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Power, Status and Network Perceptions: The Effects of Network Bias on Organizational Outcomes

Professor Martin J. Kilduff

**University of Cambridge
Judge Business School
Trumpington Street
Cambridge, United Kingdom CB2 1AG**

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14. ABSTRACT
Knowing who is connected to whom is important in organizations, but people make mistakes when attempting to recall and report connections among others in their social networks. The objective of this research project was to investigate how power and status influence the extent to which people rely on mental templates (schemas) in observing and responding to social networks at work. The approach was to join two research traditions, entitativity and social cognition, in order to investigate the implications of social network accuracy for decision-making, trust and innovation. This was carried out by conducting two separate but related studies using original data collected for this project concerning misperceptions of friendship networks (study 1) and misperceptions of advice networks (study 2). In this first part of this report, we discuss the investigation into how individuals' personal sense of power leads to distorted perceptions of social networks and the tendency to think these distorted networks are easily mobilized in pursuit of goals. In the second part (based on archival data), we discuss the investigation into how individuals systematically misperceive the pecking order in organizational friendship networks. Individuals who were in actual fact central players in the network tended to overestimate the extent of status differentiation. The more individuals perceived status differentiation, the less they found their jobs in the organization satisfying.

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UNIVERSITY OF CAMBRIDGE
JUDGE BUSINESS SCHOOL

Power, Status and Network Perceptions: The Effects of Network Bias on Organizational Outcomes

Principal Investigator: Professor Martin Kilduff

EOARD Project # 10-3095

CONTENTS

Overall summary	3
Paper number 1: Personal Sense of Power and Network Misperceptions: Effects on Density and Goal Mobilization	4-27
Paper number 2: From Local Perceptions to Networkwide Patterns: the Effects of Status Bias on Job Satisfaction	28-67

OVERALL SUMMARY

Knowing who is connected to whom is important in organizations, but people make mistakes when attempting to recall and report connections among others in their social networks. We investigate how power and status influence the extent to which people rely on mental templates (schemas) in observing and responding to social networks at work. The first paper comprises two separate but related studies using original data collected for this project concerning misperceptions of friendship networks (study 1) and misperceptions of advice networks (study 2). In this first paper, we investigate how individuals' personal sense of power leads to distorted perceptions of social networks and the tendency to think these distorted networks are easily mobilized in pursuit of goals. In the second paper (based on archival data), we investigate how individuals systematically misperceive the pecking order in organizational friendship networks. Individuals who were in actual fact central players in the network tended to overestimate the extent of status differentiation. The more individuals perceived status differentiation, the less they found their jobs in the organization satisfying.

**Personal Sense of Power and Network Misperceptions: Effects on Density and Goal
Mobilization^a**

Abstract

Do people with a personal sense of power (such as leaders) tend to see the networks in which they are involved as densely integrated (highly entitative) and as easily mobilized? In a study of working adults ($N = 122$), we found that personal sense of power predicted the tendency to see friendship networks in organizations as more dense, controlling for gender, education level, organizational rank, and trait dominance. In a follow-up study controlling for the actual density of people's networks, we found that would-be leaders enrolled in an M.B.A. program ($N = 120$) with higher sense of personal power distorted their advice networks in terms of greater density. In both studies, power also predicted the tendency to see these seemingly dense networks as capable and willing of being easily mobilized for coordinated action.

^a Paper co-authored with Blaine Landis, Jochen Menges (University of Cambridge) and Gavin Kilduff (New York University).

Holding an accurate picture of the social networks within an organization can have important benefits and consequences for individuals. Research on network cognition suggests that people who have accurate network perceptions tend to be credited with reputational power (Krackhardt, 1990). Equally, the consequences of misjudging the informal organizational network can be dramatic. In one such case, the CEO of a manufacturing firm unwittingly laid off an employee who had personally recruited over a hundred friends and family members through the company's referral program (Burt & Ronchi, 1990). His position in the informal network was discovered only after the company launched an investigation into the sources of employee hostility toward upper management. Indeed, understanding the pattern of informal relations within an organization can be a deciding factor in achieving influence and getting ahead in organizations (cf. Janicik & Larrick, 2005).

Research examining how well individuals perceive and recall connections among people in their network suggests that these cognitive processes are often fraught with bias and error (Kilduff & Tsai, 2003). People tend to hold widely different perceptions of the same set of relations (Kilduff & Krackhardt, 1994; Krackhardt, 1987), and even overestimate the degree to which they are central in strong-tie networks (Kumbasar, Romney, & Batchelder, 1994). One reason for these distortions has to do with the sheer number of network connections likely present in many organizations. As Kilduff, Crossland, Tsai, and Krackhardt (2008: 15) explained, "Even a relatively small organizational network, consisting of 20 people, requires the individual to monitor hundreds of possible relationship pairs." To deal with the bewildering number of network connections, individuals many need to rely on pre-existing knowledge (schemas) about the patterning of social relationships (De Soto, 1960; Freeman, 1992; Janicik & Larrick, 2005).

