. Such configuration, however, represents the mechanism through which outcomes are achieved in teams. For example, viewing each line as a cooperative tie, the team on the left has a chain-shaped workflow, while the team on the right has a star-shaped workflow. The team on the right relies more on the team member noted by black dot than the team on the left. On the other hand, viewing each line as a competitive tie, competition in the left team is shared among team members, while competition in the right team is concentrated on one person. If the black dot is removed, the left team would still have considerable amount of competition but the right team would have no competition at all. All these within

team mechanisms cannot be discovered by a pure situational theory to cooperation and competition that only focuses on aggregate level of activities.

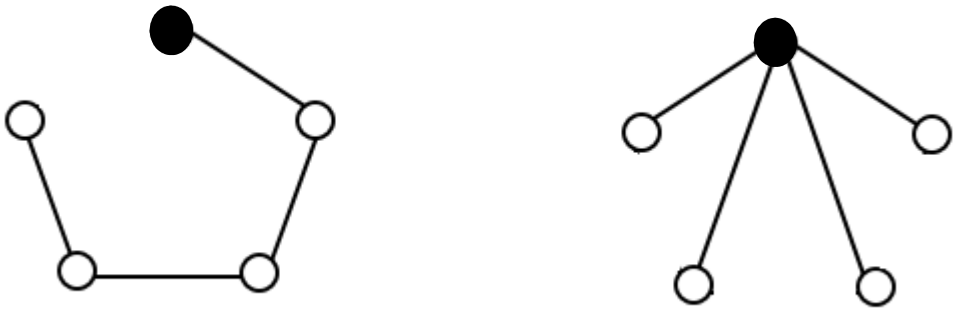


Figure 1. Configural view of within team cooperation (or competition).

As an alternative to a situational theory, I develop a differentiated model of within team cooperation and competition. My model is "differentiated" because I conceptualize cooperation and competition as individual behaviors that can vary from dyad to dyad. Within a team, one person must consider all other team members, one at a time. If a team has *n* team members, each team member is in *n-1* interaction dyads, representing his or her relationships with all other team members. I regard dyadic interactions as building blocks that constitute the foundation of within team cooperation and competition. Utilizing social network techniques, I map these target-specific behaviors into a cooperation network and a competition network, so that the cooperative or competitive behaviors from one focal individual (termed as *the ego*) to another team member (termed as *an alter*) forms one cooperative or competitive *tie*. By doing so, my model presents a configural view of each team's cooperation and competition.

Because within team cooperation and competition were often operationalized by manipulating external task or reward structure (Beersma et al., 2003; Garcia & Tor, 2007;

Tauer & Harackiewicz, 2004), behavioral content is not the research focus in most within team cooperation and competition studies. However, within team cooperation has been researched intensively on its own under various labels, such as coordination (Arrow, McGrath & Berdahl, 2000; Cannon-Bowers, Salas, & Converse, 1993; Rico, Sanchez-Manzenares, Gil, & Gibson, 2008; Tannenbaum, Beard & Salas, 1992), team action processes (Marks et al., 2001; Marks & Panzer, 2004; Porter, Hollenbeck, Ilgen, Ellis, West, & Moon, 2003), and team planning, exchange, and programming (Kraut & Streeter, 1995; March & Simon, 1958). I inductively integrate the prior literature into three categories of cooperative behavior: *sharing, helping, and voicing*.

On the other hand, the conceptualization of within team competition is less developed, because conventional competition based on win-lose relationships seems to be incompatible with most team contexts. Teams are different from a group of independent individuals, because there is positive social interdependence (e.g., goals, rewards, or tasks) among its members so that they can act as a "dynamic whole" (Mathieu, Maynard, Rapp, & Gilson, 2008; McGrath, 1984; Shaw, 1971). Because many contemporary work tasks are complex enough to require coordination among multiple individuals, teams have become a very common form to organize work activities (Cohen & Bailey, 1997). The definition of competition in the dominant situational theory, however, is a negatively interrelated goal structure among participants (Deutsch, 1949; Johnson & Johnson, 1989). It seems paradoxical to count on the team to complete a task together and, at the same time, have negatively interrelated goals among team members. This is probably why among the limited number of studies that examine within team competition (e.g., Beersma et al., 2003; Tauer & Harackiewicz, 2004), the shared team membership among participants of competition is

often deemphasized – team members are set against each other in ways implying there is no positive interdependence among them (i.e., manipulated as individualized tasks and rewards in lab). Therefore, further theoretical development of within team competition is very much needed.

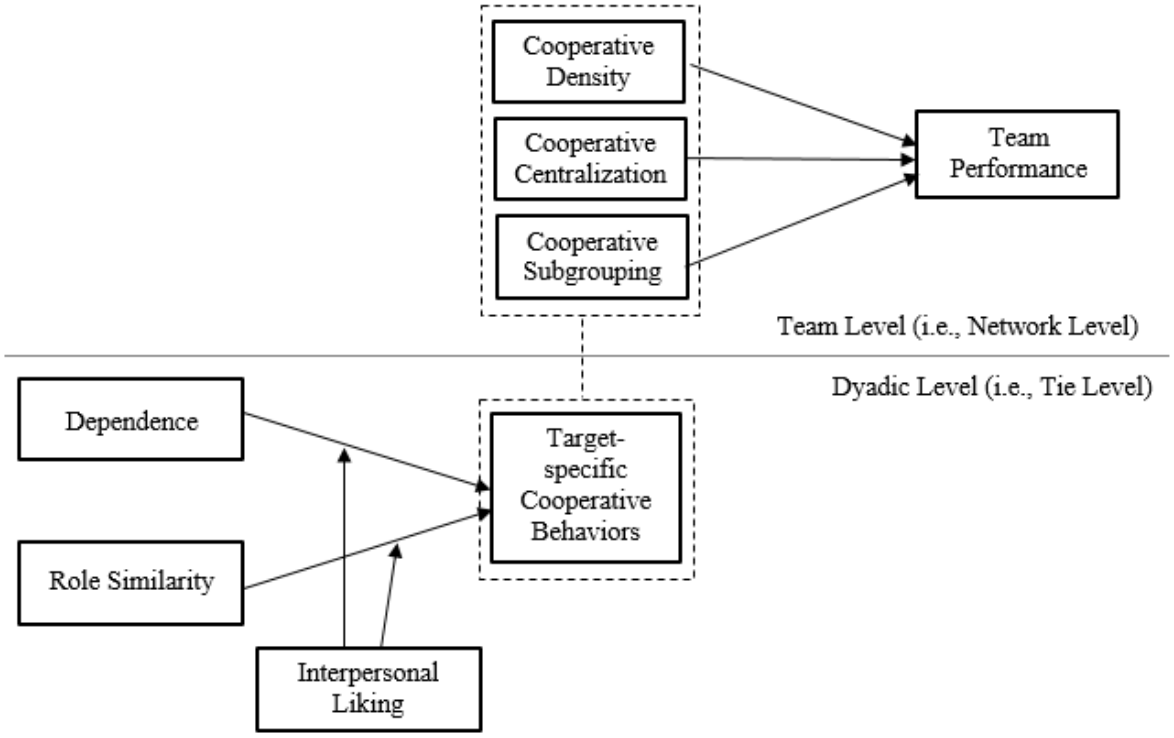
In this dissertation, I formulate a novel proposition that, in most team settings, the typical within team competition represents a *restrained* form of competition. Team members still compete, but such activities are restrained by their positive social interdependence. Unrestrained competition, opposition, or even hostility that sacrifices collective outcomes just for individual wins and losses still could occur. However, as will be discussed in more details in the next chapter, these are expected to be less common in team settings because they tend to be socially rejected and cannot be sustained over time without significantly hindering team goal pursuit and accomplishment. In addition, it's also important to note that some specific team set-ups, such as the starters-substitutes design in sports teams and orchestras, might encourage zero-sum competitive activities between members with similar expertise for one role (i.e., starting pitcher or first chair violin). However, such set-ups are rarely seen in business organizations. The conceptual domain I'm interested in, although doesn't cover the whole spectrum of within team competitive activities, is the typical within team competition that occurs within the bounds of social interdependencies among team members. Specifically, I argue that participants in typical within team competition compete for a socially enacted form of supremacy – within team status. Within team status is formed by collective judgment about where each team member deserves to rank in the team's social hierarchy (Berger, Chohen, & Zelditch, 1972). Recent theories and findings in status research suggested that individuals rise in status by enhancing their value in the eyes of fellow team

members (Anderson & Kilduff, 2009). Consistent with this rationale, I identify three behavioral dimensions of within team competition for status: outwardly conveying the ego's *competence* over the alter, demonstrating higher level of *participation* than the alter, and developing more within team *connections* than the alter. Such within team competitive activities have the potential to help, instead of hurt, team outcomes. At the same time, these behaviors increase the chance of an individual attaining higher status.

Having explained the configuration and the behavioral content of within team cooperation and competition, I then seek to explain why such differentiation would occur and how it influences team performance. To predict dyadic levels of competition and cooperation, I identify two antecedents – dependence and role similarity. According to interdependence theory (Kelley & Thibaut, 1978), individual behaviors in specific social contexts are determined by both the social structure they are placed in and the characteristics of the interaction partner in relation to the self. Dependence captures the former and role similarity captures the latter. Specifically, I focus on laying out the flow of tasks and rewards, and how similar the ego with the alter in roles, and expect individuals to rely on these existing social structures and individual characteristics to guide their actions. In addition to these instrumental (i.e., work) ties, I argue that expressive (i.e., non-work) ties also matter. I propose that the effects of dependence and role similarity are altered by interpersonal liking in each dyad. Within team cooperation and competition are differentiated because each dyad has unique dependence, role similarity and interpersonal liking.

To predict team performance, I use three commonly studied network indices to quantify how cooperative and competitive ties are distributed within each team. These indices include density that describes the overall connectedness, centralization that describes

the degree of uneven distribution, and subgrouping that describes disconnection or discontinuity (Crawford & LePine, 2013; Wasserman & Faust, 1994). These team network characteristics represent different aspects of network configuration of within team cooperation and competition. In the team level model, I investigate how these configurations of within team cooperation and competition influence team performance. The overall research model is presented in Figure 2.



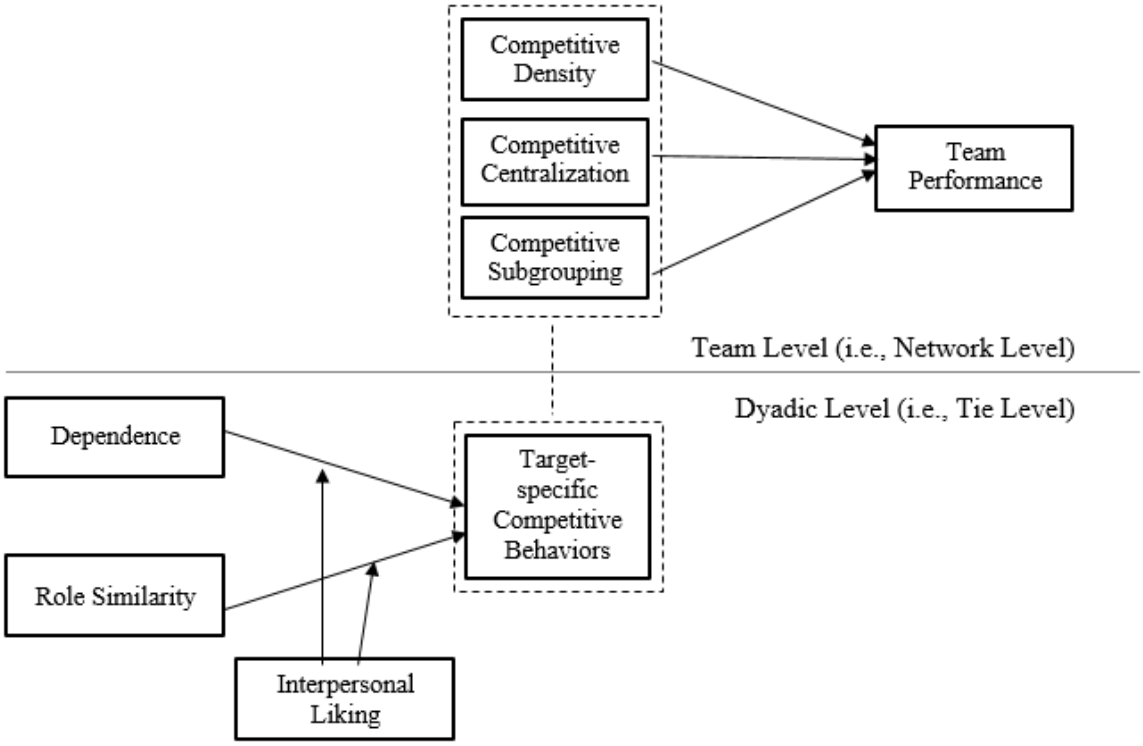


Figure 2. Overall conceptual model.

Note. Dashed paths denote emergence; solid paths denote theoretical paths.

Model Justification

First, consistent with prior work (Johnson & Johnson, 1989; Stanne et al., 1999), I conceptualize within team cooperation and competition as two separate constructs, rather than two end points of one continuum. In teams, an increase in cooperation doesn't necessarily lead to a decrease in competition. Similarly, at the dyadic level, when there is no cooperation between two individuals, it does not mean there is a competitive relationship between them.

Second, based on interdependence theory (Kelley & Thibaut, 1978), I argue that cooperation and competition are essentially dyadic phenomena instead of individual phenomena. This approach is more informative than a trait approach that treats cooperation and competition as stable individual differences, or motivational and attitudinal approach that treats cooperation and competition as predisposition to choose to act in a certain way (e.g., Helmreich, Beane, Lucker, & Spence, 1978; McClintock & Allison, 1989). The approaches used here suggest that cooperative and competitive behaviors are specific to relationships as embedded in their immediate interaction encounter. However, I acknowledge the importance of individual difference in shaping individuals' cooperative and competitive behaviors. As will be discussed in the method chapter, I control for individual personality to rule out this alternative explanation in my research model.

Third, I argue that differentiation of cooperative and competitive behaviors depends on the level of dependence and similarity of each pair of ego and alter. The choice of dependence and role similarity as dyadic antecedents is guided by interdependence theory, which argues that individual behaviors are influenced by both the situational structure the

ego and the alter are placed in, and the characteristics of the alter relative to the ego (Kelley & Thibaut, 1978). Dependence and similarity are able to capture these two different aspects. Specifically, dependence describes to what extent the ego's task and reward outcomes are controlled by the alter's action (Kelley & Thibaut, 1978; Rusbult & Van Lange, 2003). Role similarity, on the other hand, refers to the degree to which the ego and the alter have similar role with each other (Borgatti & Everett, 1993; Tesser, 1988; Tsui & O'Reilly, 1989). Dependence captures the formal aspect of why team members act cooperatively or competitively, because dependence in task and reward structure has specified desirable and undesirable behaviors towards each alter. On the other hand, similarity captures informal reasons to act cooperatively and competitively, as it represents how the ego interprets his or her relationship with the alter. Together dependence and role similarity influence target-specific differentiated within team cooperation and competition. In addition to these two work-related antecedents of within team cooperation and competition, I also argue that affective relationship between individuals, captured by interpersonal liking, is able to alter how dependence and role similarity influence within team cooperation and competition. Such addition is consistent with social network theories and findings that suggest network ties can be roughly divided into two broad categories, instrumental and expressive (Crawford, 2011; Lin, 2001; Poldony & Baron, 1997). Interpersonal liking is a typical expressive tie at workplace that provides a sense of identity, acceptance, and belonging; therefore is able to influence individual choice of cooperative and competitive behaviors.

Finally, according to Marks, Mathieu and Zaccaro (2001), team process is defined as "members' interdependent acts that convert inputs to outcomes through cognitive, verbal, and behavioral activities directed toward organizing taskwork to achieve collective goals" (p.357).

The traditional method of measuring team process is to ask each member his or her own perceptions of team processes. If their perceptions converge at the team level (e.g., meeting thresholds of ICC1, ICC2, and Rwg), the mean score of team members' perceptions is used to represent the overall team process. Very recently, the development of social network approach has innovated the way of conceptualizing and measuring team processes. Crawford and LePine (2013) argue that team-level social network indices, such as density, centralization and subgrouping, provide a configural view of how team members interact with each other. Specifically, density describes the extent to which all members are connected with each other (see an illustration in Figure 3), centralization refers to the extent to which connections in the team are concentrated to a small number of individuals (see an illustration in Figure 4), and subgrouping refers to the discontinuity or the disconnection of the tie distribution within the team (see an illustration in Figure 5). Such social network approach relaxes the uniformity and linearity assumptions among team member interactions and convergence requirement of lower level constructs at higher level. Therefore, the rich information at dyadic level is not lost in the process of emergence.

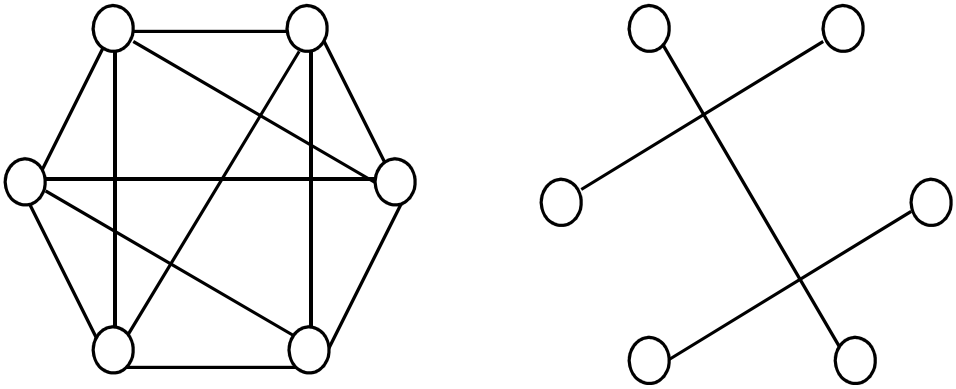


Figure 3. Hypothetical teams in high and low density.

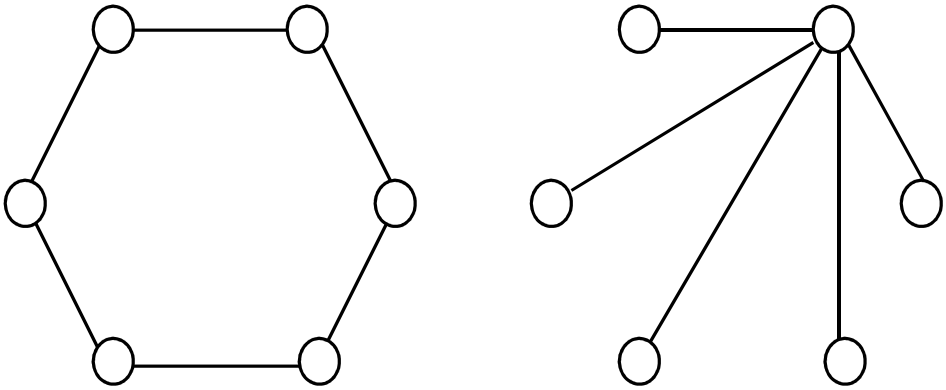


Figure 4. Hypothetical teams in high and low centralization.

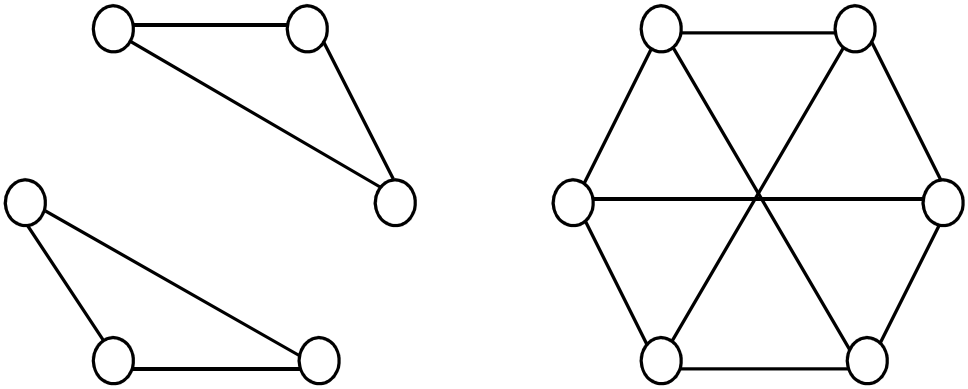


Figure 5. Hypothetical teams in high and low subgrouping.

Theoretical Contribution

My dissertation attempts to make several important theoretical contributions. First, the differentiated theory of within team cooperation and competition uncovers the essence of cooperation and competition in team setting. Despite the large number of empirical studies published on cooperation and competition, the theoretical development is severely lacking (Kilduff, Elfenbein, & Staw, 2010; Stanne et al., 1999). So far, the limited theoretical attempts about cooperation and competition are purely situational, such as examining how individuals' goals (i.e., outcome interdependence; Deutsch, 1949) or actions (i.e., means interdependence; Johnson & Johnson, 1989) are related to each other. My configural approach represents a significant departure from studies rely on situational theory (e.g., Alper, Tjosvold, & Law, 1998; Beersma et al., 2003; He, Baruch, & Lin, forthcoming; Tauer & Harackiewicz, 2004). Drawing from interdependence theory (Kelley & Thibaut, 1978), my dissertation regards target-specific cooperative and competitive behaviors as the foundations for team cooperative and competitive dynamics and examines how the ego's cooperative and competitive behaviors differentiate across all other alters. In other words, cooperation and competition are not determined top-down, but bottom-up (Kozlowski & Klein, 2000).

Second, within team competition has received far less research attention than within team cooperation. Many important research streams, such as team processes (e.g., Marks et al., 2001), team cognitions (e.g., Mohammed, Ferzandi, & Hamilton, 2010) and emergent states (e.g., Stajkovic, Lee, & Nyberg, 2009), are all cooperation-based concepts. There are a couple of studies about intergroup competition (e.g., Baer, Leenders, Oldham, & Vadera, 2010; Erev, Borstein, & Galili, 1993; Kilduff et al., 2010), but very little has been published on within team competition. As discussed in the introduction chapter, a handful of studies

(e.g., Beersma et al., 2003; Tauer & Harackiewicz, 2004) manipulated within team competition in lab, but these manipulations simply assigned individualized task or awards to participants and did not account for the positive social interdependence among within team competition participants. I argue that within team competition is a restrained form of competition. Unlike conventional competition that competes for limited rewards or higher performance ranks, in typical team settings, within team competition involves competing for within team status. The present dissertation, hence, is perhaps one of the only attempts to conceptualize the nature of within team competition and it has meaningful implications for managing real teams.

Third, my dissertation also identifies specific behaviors of cooperation and competition within teams. Since situational theory of cooperation and competition has dominated the literature in the past decades, the specific forms of cooperative and competitive behaviors are still unclear. To advance future field research on this topic, I develop a theory-driven short scale of cooperative and competitive behaviors that can be used in team and social network research. I validate a three-dimensional within team cooperation (i.e., sharing, helping and voicing) and three-dimensional within team competition (i.e., outperforming others in competence, participation and connection).

Fourth, my dissertation also explains why within team cooperation and competition are differentiated. Differentiation at the dyadic level should be explained by antecedents at dyadic level. Following interdependence theory (Kelley & Thibaut, 1978), I identify two antecedents of such differentiation, dependence and similarity of each ego-alter pair. Dependence, which refers to task and reward structure that prescribe interrelationships among team members, captures the situational and formal reasons, while similarity, which

describes to what degree the ego and the alter are similar in demographic and role variables, captures interpersonal and informal reasons. In addition to these instrumental factors, I also argue that the effects of these antecedents are essentially individual choice, and thus are also subject to expressive factors. Interpersonal liking is able to alter the effects of dependence and role similarity. Together, these represent a reasonably complete picture of why individuals act cooperatively and/or competitively to their team members.

Finally, utilizing social network techniques, I construct cooperation network and competition network based on target-specific cooperative and competitive behaviors at dyadic level. Then, I use density, centralization, and subgrouping to quantify different aspects of within team cooperation and competition configuration. It goes beyond traditional compositional approach (Chan, 1998) that ignores the complex interaction patterns among team members, and shifts to a compilational approach (Kozlowski & Klein, 2000). Thus, the test of how network configurations, density, centralization and subgrouping, influence team performance adds to the recent trend of using network configurations, instead of mean scores of team processes, to predict team performance.

LITERATURE REVIEW

Overview of Cooperation and Competition Research

Deutsch (1949)'s theory defined cooperation and competition as two structures that are characterized by situational factors and can be manipulated externally. Individuals are motivated to seek an outcome that is beneficial to those he or she is cooperatively linked, and seek an outcome that is beneficial to the self but not to those he or she is competitively linked. Since the formulation of Deutsch (1949)'s theory, a lot of empirical studies have been published during 1950s-1980s to compare cooperative teams and competitive teams (mostly in laboratory settings). Cooperation is often manipulated by positively related task structure or team-based reward structure, while competition is often manipulated by negative related task structure or individual-based reward structure. The main conclusion of this line of research is cooperative teams are superior to competitive teams. Johnson, Maruyama, Johnson, Nelson, & Skon (1981)'s meta-analysis included more than 100 studies published between 1924 and 1980 that compared the relative effectiveness of cooperation and competition. They found that (1) cooperation is significantly more effective than competition (ΔM = 0.78); (2) cooperation is significantly more effective than individualized settings (ΔM = 0.78); (3) there is no significant difference between competition and individualized settings (ΔM = 0.03). Their moderation analysis showed that these conclusions are very robust, valid across different age groups, task types and team sizes.

Johnson and Johnson (1989) is an important theoretical extension of Deutsch (1949). This theory aims to resolve the controversy of whether competition is effective or not, as anecdotal evidence of the benefits of competition is much more persuasive than the empirical evidence. Agreeing with Deutsch, they argue that negative goal structure (termed as outcome

interdependence in their theory) is still essential for competition to occur. Additionally, Johnson and Johnson (1989) make a distinction between zero-sum competition and appropriate competition. The negative outcome interdependence is structured so strongly in zero-sum competition that winning and defeating everyone else is the most important aspect of the situation. In contrast, appropriate competition has weaker negative outcome interdependence than zero-sum competition. They posit that appropriate competition should meet four criteria: (1) winning is relatively unimportant, (2) all participants have reasonable chance to win, (3) rules and criteria for winning are clearly stated, and (4) participants are able to monitor each other's performance.

Following this theoretical rationale, Stanne et al. (1999) conducted a meta-analysis specifically on motor skill performance. They divided competition into zero-sum, appropriate, and unclear (i.e., the primary studies that didn't describe clearly how competition is structured). With the hope of showing appropriate competition is more efficient than cooperation on motor skill performance, they once again replicated the finding in Johnson et al. (1981) that cooperation is always more effective than competition. They just found that the difference between cooperation and zero-sum or unclear competition is substantially larger than the difference between cooperation and appropriate competition. Two meta-analyses, Johnson et al. (1981) and Stanne et al. (1999), with almost a 20 year gap between them, documented the same finding, suggesting robustness. It's also worthy to note that, in a later empirical study by Tjosvold, Johnson, Johnson, and Sun (2003), the four conditions of appropriate competition identified in Johnson and Johnson (1989) only received weak empirical support. The only solid finding was fairness is related to appropriate competition. Thus, a further development of the nature of competition is still warranted.

Since 2000s, very little research has been published on the topic of cooperation and competition. One of a few exceptions, Beersma et al. (2003) manipulated competitive reward structure and cooperative reward structure, and found that competitive teams have higher speed while cooperative teams have higher accuracy on completing assigned tasks. Johnson, Hollenbeck, Humphrey, Ilgen, Jundt, and Meyer (2006) developed a concept called "asymmetric adaptability" as they found it's much more difficult for teams switching from competitive to cooperative reward structure than the other way round. Tauer and Harackiewicz (2004) refuted the previous finding that competition is harmful for one's intrinsic motivation (Deci, Betley, Kahle, Abrams, & Porac, 1981; Reeve & Deci, 1996), and found instead that intergroup competition has a strong positive effect on enjoyment. Maruyama and Elliot (2012) used both meta-analytic and primary empirical studies to show that the inconclusive relationship between competition and performance can be attributed to two opposing mediating mechanisms, performance approach goals and performance avoidance goals.

These studies are all interesting and advanced our understanding on this topic, however, all of them relied on the traditional situational approach to cooperation and competition. As noted in several different time points in the history of cooperation and competition research (Deutsch, 1949; Johnson & Johnson, 1989; Stanne et al., 1999), despite the large number of empirical studies, the theoretical development of cooperation and competition is severely inadequate. Our understanding about cooperation and competition is indeed not significantly different from half a century ago.

As a concluding remark, cooperation and competition research was once vigorous, but perhaps due to a saturation of knowledge, or the trend in team research to use more field

data, this research line has substantially slowed down since 2000s. The primary focus of past research was to examine the relative efficiency of cooperative teams and competitive teams. However, the sole reliance on situational theory has limited the advancement of cooperation and competition research. With a goal of understanding the nature of cooperation and competition within teams, particularly those operating in naturalistic settings, I provide a thorough review of within team cooperation and competition in the sections below.

Within Team Cooperation

Within team cooperation is a prevalent concept in contemporary team research. It has been developed independently of the cooperation and competition research reviewed above, especially since 2000s. It is often treated as a team process, which refers to team members' interdependent action to get things done in teams (LePine, Piccolo, Jackson, Mathieu, & Saul, 2008; Marks et al., 2001; Mathieu et al., 2008). The team process literature has been dominated by concepts that are highly relevant to within team cooperation, such as coordination, planning, programming, and action phase (see reviews at Cohen & Bailey, 1997; Gist, Locke, & Taylor, 1987; Guzzo & Shea, 1992; Ilgen, Hollenbeck, Johnson, & Jundt, 2005; Marks et al., 2001).

My theoretical approach to within team cooperation builds on theories and findings in the literature of team process, but it has three key differences. First, the prior literature often used the team as the referent – asking team members to rate their perceptions of how the team functions as a whole. In such rating processes, employees' perceptions of the "whole" are based on their own information processing of many different "parts". However, information processing rules of how these "parts" are aggregated into the "whole" are

complex and idiosyncratic (Hinsz, Tindale, & Vollrath, 1997). For example, it's possible that person A observed an intense competitive relationship between person B and C. Such impression is so strong that person A concluded that his or her team, even if the team is composed of ten other non-competitive relationships, is highly competitive. From person D's perspective, ten other non-competitive relationships are perhaps more salient than the one competitive relationship. Such aggregation rules used by different people are difficult to quantify, and they are often buried in the rating process of survey items. The configural approach I used, alternatively, uses dyad as the referent – asking team members to rate their behaviors towards all other team members. Thus, the perception of the "whole" is not governed by team members' idiosyncratic information processing rules, but is derived from a network configuration based on everybody's ratings about everybody else.

Second, the most common operationalization of team processes is, team members are asked to rate their perceptions of how the team works together, and then their answers are aggregated, after justification (e.g., meeting the threshold of ICC and Rwg), into a team level score. As discussed in the introduction chapter, the complex, nonlinear, and unevenly distributed cooperative behaviors within the team cannot be accounted for by this approach (Crawford & LePine, 2013; Kozlowski & Klein, 2000). Instead of using simple arithmetical aggregation, I construct a cooperation network based on team members' differentiated behaviors at dyadic level, and then use three commonly studied network indices, density, centralization, and subgrouping, to quantify different aspects of the network configuration. This approach does not assume the commonality among lower level phenomena, allows them to differ from each other, and directly accounts for how complex interaction patterns are distributed within the team.

Third, in order to construct the proposed cooperation network, it's necessary to identify specific behaviors of how individuals cooperate with each other that constitute the content of each cooperative tie. My approach is slightly different from most of the existing studies that adopts social network approach for within team cooperation (e.g., Brass, 1984; Li, Zhao, Walter, Zhang, & Yu, 2015; Sparrowe, Liden, Wayne, & Kraimer, 2001). The previous research often asked the participants to describe the role – whether the alter is an input provider or an output receiver to the alter, while the tie in the cooperation network I proposed is behavioral in nature. In Table 1, with the purpose of reasonably covering the whole spectrum of cooperative behaviors, I collected a list of similar constructs in the literature on the basis of several comprehensive reviews on team research, such as Cohen and Bailey (1997), Mathieu, Maynard, Rapp and Gilson (2008), and Ilgen, Hollenbeck, Johnson and Jundt (2005). Please note that this list intends to only cover interpersonal behaviors, and didn't include how team members act towards goals, tasks, and external environment (e.g., monitoring progress towards goals, systems monitoring, strategy formulation etc.). I then inductively summarize relevant team process literature into three major behavioral categories, sharing, helping and voicing.

Table 1

Relevant Constructs with Within Team Cooperation

Constructs	Definition	Sample Study
Communication	Active information exchange and information sharing among team members.	Dickinson & McIntyre (1997)
Constructive Controversy	Open and productive discussion of opposition ideas, positions, information, opinions, and perspectives to solve a problem and reach a decision.	Tjosvold, Wedley, & Field (1986)
Creative Process Engagement	Employee involvement in creativity-related methods or processes, such as problem identification, information searching and coding, and idea and alternative generation.	Zhang & Bartol (2010)
Information Sharing	Communication process through which team members collectively utilize their available informational resources, such as work-related information exchange, keep one another updated of activities and key developments.	Bunderson & Sutcliffe (2002)
Knowledge Sharing	Sharing work-related knowlegde to other team members, such as work reports, documents, know-how, know-where, and know-whom.	Cummings (2004)
Monitoring and Backup	Assistance among team members that include providing verbal feedback, coaching, helping, or completing a teammate's tasks.	Marks & Penzer (2004)
OCB Behavioral Norm	The level of OCB that is viewed as typical within the team, which serves for guidelines for acceptable and unacceptable behaviors that are informally agreed within the team.	Ehrhart & Naumann (2004)
Team Altruism	Interdependent and voluntary actions that aim to benefit teammates, such as coordinating specific helping and problem-solving behaviors towards a teammate in need	Li, Kirkman, & Porter (2014)
Team Learning Behaviors	Obtaining and processing data to improve and adapte, such as seeking feedback, sharing information, asking for help, and trial and error.	Edmonson (1999)
Team OCB	Overall discretionary behaviors that intend to promote the efficient and effective functionsing of the organization, which is often operationalized as averaged individual citizenship behaviors.	Podsakoff, Ahearne, & MacKenzie (1997)

Sharing refers to the ego's behaviors to share his or her knowledge and resources with the alter (Cummings, 2004; Wang & Noe, 2010). It indicates the channels through which knowledge and resources are transferred within the team. It has been shown that collective sharing process serves as a mediator between many important team inputs and team outputs (e.g., Hirschfeld, Jordan, Feild, Giles, & Armenakis, 2006; Lin, 2010; Reagans, Argote, & Brooks, 2005; Siemsen, Balasubramanian, & Roth, 2007; Srivastava, Bartol, & Locke, 2006). Helping and voicing are not only valued outcomes of the team's collective citizenship behaviors (e.g., Li, Kirkman & Porter, 2014; Pearce & Herbik, 2004; Yun, Cox, Sims, & Salam, 2007), but also important team processes that demonstrate the team's ability to adapt to changing demands (e.g., Barrick et al., 1998; Bijlsma-Frankema, de Jong, & van de Bunt, 2008; Marks et al., 2001; Marks & Panzer, 2004; Porter, 2005). Though helping, the ego's efforts in assisting the performance of the alter, and voicing, the ego's vocal suggestions to troubleshoot and improve the alter's performance, the team is able to better adapt to changing demands and thus achieve better team outcomes.

As a summary, within team cooperation has been well studied in team research. In reviewing this rich literature, I inductively identify three major cooperative behaviors, sharing, helping, and voicing, and argue that the ego's cooperative behaviors varies from one alter to another. Sharing, helping and voicing are all actions to promote the collective outcomes through enhancing the alter's outcomes. Together they capture three different yet related behavioral aspects that an ego can behave cooperatively in a team.

Within Team Competition

Contrary to within team cooperation, little research has examined the nature of within

team competition, which perhaps could be attributed to the inherent tension between team settings and competitive activities. Team is often used in organizations because most tasks are beyond individualized efforts and thus require the collective work of a group of individuals. By definition, most teams, if not all, share a common goal and operate on a cooperative basis (Cohen & Bailey, 1997). However, this design doesn't necessarily eliminate competition among team members, but adds an extra layer of complexity to how team members compete with each other.

Specifically, within team competition is distinct from conventional interindividual or intergroup competition, as its participants are bonded by the same team membership. Such bond restrains competition. Conventional competition often focused on how individuals compete for the largest share in a limited size of reward (e.g., Beersma et al., 2003; Garcia & Tor, 2007) or compete for the highest rank in a contest (e.g., Kilduff et al., 2010; Tauer & Harackiewicz, 2004). These studies are almost all based on experimenter-controlled conditions or population groups (e.g., athletes or sports teams) that are meant to be against each other. I conjecture that these conventional competitive relationships are unlikely to occur in typical, real team settings. There is ample evidence to support this claim. According to the compensation literature, team-based pay has been increasingly used in organizations (to match with the design of teams as primary work units), thus leveling incentives paid across members in a team (Balkin & Montemayor, 2000; DeMatteo, Eby, & Sundstrom, 1998). Although performance-based pay is found to be effective in promoting individual performance, most organizations still offer a largely compressed pay structure to minimize social comparison costs (Nickerson & Zenger, 2008; Zenger, 1992). Similarly, the forced rank performance rating system, which ranks employees from the best to the worst, was once

popular among some larger corporations but quickly received severe criticism and even lead to lawsuit, as it could be easily abused (Grote, 2005). Thus, formal competitive structures that place employees against each other seem to be unpopular in the real teams, but even informal competitive behaviors defined in situational theory are not considered as desirable. Due to the presence of various control mechanisms in team setting (e.g., team members are monitored by a team supervisor or by each other; Barker, 1993; Marks & Panzer, 2004; Ouchi, 1979), a person is generally not encouraged to jeopardize the collective outcomes in attempting to defeat a particular teammate. As a matter of fact, research has shown that hypercompetitive behaviors by force and aggression are socially punished by team members (Anderson, Srivastava, Beer, Spataro, & Chatman, 2006; Ridgeway & Diekema, 1989). Therefore, it seems that teams have no good reasons to and indeed did not encourage conventional competitive behaviors among team members.

An intriguing question is, if a more competent member cannot be recognized either by more rewards or higher performance ranks, why would he or she be willing to commit or even stay? The prediction of equity theory would be that individuals are unmotivated or tend to self- select themselves to a team of competence homogeneity, so that they don't feel undercompensated when working with less competent but similarly recognized teammates (Adams, 1963). Although direct investigation of this issue is unavailable, many broader empirical findings do not seem to support this prediction. For example, meta-analysis has documented that more competent individuals are also more committed (Thomas, Whitman, & Chockalingam, 2010). Shaw and Gupta (2007)'s large scale empirical study found a close to zero and statistically insignificant correlation between pay dispersion and good performance quits, a relationship that would be negative if high performers left organizations

that do not pay them differentially. These results suggested that the majority of the good performers indeed stay and commit even if they are not formally recognized. To solve this puzzle, I formulate a novel proposition that these competent members commit to compete for within team status.

Within team status refers to a socially formed order of team members' prominence, respect, and influence (Anderson & Kilduff, 2009; Berger, Cohen, & Zelditch, 1972). The evaluation of within team status involves some degree of implicit consensus about how individuals are informally ranked within a team, but such hierarchy is less coercive than reward distribution and performance ranks. Striving for status is a fundamental need of human beings (Barrick, Mount, & Li, 2013). Even without formal recognition, individuals are still motivated to compete for within team status. High within team status is also worthy to compete for, as it's socially, materially and psychologically rewarding (Anderson & Kennedy, forthcoming; Blau, 1964; Berger et al., 1972; Halevy, Chou, & Galinsky, 2011; Van Vugt, Hogan, & Kaiser, 2008). Specifically, high status individuals tend to have disproportionate control over the group decision making, are able to direct other team members' actions, receive higher regard and admiration, and have better access to valued resources in the team.

Now, I will discuss the specific forms of within team competition[1]. To start with, a head to head relationship is fundamental to within team competition. Kilduff et al. (2010) refers to such relationship as a "psychological rivalry", where the alter has to be a salient referent for competition in the eyes of the ego. In other words, there has to be a specific

[1] For simplicity, I focus my argument on a unilateral, two-party competition (i.e., from the ego to the alter), but multiple-party competition and bilateral competition are also likely to occur and could be easily captured by the present configural approach.

target for a competitive relationship to occur, as competition, including within team competition, is essentially socially constructed activities (Kelly & Thibaut, 1978; Kulik & Ambrose, 1992).

Drawing from within team status literature (Anderson & Kilduff, 2010; Berger et al., 1972), I identify three major categories of target-specific competitive behaviors for higher within team status. The first type is to outwardly convey the ego's competence is superior to the alter's competence. The competence argument is the central tenet in functionalist perspective of status (Berger et al., 1972), and it has received massive empirical support (see a review at Anderson & Kennedy, in press; Driskell & Mullen, 1990). To compete for higher within team status, one must exhibit superior competence that apparently contributes to the team's success.

The second type of behavior is also consistent with functionalist perspective, which describes the competitive behaviors that demonstrate the superiority of one's participation over the target's. Recent studies have confirmed that high level of participation, especially when beyond one's in-role performance requirement, enhances within team status. Participation seems to be a counterintuitive dimension for within team competition, as it has some "cooperative appeal". However, I believe that participation could serve as a mean for individuals to stay competitive in a team. For example, Flynn, Reagans, Amanatullah and Ames (2006) found that individuals motivated by high within team status offered more and sought less from fellow team members. Willer (2009) showed that individuals' extra contributions are rewarded by higher within team status. One even more direct evidence is Hardy and Van Vugt (2006), in testing their competitive altruism hypothesis, they found that individuals compete with each other for generosity and altruism in contexts of social

dilemma. When the competing mechanism is removed, the level of altruistic behaviors reduces significantly.

Third, the ego also competes for the superiority of connections with other team members over the alter. According to Anderson and Shirako (2008), social connections serve as channels to make individuals' competence and participation visible to the rest of the team. The attempts of building social connections within the team are more direct attempts of competing for within team status.

Taken together, I argue that within team competition is distinct from conventional competition, as its participants are bonded by the same team membership. Instead of competing for limited rewards or performance ranks, within team competition involves competing for within team status. Specifically, within team competition include competitive behaviors to show superiority over a target on competence, participation, and connection. A political election metaphor used in Anderson and Kennedy (in press) seems to be consistent with this proposition. Just as political candidates must compete with each other through convincing voters they are right for the job, team members also compete with each other for high within team status through behaviors that show superior competence, participation and connections, attempting to convince their fellow team members that they are valuable to the team.

THEORY AND HYPOTHESIS DEVELOPMENT

Interdependence Theory

In the present dissertation, I primarily rely on interdependence theory (Kelley & Thibaut, 1978) to guide my model specification. Interdependence theory is a theory at dyadic level that emphasizes two factors: interaction between the ego and the alter (I) and the specific social situation in which their interaction transpires (S) (Holmes, 2002; Rusbult & Van Lange, 2003). Factor (I) is a situation-based analysis of the ego's characteristics in relation to the alter's characteristics. What of interest is not the reliability of the ego's behaviors across different situations (i.e., as a form of individual difference), but his or her behaviors in a specific social situation and with a specific alter. Factor (S) sets the context for factor (I) to occur, and at the same time, factor (S) is also subject to the transformation process in factor (I). Transformation process means the ego and the alter take interests, preferences, and motives of the self and the other into consideration, and transform the given "gut level" situation into an effective situation that eventually determine their behaviors. For example, John and Mary belong to the same team but they had different views about how to move forward on a specific task. This constitutes the *given situation.* Then, they engage in a transformation process that attempts to explain their own preferences, seek to understand the other person's characteristics, analyze relationship-based motives, and engage in information seeking behaviors to better understand the social situation. After the transformation process, the given situation is transformed into an *effective situation*. John decides that Mary's opinion is more important than his own, and he determines his cooperative and competitive behaviors based on this effective situation. The key insights of this theory are (1) dyads are the building blocks of team dynamics, and (2) interpersonal interaction is subject to the

dynamics between the people and the situation.

Consistent with this theoretical logic, my research model uses dyadic cooperative and competitive behaviors as the building blocks for team cooperative and competitive dynamics. Such configural approach accounts for an important fact that is often overlooked by previous team research – the differentiation of within team cooperation and competition. In order to better understand factors that lead to this differentiation, I hypothesize two sets of dyadic antecedents, dependence and role similarity. According to the interdependence theory (Kelley & Thibaut, 1978), individual behaviors are shaped by both the social structure the ego and the alter are placed in and the specific characteristics of the alter in relation to the ego. Dependence is able to capture the social structure and similarity is able to capture the relative ego-alter characteristics. Together dependence and similarity cover formal and informal reasons to act cooperatively or competitively. In addition, interpersonal liking in this ego-alter pair is able to alter the effects of dependence and role similarity, because instrumental and expressive factors are both relevant in determining the appropriate actions to an alter.

Dyadic Level Hypothesis: Dependence Argument

The general prediction about dependence is, when the ego is dependent on the alter, the ego is more likely to cooperate and less likely to compete with him or her. Dependence, as a key concept in interdependence theory (Kelley & Thibaut, 1978), describes the degree to which the ego relies on the alter in their interaction (i.e., the ego's outcomes are influenced by the alter's actions).

There are two major facets in interpersonal dependence that are most relevant to team

settings: task and reward dependence. As reviewed earlier, task and reward structures are frequently studied in cooperation and competition research. However, previous studies (e.g., Beersma et al., 2003; Garcia, Tor, & Gonzalez, 2006; Garcia & Tor, 2007; Kilduff et al., 2010; Tauer & Harackiewicz, 2004) are almost always based on an oversimplified situational approach, in which task and reward structures are manipulated or coded externally, or are measured as team-level constructs. The clear limitation of this approach is, even if the overall task or reward structure is interdependent, one person may not necessarily depend on everyone else to accomplish tasks or to receive rewards. Such differentiation can only be captured by dyadic level conceptualization and measurement.

Furthermore, Brass (1984) argues that organizational structure does not simply result from formally prescribed roles and positions, but from how team members act upon formal structures and informally modify the prescribed workflow within the team. These two structures (i.e., prescribed and emerged) are likely to overlap. However, when they are not, what influences the team dynamics and performance is not the formally enforced structure but the emerged pattern of interpersonal interaction[2]. Thus, following prior team social network research (Brass, 1984; Li et al., forthcoming; Sparrowe et al., 2001), I capture task and reward dependence at the dyadic level by constructing corresponding team social network. Each team member indicates his or her dyadic relationship with all other team members, such as whether the ego depends on the alter to get work done (i.e., task dependence) and whether the ego depends on the alter to get rewarded (i.e., reward dependence). It's also important to note that the direction of dependence is important. The ego's cooperative and competitive behaviors are likely to occur when the ego depends on the

[2] I suspect that reward dependence tends to have smaller degree of differentiation and higher level of agreement than task dependence in terms of such differentiation, because reward dependence is often structured more formally than task dependence in a team.

alter, rather than when the alter depends on the ego.

According to interdependence theory (Kelley & Thibaut, 1978), when the ego's dependence on the alter is high, he or she is motivated to engage in cooperative behaviors towards the alter. The ego tends to maximize the joint outcomes because his or her task and reward are contingent on the alter. As conceptualized above, the specific forms of interpersonal cooperative behaviors include helping, voicing and sharing. As found in Carson, Tesluk and Marrone (2007), individuals tend to exhibit higher level of cooperation when they received instrumental help from their teammates. Similarly, the ego is also less likely to engage in competitive behaviors towards the alter, including outperforming the alter on apparent competence, participation, and connections. In a structure of high dependence, any behaviors to maximize the relative difference with the alter are undesirable as the ego and the alter's task or reward outcomes are tied together. Thus, I formulate the first set of dyadic level hypotheses as:

Hypothesis 1: Dependence is positively related to cooperative behaviors.

Hypothesis 2: Dependence is negatively related to competitive behaviors.

Dyadic Level Hypothesis: Role Similarity Argument

Role similarity describes the degree to which the ego and the alter contribute to the team in a similar way. I propose that when the ego and the alter have similar roles in the team, they are likely to cooperate with each other. Although direct evidence on role similarity is still rare, the theoretical mechanisms underlying this effect is consistent with arguments in similarity-attraction paradigm, such as interpersonal attraction, high frequency of interaction, and high value attached to the social category that the self belongs to (e.g., Bryne, 1971;

Ferris, Judge, Rowland, & Fitzgibbons, 1994; Goldberg, 2005; Heider, 1946). For example, if two team members are both specialized in computing skills, cooperative behaviors are likely to occur because they understand each other's language and skillset.

Interestingly, high role similarity also poses a threat to the ego's self-identity, which in turn fuels competitive behaviors. Similarity is a core concept in a number of competition-related theories. For example, social comparison theory suggests that individuals are likely to compare themselves with a similar referent, and unsatisfied results of such comparison could lead to competitive behaviors (Festinger, 1954; Goethals & Darley, 1977). Self-maintenance model argues that being outperformed by a person that one identifies with is more threatening than being outperformed by a stranger (Tesser, 1988). In supporting their psychological theory of rivalry, Kilduff et al. (2010) provides direct empirical evidence that that two university basketball teams are more likely to form a rivalry relationship if they are high in geographic, basketball status, and university characteristics similarity. Using a similar example as above, two team members who are good at computing skills are more likely to compete together, because they are readily comparable. Thus, I hypothesize that the ego is more likely to both cooperate and compete with an alter with a similar role:

Hypothesis 3: Role similarity is positively related to cooperative behaviors.

Hypothesis 4: Role similarity is positively related to competitive behaviors.

Dyadic Level Hypothesis: Interpersonal Liking Argument

Interpersonal liking describes the general affective tie between the ego and the alter. It is similar with yet broader than friendship tie (Krackhardt & Kilduff, 1999). It implies acceptance, identification, and a sense of belonging. For dependence argument, the

moderating role of interpersonal liking is quite straightforward. When interpersonal liking tie is strong, dependent ego-alter pairs are more motivated to cooperate and less motivated to compete than when liking is weak. Instrumental force and expressive force interactively influence the choice of cooperative and competitive behaviors. Therefore, liking strengthens the positive relationship between dependence and cooperative behaviors (making the main effect more positive) and weakens the negative relationship between dependence and competitive behaviors (making the main effect less negative).

For role similarity argument, it was predicted that high role similarity is positively related to both cooperative and competitive behaviors. Interpersonal liking serves as the moderator that helps distinguish these two paths. When interpersonal liking is high, the ego is more likely to engage in cooperative behaviors towards the alter with a similar role. The main effect is strengthened (i.e., more positive). On the other hand, the ego is more likely to act competitively when interpersonal liking is low. The main effect is weakened (i.e., less positive). This is because the strong affective bond between the ego and the alter further enhances the similarity-attraction effect (Bryne, 1971; Heider, 1946). To better illustrate, I plotted the hypothesized moderation effects in the figures below. Each of them corresponds to one hypothesis.

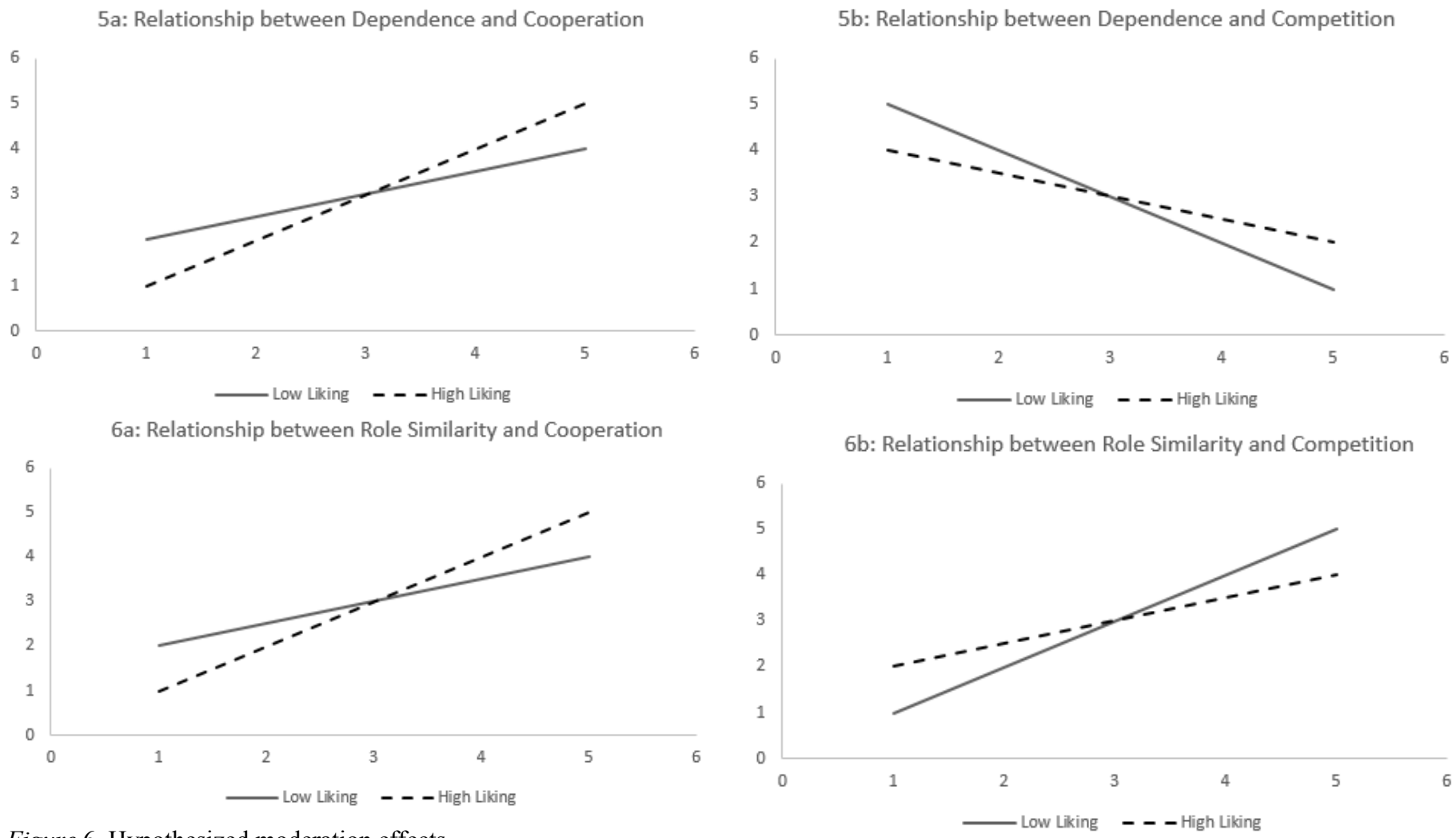


Figure 6. Hypothesized moderation effects.

Hypothesis 5a: Interpersonal liking moderates the positive relationship between dependence and cooperative behaviors. Specifically, the positive effect of dependence on cooperative behaviors is more positive when interpersonal liking is high, and vice versa.

Hypothesis 5b: Interpersonal liking moderates the negative relationship between dependence and competitive behaviors. Specifically, the negative effect of dependence on competitive behaviors is less negative when interpersonal liking is high, and vice versa.

Hypothesis 6a: Interpersonal liking moderates the positive relationship between role similarity and cooperative behaviors. Specifically, the positive effect of role similarity on cooperative behaviors is more positive when interpersonal liking is high, and vice versa.

Hypothesis 6b: Interpersonal liking moderates the positive relationship between role similarity and competitive behaviors. Specifically, the positive effect of role similarity on competitive behaviors is less positive when interpersonal liking is high, and vice versa.

Team Level Hypothesis: Density Argument

Dyadic cooperative and competitive behaviors can further emerge into team cooperative and competitive processes. I construct a cooperation network and a competition network based on cooperative and competitive behaviors at dyadic level, respectively. Then, I compute three most commonly used network indices, density, centralization, and subgrouping to capture different aspects of network structure – closure, concentration, and discontinuity.

As shown in Figure 3, density of cooperation network refers to the overall connectedness of team members' cooperative ties. It is operationalized by the present social ties within the team divided by the maximum number of ties possible. As argued in the previous chapter, each cooperative tie means an ego's sharing, helping and voicing behaviors towards an alter. It has been shown that density of cooperation network indicates the team's capacity to coordinate its actions (Balkundi & Harrison, 2006; Reagans & Zuckerman, 2001; Sparrowe et al., 2001). The higher the density, the better the coordination within the team. Thus, I hypothesize that high density of cooperation network positively relates to team performance.

On the other hand, density of competition network is derived from a completely different network. Its meaning is different. As discussed in the previous chapter, I conceptualize each competitive tie as the ego's behaviors towards the alter to compete for within team status in terms of competence, participation, and connections. When within team competition is kept at low or moderate level, it's actually healthy for the team. In attempts of competing for within team status, an ego is motivated to do good to the team in order to

convince others that he or she deserves high within team status. However, as the density further increases, the desire to maximize relative difference between the ego and the alter associated with a competitive tie will start to interfere with team performance. When the density of competition network is very high, team members will be unwilling to promote each other's outcomes, thus tend to compromise the overall team performance. Thus, I hypothesize the effect of competition density on team performance as a curvilinear relationship.

Hypothesis 7: Cooperation density is positively related to team performance.

Hypothesis 8: Competition density relates to team performance in an inverted-U shape (i.e., positive at first and then turns negative).

Team Level Hypothesis: Centralization Argument

Centralization refers to the degree of tie concentration around one or a few members. Total centralization means that one person completely dominates all the social ties, while total decentralization means that all members are equally connected with each other (see Figure 4 for an illustration). Sparrowe et al. (2001) discussed an analogy that might be helpful for the understanding the conceptual difference between density and centralization – density is analogous to mean and centralization is analogous to variance. For example, low centralization means that team members all have similar amount of social ties, but it doesn't speak to the actual amount of social ties. Essentially, the centralization argument is centering on whether team members have similar or dissimilar amount of social ties.

High centralization of cooperation network is detrimental as it unevenly allocates the number of channels, through which team members share, help and voice, among team

members (Cross & Parker 2004). In addition, team members who do not belong to the cooperative core of the team may be less motivated to achieve overall team goals (Zhang & Peterson, 2011). Low cooperation centralization implies a high congruence on how much team members together value cooperation, so that they have similar perspectives of how much they want to interdependently accomplish team goals. It has been empirically shown that such supplementary fit can effectively reduce conflict and increase performance (De Dreu & Weingart, 2003). Thus, I hypothesize that high centralization of cooperation network is negatively related to team performance. High centralization of competition network, on the other hand, means that actions of competing for within team status are concentrated among one or a few team members. The competitive core is motivated to prove its values to the team and emerges as informal leaders of the team. Such role differentiation provides order and efficiency so that team members know what to expect and who to follow, thus offering process gains (Haleblian & Finkelstein, 1993; Ronay, Greenaway, Anicich, & Galinsky, 2012). I therefore propose that high centralization of competition network is positively related to team performance.

The above predictions are consistent with Humphrey, Hollenbeck, Meyer, and Ilgen (2007)'s trait configuration theory, which applies complementary fit and supplementary fit theory (Kristof, 1996) to team composition research. Although I'm less interested in trait as a team composition, the theoretical rationale behind is very relevant to my arguments. Humphrey et al. (2007) argue that supplementary fit, which suggests similar people are more comfortable and productive together, is an effective configuration for cooperation-related trait (e.g., conscientiousness). In my study context, this theory could be understood as small variance of cooperation (i.e., low cooperation centralization) is desirable. On the other hand,

complementary fit, which argues that people fit together when they fill an unmet need of each other, is an effective configuration for competition-related trait (e.g., extroversion). In my study context, people high in competitive behaviors are usually those who like to take care of others (i.e., informal leaders), and people low in competitive behaviors are usually those who like to be taken care of (i.e., informal followers). High centralization of competition implies a complementary fit for these two types of people. Thus, a large variance of competition (i.e., high competition centralization) is desirable. Therefore, I formulate my centralization hypothesis below:

Hypothesis 9: Cooperation centralization is negatively related to team performance.

Hypothesis 10: Competition centralization is positively related to team performance.

Team Level Hypothesis: Subgrouping Argument

Subgrouping refers to high concentration of social ties within subgroups and low concentration of social ties between subgroups (Knoke & Yang, 2008; Wasserman & Faust, 1994). In contrast to density that captures the level of activities and centralization that captures the variance of tie distribution, subgrouping captures the discontinuity or disconnection of tie distribution. As shown in Figure 6, it speaks to whether there is any subgroups and if yes, how many subgroups can be found in a team. One of the most commonly used indices to measure subgrouping is the number of component in a network. Component refers to a portion of the social network in which all actors are connected directly or indirectly with each other (Wasserman & Faust, 1994). If the number of components is bigger than two, the team is not connected as a single component.

In cooperation network, subgrouping is undesirable, because it represents a difficulty

of information and resource transfer between subgroups (Carton & Cummings, 2012). Inability to connect disparate efforts within the team is likely to be reflected in lower team performance. Subgrouping in competition network, on the other hand, implies focused efforts to compete for within team status. Since team members tend to compete with those who are comparable with themselves, high level of subgrouping in competition network suggests that the team has a clear status hierarchy, which in turn leads to the higher efficiency due to such clear role specialization (Gibson & Vermeulen, 2003; Ronay et al., 2012).

Hypothesis 11: Cooperation subgrouping is negatively related to team performance.

Hypothesis 12: Competition subgrouping is positively related to team performance.

To test my research model, I design two studies. Study 1 is based on student sample, while Study 2 is based on field sample. In Study 1, I developed and validated a new social network-based measure of within team cooperation and within team competition. I examined the psychometric characteristics of this new measure, such as face validity, factor loadings, convergent validity with conceptually similar constructs, discriminant validity with conceptually distinct constructs, and predictive validity over team performance. Then, I used this validated measure to test the overall research model in Study 2. Study 2 examines why within team cooperation and competition are differentiated across dyads (i.e., dyadic level model), and explores the performance implications of different configurations of within team cooperation and competition (i.e., team level model).

STUDY 1 METHOD AND RESULTS

Procedure

The purpose of Study 1 is to develop and validate new network measures of within team cooperation and within team competition. In the previous chapters, I identified three types of behaviors for within team cooperation, the ego's sharing, helping and voicing behaviors to an alter, and three types of behaviors for within team competition, showing superiority over an alter on competence, participation and connection. As the first step of the scale development, I wrote a list of 18 social network items that covers all these conceptual domains. Then, I tested the face validity of these items by consulting a group of eight experts in team research, including Ph.D. students and faculty members. They were asked to evaluate whether these items are able to tap into the proposed conceptual domain, and assess the clarity and relevance of the scale as it appears to research participants. The length of the scale is the other important concern. In order to construct a complete team social network, each participant needs to evaluate his or her relationship with every other team member. For a team size of n and a survey length of m, this would result in collecting $m*n*(n-1)$ responses from each team. Therefore, my goal was to keep the scale reasonably short but sufficiently inclusive to cover the range of behaviors of within team cooperation and competition. At the end of this stage, I retained 6 social network items to measure within team cooperation and competition (See Table 1). For within team cooperation, I developed one item for each theoretical dimension (i.e., sharing, helping and voicing). For within team competition, I also developed one item for each dimension (i.e., competence, participation and connection).

Table 2

Items for Within Team Cooperation and Competition

Within team cooperation. Every team member rated his or her behaviors towards each of his or her teammates on 0 =never, 1=sometimes, and 2=often.	
Sharing	1. I share my knowledge and resources with this person;
Helping	2. I provide help when this person is in need;
Voicing	3. I give this person suggestions to further improve his or her work;
Within team competition. Every team member rated his or her behaviors towards each of his or her teammates on 0 =never, 1=sometimes, and 2=often.	
Competence	1. I work hard to appear more competent than this person;
Participation	2. I do extra work so that I appear more involved than this person;
Connections	3. I work hard to draw more teammates to my side than this person;

I administered study 1 in a large introductory management course in a mid-west university in Spring 2015. In this course, students were randomly assigned to three- or four-person teams to complete team projects together. I collected data in the middle of the semester, when students had already completed two team projects together and were able to accurately assess how they interacted with each other. Students were asked to fill out a questionnaire for class credit. Among 527 students from 139 teams who registered for this course, 488 students from all 139 teams returned completed questionnaires, representing a team level response rate of 100% and an individual level response rate of 92.6%.

Measures

Within team cooperation. Three network items were used to measure within team cooperation (See Table 1). Research participants were instructed to rate their own behaviors towards each other team member listed on a roster. The first item captures the sharing aspect, the second item captures the helping aspect, and the third item captures the voicing aspect. These behaviors were measured on a 3-point anchor, 0 = no, 1 = sometimes and 2 = always. I chose this anchor because it can be easily transformed into a binary measure with 0 (=without a tie) and 1 (=with a tie) yet still allows the measure of the strength of each tie.

Within team competition. Similar with within team cooperation, I used three items each capturing dimensional level competence, participation, and connection of within team competition (See Table 1). These behaviors were measured on the same 3-point anchor – 0 = no, 1 = sometimes, and 2 = always.

Team cooperative and competitive goal structure. This 10-item scale measures the team's goal structure, and it is based on Deutsch (1949)'s situational theory of cooperation

and competition. It was developed and validated by Tjosvold, Andrews and Struthers (1991). Cooperative goal structure means team members' goals are positively interdependent (one sample item in this scale is "Our team members swim or sink together") and competitive goal structure means team members' goals are negatively interdependent (one sample item in this scale is "team members have a win-lose relationships"). The reliability estimates of cooperative and competitive goal structure were 0.73 and 0.71, respectively.

Team performance. Team performance was measured by the objective project score each team receives for the team project. The maximum score for the project is 75. The time lag between the survey and the due date of the team project is approximately three weeks. The grading scheme was developed by the lead instructor of the course, which assesses four different aspects, (1) the extent to which students are capable of using management concepts accurately, (2) providing appropriate solutions to the scenario, (3) citing quality evidence to support arguments, and (4) delivering clear written communication with internally consistent formatting and style. This grading scheme is consistently applied to all teams and is made available to the students at the beginning of the semester.

Data Analytic Strategies

The first research goal of Study 1 is to test the extent to which sharing, helping and voicing social networks tap into a common/latent network of within team cooperation, and the extent to which competence, participation and connection social networks tap into a common/latent network of within team competition. It's important to note that correlations between two social networks are correlating two adjacency matrices and thus are different from correlations between two vectors (i.e., the traditional correlation analysis between two variables). Social network data clearly violates assumptions of significance testing (Borgatti,

Everett, & Johnson, 2013), so it should be tested by a different procedure that is able to account for the characteristics of social network and correctly estimates the standard error associated with each correlation coefficient. As a result, I used Quadratic Assignment Procedure (QAP) correlation in UCINET 6.0 (Borgatti, Everett, & Freeman, 2002) to compute matrix correlation coefficients and their associated significance value. This procedure involves generating a large number of random rearrangements (50,000 in my case) around pre-specified team membership structures of the network data, and the p-values obtained by QAP represent the probability of getting observed correlations by chance. The theoretical rationale of QAP p-value is completely different from p-value of traditional analysis, which is based on the rationale of null hypothesis significance testing and only suggests the chance of getting non-zero coefficients in population. To investigate the measurement structure of these social networks, I imported the correlation matrix to Mplus 7.0 for a confirmatory factor analysis (CFA) (Muthén & Muthén, 2012).

The second research goal is to establish convergent validity, discriminant validity and predictive validity of within team cooperation and within team competition. I compared the measure of within team cooperation and competition with a conceptually similar scale, team cooperative and competitive goal structure. Although team cooperative and competitive goal structure come from completely different theoretical origin (i.e. situational theory of cooperation and competition; Deutcsh, 1949), it is conceptually similar with the newly developed social network measure. Convergent validity is established if within team cooperation and cooperative goal structure is strongly related and within team competition and competitive goal structure is strongly correlated. Discriminant validity is established if within team cooperation and competitive goal structure and within team competition and

cooperative goal structure is weakly correlated. Predictive validity is established if within team cooperation and competition network indices predict team performance beyond cooperative and competitive goal structure.

Results

Network correlations and their associated significance values are presented in Table 3. The sample size of 1447 is the number of dyads among 488 research participants from 139 teams. Three dimensional networks of within team cooperation and competition have substantially larger within- than between-construct magnitudes of correlations. The significance testing based on QAP suggested that chances of getting such large within-construct correlations (r = .42~.75) by chance are all less than 10%. These preliminary results suggested that (1) within team cooperation and within team competition captured distinct information about social relationships in a team, (2) sharing, helping and voicing networks were similar with each other, and (3) competence, participation and connection networks were similar with each other.

Table 3
Study 1 Within Team Cooperation and Competition Network Correlations

		M	*SD*	1	2	3	4	5	6
1	Sharing	1.68	0.51	--					
2	Helping	1.73	0.48	.60†	--				
3	Voicing	1.52	0.59	.42†	.52†	--			
4	Competence	0.72	0.80	.03	.07	.20	--		
5	Participation	0.64	0.78	-.01	.05	.13	.75*	--	
6	Connection	0.56	0.76	.02	-.00	.17	.68*	.68*	--

Note. N=1447. Correlation significance values obtained from quadratic assignment procedure (QAP) based on 50,000 permutations. * $p < .05$, one-tailed; † $p < .10$, one-tailed

Next, I imported the correlation matrix as reported in Table 3 to Mplus 7.0 (Muthén & Muthén, 2012) to conduct a CFA. I specified a theoretical model (Model 1) and three alternative models (Model 2-4). There were two correlated latent factors in Model 1, within team cooperation and within team competition. Sharing, helping and voicing were linked to the former, and competence, participation and connection were linked to the latter. Model 2 also had two latent factors. Within team cooperation is indicated by sharing, helping, voicing, and participation, and within team competition is indicated by competence and connection. Since competition on the level of participation to the team seems to have a cooperative appeal, it's therefore necessary to check whether they are empirically distinct. Model 3 was based on a similar rationale. Within team competition was indicated by competence, participation, connection and voicing, as voicing may be viewed as a form of controversy that might theoretically relevant to within team competition. Model 4 was a one latent factor model that is reflected by all six social networks. The model comparison results were presented in Table 4.

Table 4

Study 1 Confirmatory Factor Analysis of Network Measurement Model

Structure	χ_2	*df*	CFI	TLI	SRMR	RMSEA
Model 1: Theoretical 2-factor model	31.96**	8	0.98	0.96	0.05	0.07 [0.05, 0.10]
Model 2: 2-factor model with a difference in participation dimension assignment	490.68**	8	0.59	0.23	0.22	0.35 [0.33, 0.38]
Model 3: 2-factor model with a difference in voicing dimension assignment	181.28**	8	0.85	0.72	0.14	0.21 [0.19, 0.24]
Model 4: 1-factor model	396.21**	9	0.67	0.45	0.19	0.30 [0.27, 0.32]

Note. n = 1447.

** $p < .01$

According to Table 4, model 1 fits the data very well (χ^2 (8) = 31.96; χ^2 /df=3.99; comparative fit index (CFI) = 0.98; Tucker–Lewis index (TLI) = 0.96; root-mean-square error of approximation (RMSEA) = 0.07 with 90% CI [.05, .10]; standardized root-mean-square residual (SRMR) =.05). It also demonstrated substantial better fit than three other alternative models, none of which meet the threshold of reasonable model fit (Hu & Bentler, 1999). Therefore, the factor structure of within team cooperation and competition scale is consistent with the proposed structure. Based on these findings, sharing, helping and voicing networks were combined into a within team cooperation network, and competence, participation and connection networks were combined into a within team competition network.

Next, I turn to test the convergent, discriminant and predictive validity of the new scale. It's important to note that such tests are coarse, because within team cooperation and competition and cooperative and competitive goal structure are actually not directly comparable – one is a set of matrices that capture different aspects of a team social network, while the other is a traditional scale that manifests itself as a set of vectors. To bring them into the same analytic level, I computed the density score of within team cooperation and within team competition by the R script developed Downes and Crawford (2013). Theoretically, density captures the overall connectedness of team members' cooperative or competitive activities within a team, and it is perhaps the empirically closest form of the team cooperative and competitive goal structure. The correlations were reported in Table 5 below.

Table 5

Study 1 Descriptive Statistics and Correlations

		M	*SD*	1	2	3	4	5
1	Within team cooperation density	1.65	0.34	--				
2	Within team competition density	0.71	0.48	.28**	--			
3	Cooperative goal structure	4.22	0.46	.22**	-.29**	--		
4	Competitive goal structure	2.59	0.54	-.18*	.56**	-.30**	--	
5	Team Performance	60.43	6.5	.24**	-.11	.18*	-.26**	--

Note. N=139. ** $p < 0.01$; * $p < 0.05$

According to Table 5, within team cooperation density could be distinguished from competitive goal structure (r = -.18, $p < 0.05$), and it converged with cooperative goal structure (r = .22, $p < 0.01$). Within team competition density was highly related to competitive goal structure (r = .56, $p < 0.01$), but was negatively related to cooperative goal structure (r = -.29, $p < 0.01$). Thus, the newly developed scale of within team cooperation and competition were positively correlated with conceptually similar scale but not with conceptually dissimilar scale, demonstrating good convergent and discriminant validity.

For the relationships with team performance, density scores of within team cooperation and competition networks demonstrated inconsistent predictions. In a hierarchical regression test conducted in Mplus 7.0 (Muthén & Muthén, 2012), within team cooperation density is statistically significant (β = 0.21; $p < 0.05$) beyond cooperative goal structure (β = 0.14; *n.s.*). On the other hand, competitive goal structure (β = -0.29; $p < 0.01$) is a better predictor than within team competition density (β = 0.05; *n.s.*). As a result, the density of within team cooperation had better predictive validity than cooperative goal structure, but the density of within team competition did not.

As a concluding remark, Study 1 findings supported convergent and discriminant validity of the new measures. With regards to the predictive validity, it was only supported for within team cooperation but not for within team competition. It's important to note that density is just one characteristic of a team social network, and it is neither theoretically nor empirically equivalent of team cooperative goal structure nor competitive goal structure. Study 2 of my dissertation will be an initial attempt to further examine how the configurations of within team cooperation and competition are shaped, and how different

configurations of these networks will influence team performance.

STUDY 2 METHOD AND RESULTS

Procedure

The purpose of Study 2 is to test the overall research model in a field sample. My research collaborator approached study 2 data collection by contacting a group of part-time executive MBA students from a comprehensive university in East China. These students had at least 10 years of working experience, and were all taking managerial roles in various organizations at the time of data collection. They allowed us to send invitations to supervisors and employees in their organizations or departments. Help offered by these students was not associated with any financial incentives or course credit. With their help, we identified a total of 94 supervisors and their 534 subordinates, representing 47 different organizations. These students helped us distribute these questionnaires, and participants themselves mailed completed questionnaires directly to a research assistant. We attached a cover letter to each questionnaire, explaining the purpose of my research and assuring confidentiality and voluntary participation. We collected 89 valid supervisor surveys and 458 valid subordinate surveys, representing response rates of 94.7% and 85.8%, respectively. For the sake of network accuracy, we only retained teams with response rates of 80% or higher. Having matched supervisor surveys, subordinate surveys and network surveys, the final sample is 2320 dyads paired by 418 employees from 83 teams. These teams had a diverse of functions, such as marketing, manufacturing, information technology, and accounting. About 65.3% of the participants were male, 59.9% attended college, and 7.8% attended graduate school. They were 32.2 years old on average, and had an average tenure of 35.2 months in the company where they worked.

Measures

I administered three surveys in this field sample, a network survey, a subordinate survey and a supervisor survey. The surveys were conducted in Chinese, but all the items have been translated and back translated to ensure their equivalence. Dyadic level measures, including within team cooperation and competition, task dependence, reward dependence, similarity, and interpersonal liking, were measured in the social network survey. With the assistance of executive MBA students, I listed the names of the all team members on this social network survey and asked participants to rate their behaviors or perceptions of all other teammates. Team performance was measured in the supervisor survey. Status striving and communion striving were measured in the subordinate survey.

Dyadic level model measures. All network items were measured on a 3-point scale, 0 = no, 1 = sometimes and 2 = always. For within team cooperation and competition, I used the same six network items as in Study 1. The items were listed in Table 1. Dependence was measured by a network item of task dependence and a network item of reward dependence. For task dependence, I adopted the item used in Brass (1984): "Does this person provide you with inputs to your job?" For reward dependence, I adopted the item used in Wageman (1995): "Does this person's performance influence your pay/benefits/rewards?" Role similarity was measured by a network item that asked "To what extent does this person has similar role (e.g., expertise, skillset, and position) with you?" Finally, interpersonal liking was measured by a network item that asked "To what extent do you like this person?"

Team level model measures. I'm interested in three different aspects of within team

cooperation and competition network – density, centralization and subgrouping. Density of within team cooperation and competition was measured by a normalized (i.e., divided by team size) mean connectedness within each team (Borgatti et al., 2002). A large value of density indicates a dense network. Centralization of within team cooperation and competition was calculated by Freeman (1979)'s measure of degree centralization, in which a value of 1 indicates complete centralization and a value of 0 indicates complete decentralization. Subgrouping of within team cooperation and competition was measured by component ratio, which calculates the degree to which the team has subsets of connected actors in reference to its team size (Wasserman & Faust, 1994). The larger the component ratio, the more disconnected of the team.

Team performance was measured by an 8-item scale developed by Barrick, Stewart, Neubert and Mount (1998) that covers eight dimensions of team performance – job knowledge, quality, quantity, initiative, interpersonal skills, planning, commitment, and an overall evaluation. Each dimension was defined and followed by interpretative examples. One example is "Job knowledge: understands work responsibilities, scope of job tasks, and routines to be performed, such as being aware of correct procedures, methods, and facts pertinent to the job and its objectives and keeping informed of routine, normal follow-up." The reliability estimate is 0.88.

Status striving and communion striving served as statistical control to rule out the potential effect contributed by individual differences. One sample item for status striving was: "I feel a thrill when I think about getting a higher status position at work", and one sample item for communion striving was "I care a lot about having coworkers and supervisors who like me". These variables are aggregated from individual responses to

form team level constructs, indicating the mean level of trait composition of each team. Results of intraclass correlation suggested that they have sufficient between-group variance, and statistical aggregation are justifiable (ICC(1) = 0.39; ICC(2)=0.86 for communion striving, and ICC(1)=0.29; ICC(2)=0.79 for status striving). They are measured by 10 items (5 items for each) adapted from Barrick, Stewart and Piotrowski (2002) on a 5-point anchor, 1= strongly disagree and 5 = strongly agree. The reliability estimates are 0.86 and 0.79, respectively.

Data Analytic Strategies

First, I examined the measurement structure of three dimensions of within team cooperation and three dimensions of within team competition. The procedure I used is the same as the one in Study 1 – a QAP correlation analysis with 50,000 permutations in UCINET 6 (Borgatti et al., 2002) followed with a network CFA in Mplus 7 (Muthén & Muthén, 2012).

Second, based on the results from the previous step, I combined the networks of sharing, helping and voicing into an overall within team cooperation by performing a between matrix average of these three networks. I did the same thing for within team competition. These two overall networks were used in subsequent data analysis.

Third, in order to reduce potential common method bias in dyadic level model, the dependent variables, within team cooperation and competition, were transposed. By doing so, the values in independent variables concerned A's rating towards B and the corresponding values in dependent variables concerned B's rating towards A. Then, I used MRQAP (Multiple Regression Quadratic Assignment Procedure) via Double-Dekker semi-

partialling in UCINET 6 (Borgatti et al., 2002) to test dyadic level hypotheses. The procedure was developed by Dekker, Krackhardt and Snijder (2007) and is often used to test dyadic level hypotheses in team social network research. Specifically, I compiled social networks of all 83 teams along their diagonal to construct a large matrix that could be processed by MRQAP. All between team ties were treated as missing values. Double-Dekker semi-partialling allows the large matrix to be partitioned into 83 smaller blocks (defined by team membership) and the permutations were restricted into each block, thus yielding more accurate estimation.

Finally, to test team level model, I used the batch processing function in UCINET 6 (Borgatti et al., 2002) and calculated density, centralization and subgrouping indicators for each team, and then imported them into Mplus 7.0 for simple regression. The group means of status striving and communion striving were controlled in this model.

Results

Dyadic level correlations were described in Table 6. As shown in the table, the Study 2 sample had similar correlations among sharing, helping, voice, competence, participation and connection with the student sample in Study 1.

Table 6

Study 2 Dyadic Level Correlations

		M	*SD*	1	2	3	4	5	6	7	8	9	10
1	Sharing	1.23	0.70	--									
2	Helping	1.26	0.66	.60†	--								
3	Voicing	0.99	0.74	.53†	.53†	--							
4	Competence	0.87	0.73	-.21	-.25	-.33	--						
5	Participation	1.04	0.74	-.23	-.24	-.32	.63*	--					
6	Connection	1.12	0.74	-.05	-.11	-.16	.53†	.62*	--				
7	Reward Dependence	0.66	0.74	.04	.05	.09	-.07	-.05	-.04	--			
8	Task Dependence	1.13	0.70	.25	.15	.13	-.09	-.03	.04	.11	--		
9	Role Similarity	0.89	0.65	.13	.06	.08	-.12	-.14	-.05	.26	.24	--	
10	Interpersonal Liking	1.48	0.64	.08	.02	.02	-.03	-.01	.03	.11	.36	-.08	--

N=2320.

Correlation significance values obtained from quadratic assignment procedure (QAP) based on 50,000 permutations. * $p < .05$, one-tailed; † $p < .10$, one-tailed.

I imported the correlations of these six networks into Mplus 7 and found the theoretical factor structure has a good fit ($\chi^2(8) = 181.64$; CFI = 0.96; TLI = 0.93; RMSEA =0.09 [0.08, 0.10]; SRMR=0.05), once again confirming the proposed factor structure.

Next, I tested the dyadic level model by MRQAP Double Dekker semi-partialling, and the results were presented in Table 7. Specifically, Hypothesis 1 predicted a positive relationship between dependence and within team cooperation. The results showed that being dependent on one's task and reward leads to higher level of cooperative behaviors towards that person ($\beta = 0.20$, $p < 0.01$). Thus, Hypothesis 1 was supported.

Hypothesis 2 predicted a negative relationship between dependence and within team competition. However, there was no significant relationship between task and reward dependence and competitive behaviors ($\beta = -0.01$, *n.s.*). Thus, Hypothesis 2 was not supported.

Hypothesis 3 is about the positive relationship between role similarity and cooperative behavior s. The findings showed that when one perceives as having a similar role to another, he or she tends to demonstrate higher level of cooperative behaviors ($\beta = 0.05$, $p < 0.01$). This hypothesis was supported.

Hypothesis 4 is about the positive relationship between similarity and competitive behaviors. The finding showed no support for this hypothesis – similarity did not affect the ego's competitive behaviors towards an alter ($\beta = -0.01$, *n.s.*).

Hypothesis 5a and 5b are about the moderation effect of interpersonal liking on dependence and cooperative and competitive behaviors, respectively. The findings suggested that these interaction terms were not statistically significant ($\omega = -0.02$, *n.s.;* $\omega =$

-0.01, *n.s.;* ω = 0.01, *n.s.;* ω = 0.03, *n.s.*). Therefore, hypothesis 5a and 5b were both not supported.

Hypothesis 6a and 6b are about interpersonal liking moderates the relationship between role similarity and cooperative behaviors and competitive behaviors, respectively. The results suggested that the interaction term on competitive behaviors was not significant (ω = -0.05; *n.s.*), and the interaction term on cooperative behaviors was supported (ω = 0.06; $p < 0.05$), For better interpretation, I plotted the interaction term in Figure 6. As shown in Figure 6, when one has a high interpersonal liking towards another, the relationship between role similarity and cooperative behaviors is strengthened. When one has a low interpersonal liking towards another, the relationship between role similarity and cooperative behaviors is washed out.

Table 7

Study 2 MRQAP Results for Dyadic Level Model

	Cooperative Behaviors		Competitive Behaviors	
Variable	Model 1	Model 2	Model 1	Model 2
Constant	.87	1.16	1.16	1.02
Task Dependence (TD)	.20(0.02)**	.20(0.02)**	-.01(0.02)	-.02(0.02)*
Reward Dependence (RD)	.04(0.02)**	.04(0.02)**	-.06(0.01)	-.05(0.02)
Role Similarity (RS)	.05(0.02)**	.05(0.02)*	-.05(0.02)	-.04(0.02)
Interpersonal Liking		.02(0.02)		.01(0.03)
TDXInterpersonal Liking		-.02(0.03)		.01(0.04)
RDXInterpersonal Liking		-.01(0.03)		.03(0.04)
RSXInterpesonal Liking		.06(0.03)*		-.05(0.03)

Note. N = 2320.

Significance values obtained from multiple regression quadratic assignment procedure (MRQAP) with Double-Dekker Semi Partialling based on 50,000 permutations. ** $p < 0.01$, one-tailed * $p < 0.05$, one-tailed.

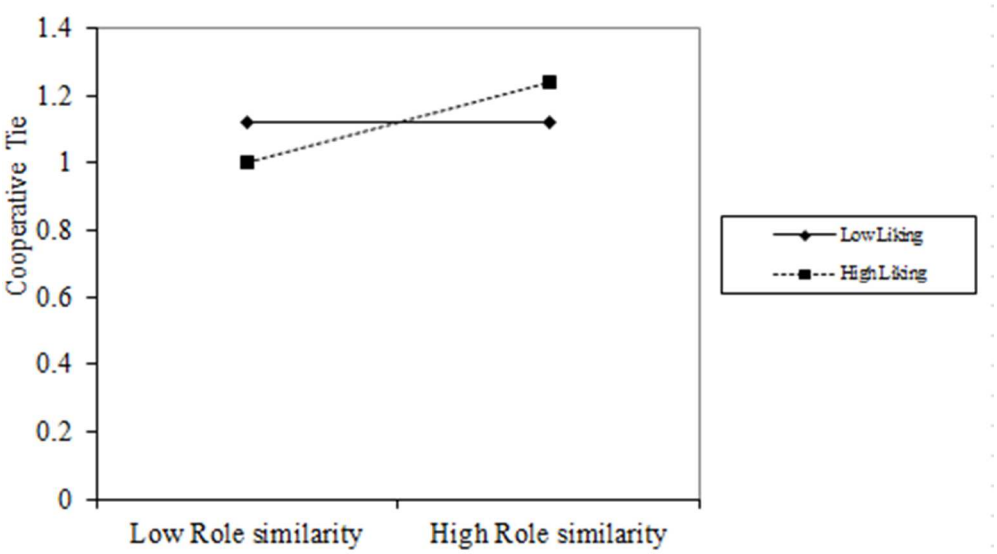


Figure 7. The moderation effect of interpersonal liking on the relationship between role similarity and target-specific cooperative behaviors.

The descriptive statistics and correlation results of variables used in team level model were presented in Table 8. In general, control variables and network indices had weak correlations with team performance. Regression results were presented in Table 9. As a quick review, Hypothesis 7 predicted a positive relationship between within team cooperation density and team performance; Hypothesis 8 proposed an inverted-U shape relationship between within team competition density and team performance; Hypothesis 9 was about a negative relationship between within team cooperation centralization and team performance; Hypothesis 10 hypothesized the relationship to be positive for within team competition centralization and team performance; Hypothesis 11 predicted a negative relationship between within team cooperation subgrouping and team performance; Hypothesis 12 proposed a positive relationship between within team competition subgrouping and team performance. None of these regression coefficients were statistically significant, so all team level hypotheses (H7 to H12) were not supported.

Table 8

Study 2 Team Level Descriptive Statistics and Correlations

		M	*SD*	1	2	3	4	5	6	7	8	9
1	Status striving	3.52	0.34	--								
2	Communion striving	3.47	0.35	.70**	--							
3	Cooperation density	0.42	0.25	-.37**	-.20	--						
4	Cooperation centralization	0.30	0.20	.01	-.01	-.19	--					
5	Cooperation subgrouping	0.33	0.24	.21	-.02	-.82**	.05	--				
6	Competition density	0.41	0.25	-.27*	-.23*	.23*	.03	-.18	--			
7	Competition centralization	0.30	0.19	.16	-.11	-.11	-.06	.16	-.33**	--		
8	Competition subgrouping	0.35	0.22	.29**	-.27*	-.27*	.02	.25*	-.82**	.20	--	
9	Team performance	3.70	0.64	.00	.08	.13	-.19†	-.14	-.09	-.06	.05	--

Note. N=83. **p < .01, two-tailed; * $p < .05$, two-tailed; † $p < 0.1$, two-tailed.

Table 9

Study 2 Unstandardized Regression Results for Team Level Model

Variable	Within team cooperation	Within team competition
Status striving	-.09(0.31)	-.21(0.30)
Communion striving	.21(0.30)	.34(0.30)
Network density	.06(0.55)	-1.98(1.87)
The square of network density		1.14(1.45)
Network centralization	-.56(0.37)	-0.28(0.51)
Network subgrouping	-.26(0.56)	-0.59(0.66)

Note. N = 83.

DISCUSSION

Going beyond the traditional approach that treats within team cooperation and competition as externally enforced goal structures (Deutsch, 1949), I develop a new theoretical perspective that conceptualizes within team cooperation and competition as bottom-up processes that are differentiated across different interaction dyads. I examine to what extent such differentiation is affected by the distribution of instrumental ties (i.e., dependence and role similarity) and expressive ties (i.e., interpersonal liking) within the team. In addition, I also reconceptualize within team competition by accounting for competing individuals' positive social interdependence as teammates. In typical team settings, team members compete for higher within team status by promoting their own competence, participation, and connection with reference to their teammates. Finally, the impacts of different configurations (i.e., density, centralization and subgrouping) of within team cooperation and competition on team performance were explored.

Summary of Findings

The first study of my dissertation is a scale development study based on a student sample. In this study, I found that within team cooperation and competition are indeed differentiated across different team members, and supported the proposed factor structure of within team cooperation and competition. Within team cooperation is composed of three dimensions, sharing, helping and voicing, while within team competition is composed of competence, participation and connection. I linked the density of within team cooperation and competition to an existing scale, cooperative and competitive goal structure, and found support for convergent and discriminant validity. I also found that, within team cooperation has stronger predictive validity than cooperative goal structure, but within team

competition has weaker predictive validity than competitive goal structure.

The second study, based on a field sample, was conducted to test the overall theoretical model. The finding once again confirmed that within team cooperation and competition are differentiated, and the newly developed scale was consistent with my theoretical predictions. At the dyadic level, within team cooperation was determined by task and reward dependence, but within team competition was not. Role similarity was positively related to within team cooperation, and was not related to within team competition. The effects of role similarity were subject to interpersonal liking – which further strengthens the effect on cooperation yet weakens the effect on competition. At the team level, the findings suggested that density, centralization and subgrouping of within team cooperation and competition were not able to predict supervisor-rated team performance.

Theoretical Implications

First, my dissertation advanced our knowledge of within team cooperation and competition. It showed that team members' cooperative and competitive behaviors are differentiated across different interaction dyads (see Table 2 and Table 6 for standard deviation of within team cooperation and competition of Study 1 and Study 2, respectively). As a result, individual and dyad homogeneity assumptions that are often made in the prior team research do not seem to be empirically valid. The findings suggested that within team cooperation and competition should not be treated as fixed team level property, as individuals indeed do not equally cooperate and compete with everyone else.

Second, my dissertation represents a preliminary attempt to explain why such

differentiation would occur. For within team cooperation, my expectations were generally supported – both instrumental and expressive ties that imply closure (e.g., being dependent, being similar and being likeable) were associated with cooperative behaviors within an ego-alter pair.

However, findings about competitive behaviors were not as predicted. Dependence was not able to predict within team competition, implying that the choices of competitive behaviors are not simply based on the structural design of tasks and rewards, and are likely to go beyond the designated task and reward flow. Based on social comparison arguments, I predicted the relationship between role similarity and competitive behaviors to be positive, but the findings suggested that they had no relationship. One possibility is that, in team settings, an unknown contingency is able to alter the relationship between role similarity and within team cooperation. Under certain condition, social comparison mechanisms are activated and the relationship between role similarity and within team competition turns positive. For example, assimilation-contrast model of social comparison (Mussweiler, Rüter, & Epstude, 2004) would suggest that, when the ego focuses on the part that is different from the alter with a similar role, competitive behaviors are more likely to follow social comparison processes. In other words, selective focus of the ego may alter the relationship between role similarity and within team competition. Another possibility is similarity in role (e.g., to what extent they take up similar responsibilities in teams) may not be the most relevant dimension that individuals draw from. It's possible that individuals tend to compare with those who are similar within themselves in background, performance, network position, or personality. Or it could be because team settings may have potential complications for social comparison processes. Prior research has shown that individuals

are particularly likely to engage in social comparison processes in teams (Forsyth, 2000; Hu & Liden, 2013), but it still remains unknown whether social comparison processes are subject to team members' positive social interdependence (e.g., shared membership, common goals, and in-group identification) with each other.

Third, at the team level, I found that density, centralization and subgrouping of within team cooperation and competition were not related to team performance. Although these findings were not as expected, they seem to be reasonable in reference to previously found effect sizes. For example, a meta-analysis conducted by Balkundi and Harrison (2006) suggested that, on average, the relationship between interaction density and team performance is only 0.13. A recent study (Crawford, Lepine & Downes, work in progress) also found weak relationships of team interaction density (r = .11), centralization (r = -.08), and subgrouping (r = .15) with team performance. These findings suggested that being dense, centralized, or disconnected may not be always better (or worse) than being sparse, decentralized or united. It implies the importance to move from the "whole" to the "parts" in understanding relationships between team network configurations and team performance. The theoretical meanings of these different network configurations are still subject to further investigations.

Practical Implications

My dissertation has a few implications that would help managers better understand their teams, and enhance team coordination and effectiveness. First, my findings suggested that the work design do matter. One person's dependence towards another person and the role similarity of this ego-alter pair are able to foster cooperative behaviors. A lack of such interdependence in the structure may be a reason why a team does not cooperate very well.

As a result, managers should pay attention to how task and reward are structured within the team, and assign individuals to appropriate positions in a way that encourages within team cooperation.

In addition, setting two or more positions that have similar functions also would help form a cooperative tie between those who hold those positions. When the work is beyond one individual's efforts, such a work arrangement would help integrate two or more individuals' efforts to accomplish a task.

Another implication is that expressive ties are important. My dissertation found that interpersonal liking is able to alter how role similarity influences within team cooperation and competition. Specifically, even if two individuals are placed into positions that are very similar with each other and a cooperative relationship between them is expected, the cooperative tie will not form if these two individuals do not like each other. In addition, a liking tie is also able to effectively reduce competitive behaviors between the ego and the alter. These findings suggest that managers should encourage team members develop expressive ties out of the work, as these ties are also able to help get the work done.

Finally, managers should also be aware that the amount of within team cooperation and competition is not necessarily related to team performance. For example, a dense network of cooperation may create information overload for employees (Oldroyd & Morris, 2012), and no within team competition at all may also potentially impair team motivation and performance (Franken & Brown, 1995). Although the specific mechanisms are still subject to further research, the general implication is managers should find an optimal configuration of within team cooperation or competition that matches with specific team characteristics.

Limitations and Future Research Directions

In this section, I note several limitations that could be addressed by future research. For Study 1, the clear limitation is that it's based on a US student sample working on class projects. The findings may not be relevant to real work setting. As a result, the research model was tested in a field sample in Study 2. However, it also has its limitations. The first one is the lack of support of the mechanism that determines the differentiation of within team competition. Given the unexpected findings in testing hypotheses about dependence and similarity, it still remains unclear why team members chose to compete with some team members but not with others. In addition to several possibilities I discussed in the prior section, future research could also explore the status argument by linking competitive behaviors to status hierarchy within a team. I primarily conceptualize within team competition around the idea of competing for within team status (Anderson & Kilduff, 2009). From a social comparison perspective, team members may only compete with those who had similar status as they do. The structure of within team competition should correspond to the structure of within team status.

Second, the null findings in the team level model also suggested several future research possibilities. The sample size of 83 is not large, so the statistical power is not very high. Future research could consider increasing the sample size to see if the results will be improved. More importantly, research efforts should be devoted to understanding why there are no relationships among configurations of within team cooperation or competition and team performance. For example, the effects of centralization may depend on where exactly cooperation or competition occurs. The cooperation or competition of the core may be more influential than the cooperation or competition of the periphery (Li et al., 2015).

Another possibility is to examine the change of team social network over time. What matters perhaps is not a cross-sectional snapshot of a network configuration, but the way a network configuration manifests itself over time (Zhao, Li, Zheng & Liu, work in progress).

Finally, the field sample is collected from Chinese organizations. It's still unclear if Chinese values (e.g., collectivism and power distance; Hofstede, 1984) would alter the way individuals view within team cooperation or competition. For example, collectivism value may influence the variance of within team cooperation and competition, as team members are more likely to view the in-group as more united (Gómez, Kirkman & Shapiro, 2000). Power distance value may prevent team members from participating in within team competition, as they tend to view within team status hierarchy as settled (Hofstede, 1984). Future research could investigate within team cooperation and competition from a lens of culture and replicate my findings in another cultural context.

CONCLUSION

As a concluding remark, my dissertation challenges the dominant theory that conceptualizes cooperation and competition as a fixed team level property that is equally distributed among all team members, and offers a social network-based configural theory that accounts for the complex, nonlinear patterns of within team cooperation and competition. Such conceptualization is consistent with the recent trend in team research that challenges actor and dyad homogeneity assumption (Humphrey et al., 2009; Li et al., 2015). Developing a new network measure of within team cooperation and competition, it opens up many fruitful research avenues to help advance our knowledge about how team members cooperate and compete with each other.

In addition, my dissertation also conceptualizes a practically important yet less understood phenomenon – within team competition. The previous theorization and operationalization of within team competition often overlooks the fact that its participants are bounded by the same team membership. In my dissertation, I conceptualize within team competition as a restrained form of competition, and its participants are competing with each other without sabotaging any team interdependence. Future research could further explore the antecedents and consequences of within team competition.

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APPENDIX SURVEY INSTRUMENT

Study 1 Surveys

Within team cooperation. Every team member rated his or her behaviors towards each of his or her teammates on 0 =never, 1=sometimes, and 2=often.

1. I share my knowledge and resources with this person;
2. I provide help when this person is in need;
3. I give this person suggestions to further improve his or her work;

Within team competition. Every team member rated his or her behaviors towards each of his or her teammates on 0 =never, 1=sometimes, and 2=often.

1. I work hard to appear more competent than this person;
2. I do extra work to appear more involved than this person;
3. I try to connect with teammates more effectively than this person;

Team cooperative and competitive goal structure. Each team member rated their perception of the team on 5-point likert scale, from 1=strongly disagree to 5 = strongly agree.

Cooperative Goal Structure

1. Our team members 'swim or sink' together.
2. Our team members want each other to succeed.
3. Our team members seek compatible goals.
4. The goals of team members go together.
5. When our team members work together, we usually have common goals.

Competitive Goal Structure

6. Team members structure things in ways that favour their own goals rather than the goals of other team members.
7. Team members have a 'win–lose' relationship.
8. Team members like to show that they are superior to each other.
9. Team members' goals are incompatible with each other.
10. Team members give high priority to the things they want to accomplish and low priority to the things other team members want to accomplish.

Citation: Alper, S., Tjosvold, D. and Law, S. A. (1998). Interdependence and controversy in group decision making: antecedents to effective self-managing teams. *Organizational Behavior and Human Decision Processes*, 74, 33–52.

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Study 2 Surveys

Within team cooperation. Every team member rated his or her behaviors towards each of his or her teammates on 0 =never, 1=sometimes, and 2=often.

1. I share my knowledge and resources with this person;
2. I provide help when this person is in need;
3. I give this person suggestions to further improve his or her work;

Within team competition. Every team member rated his or her behaviors towards each of his or her teammates on 0 =never, 1=sometimes, and 2=often.

4. I work hard to appear more competent than this person;
5. I do extra work to appear more involved than this person;
6. I try to connect with teammates more effectively than this person;

Task and reward dependence. Every team member rated his or her behaviors towards each of his or her teammates on 0 =no, 1=sometimes, and 2=often.

1. Does this person provide you with inputs to your job?
2. Do you distribute the outputs from you work to this person?
3. Does this person's performance influence your pay/benefits/awards?

Citation: Brass, D. J. (1984). Being in the Right Place: A Structural Analysis of Individual Influence in an Organization. *Administrative Science Quarterly*, 29, 518-539.

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Interpersonal liking. Every team member rated his or her behaviors towards each of his or her teammates on 0 =no, 1=a little bit, and 2=very much.

1. To what extent do you like this person?

Role similarity. Every team member rated his or her behaviors towards each of his or her teammates on 0 =no, 1=a little bit, and 2=very much.

1. To what extent does this person has similar role (e.g., expertise, skillset, and position) with you?

Demographics. Each team member reported their gender, education, tenure and specialized area.

Status Striving and Communion Striving. Each team member rated their perception of the self on 5-point Likert scale, from 1=strongly disagree to 5 = strongly agree.

1. I focus my attention on being the best employee in the work unit.
2. I set personal goals for performing better than anyone else.
3. I always try to be the highest performer.
4. I get excited about the prospect of being the most successful employee
5. I feel a thrill when I think about getting a higher status position at work.

6. I focus my attention on getting along with others at work.
7. I spend a lot of time contemplating whether my coworkers like me.
8. I expend a lot of effort developing a reputation as someone who is easy to get along with.
9. I get excited about the prospect of having coworkers who are good friends.
10. I care a lot about having coworkers and supervisors who are like me.

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Team performance. The supervisor rated his or her perception of the team on a 5-point Likert scale, from 1= Consistently below requirements to 5= Consistently exceeds requirements

_____ 1. JOB KNOWLEDGE: Understands work responsibilities, scope of job tasks, and routines to be performed.

* Aware of correct procedures, methods, and facts pertinent to the job and its objectives.
* Keeps informed of routine, normal follow-up.

_____ 2. QUALITY OF WORK: Completes work thoroughly, accurately, and according to specifications.

* Produces output with a minimum number of errors.
* Maintains economy of materials and cost consciousness.
* Completes the work thoroughly without requiring constant correction or revision.

_____ 3. QUANTITY OF WORK. Maintains steady, acceptable level of work output.

* Completes assigned work within acceptable time frame.
* Increases work pace, when necessary, to meet a deadline.

_____ 4. INITIATIVE. Willing to seek out solutions to problems and learn more of the various functions involved.

*Suggests job, team, or organizational improvements.
* Works extra hard when requested and takes on additional responsibilities readily.
* Initiates actions independently and requires minimal supervision and support.

____ 5. INTERPERSONAL SKILLS: Practices basic communication skills, maintains good interpersonal relations with customers, managers, and other employees.

* Maintains smooth working relationship with associates in other organizational units.
* Knows when and how to listen and how to give good feedback.
* Maintains self-control (controls emotions and handles difficult situations).

____ 6. PLANNING & ALLOCATING: Planning-forming goals and allocating resources to meet them.

* Monitors progress toward objectives and adjusts plans as necessary to reach them.
* Allocates and schedules resources according to priority.
* Takes into account all available information to make timely decisions.

____ 7. COMMITMENT TO TEAM: Demonstrates a consistent, dependable work effort, and a positive work attitude.

*Supports the team even under difficult circumstances.
*Always willing to help others out and enjoys being at work.
*Endorses and defends team and organizational objectives.

____ 8. OVERALL JOB PERFORMANCE: A summary evaluation of overall performance against work expectations.

* Consider extent to which objectives were achieved.
* Assess team contributions towards objectives.
* Recognize difficulty of objectives.

Citation: Barrick, M. R., Stewart, G. L., Neubert, M. J., & Mount, M. K. (1998). Relating member ability and personality to work-team processes and team effectiveness. *Journal of Applied Psychology*, 83(3), 377-391.