However, the question of which individuals tend to come to distort their social networks through the use of schemas awaits an empirical answer. Who in organizations is likely to rely on schemas in social network perception, and in what way does the presumed reliance on schemas affect network perceptions? In this paper, we forward the proposition that one factor leading to the distortion of social network perceptions is power. Power changes how the brain handles information about the social world, inducing an increased reliance on heuristic processing (Keltner, Gruenfeld, & Anderson, 2003; Smith & Trope, 2006). When individuals rely on heuristics, they tend to anticipate where connections between people in their network should exist and “fill in the blanks” according to established cognitive schemas (Freeman, 1992). Combining research on power and abstract information processing (Smith & Trope, 2006) with evidence from social network perception studies of network schemas (De Soto, 1960, Freeman, 1992), we forward the proposition that power is linked to distorted perceptions of increased network density. These perceptions may lead managers to view the people they rely on in organizations as more cohesive than they really are, or overlook the sources of fragmentation in networks entirely. We further contend that one such consequence of power in organizations is to see these seemingly connected sets of individuals as easily mobilized to achieve a particular goal.

THEORY AND HYPOTHESES

Social Network Cognition

Scholarly interest in how well individuals can remember who is connected to whom has existed for at least half a century (De Soto, 1960; Freeman, 1992). Early studies presented participants with flashcards containing information about a relationship between two individuals (“Sam confides in Charlie”) and measured the average number of trials it took to learn these

relations (De Soto, 1960) and the kinds of errors participants made during learning trials (Freeman, 1992). These early studies established that the properties of a set of relationships (termed a social structure) affect learning and error rates. As De Soto (1960: 421) noted, "...a social structure is easiest to learn when it possesses the mathematical properties people expect in it."

Two of the common properties that people expect to see are balance and linear ordering, which are built on the principle of transitivity (Janicik & Larrick, 2005). If one individual is friends with another individual, then we expect to see reciprocity in the relationship. We also expect to see two people who are friends with the same individual to be friends with each other. In terms of linear ordering, we expect that, if a manager influences a subordinate, and the subordinate influences a new employee, then the manager will influence the new employee as well. It is important to note that both balance and the linear ordering schemas lead individuals to "fill in the blanks" (Freeman, 1992). When individuals engage in schematic processing of network connections, they are more likely to insert connections that are not there than miss connections that are actually there, presumably through the use of such schemas.

But do such schematic processing effects also tend to occur in real social networks (not merely fictitious relationships depicted on flashcards)? Recently, research has seen increased interest in studies of how individuals perceive, learn and recall organizational network connections (Ibarra, Kilduff, & Tsai, 2005; Kilduff & Brass, 2010). In general, these studies suggest that individuals assemble information about the social world in a fuzzy, simplified way. That is, when individuals tend to discern who is connected to whom, they tend to exaggerate the connectedness and centralization of individuals in networks. In friendship networks across four organizations, people reported more clustering ("small worlds") than actually existed, and

attributed greater popularity and brokerage to those they thought were popular than those who were actually popular (Kilduff et al., 2008). Further, people tended to see greater connectivity among their social contacts when they exhibited a strong need for cognitive closure (Flynn, Reagans, & Guillory, 2010), indicating that people come to distort their social worlds not merely on account of their inherent complexity, but also for reasons pertaining to individual cognitive factors.

Power and Network Cognition

As noted by several researchers (Keltner, Gruenfeld, & Anderson, 2003; Magee & Galinsky, 2008; Simpson, Markovsky, & Steketee, 2011), power is an important variable in social cognition. It is particularly relevant to managers and organizations, given the hierarchical nature of manager-employee relationships. Power is sometimes defined as control over valued resources (e.g., Magee & Galinsky, 2008), but not all who have resource control feel or wield their power. Therefore, we chose to adopt the perspective of other researchers who have described power as a psychological state (e.g., Anderson, John, & Keltner, 2011). There has been a surge of theorizing and empirical research on power in social psychology in the last decade (see Keltner et al., 2003, for a review), which has brought new understanding of the way in which power transforms perceptions of other individuals.

First, power changes how individuals interpret information (Fiske, 1993; Keltner et al., 2003). Powerful individuals tend to engage in more general, gist-based processing, which includes an increased reliance on heuristics. Lack of power, in contrast, encourages individuals to rely on deliberate, step-by-step processing, which is nuanced and focused on details (Keltner et al., 2003). In a series of experiments testing these theoretical claims, researchers found that power led individuals to extract the general features of stimuli and ignore details (Smith &

Trope, 2006). A neuropsychological experiment further reinforced these findings, showing activation in the right hemisphere, a part of the brain implicated in abstract information processing (Smith & Trope, 2006). Thus, when individuals experience power, they may be more likely to rely on cognitive heuristics that insert relations that may not be present, leading to distorted network perceptions of increased density.

Second, an experiment manipulating the experience of power and examining how well individuals recalled a fictitious set of influence relations among actors showed that power was associated with less accurate network perceptions (Simpson et al., 2011). In particular, although high-power and low-power participants did not differ significantly in their perceptions of ties that actually existed, high-power perceivers tended to recall relations between actors who did not actually have ties: "... those primed with high power were more likely than those primed with low power to state erroneously that non-existing ties originating at Ken, or ending at Mike or Bab, actually existed" (Simpson et al., 2011: 168). High-power participants in the experiment also accentuated the degree to which the influential actors held influence over others and the degree to which those being influenced were in fact influenced. These effects are consistent with the idea that power leads to heuristic processing of network information, which in turn leads individuals to rely on cognitive schemas and exaggerate the density of their network connections.

Finally, experimental research has demonstrated that power leads to reduced perspective taking (Galinsky, Magee, Inesi, & Gruenfeld, 2006). Certainly, recalling who is connected to whom in a social network is at least partly dependent on one's ability to take the position of others in the network and consider who they may approach for advice, or consider a personal friend. Failure to take another's perspective may lead to a distorted consideration of the company others keep. In the absence of direct experience with who is likely to be connected to whom, power

is likely to activate schemas, which in turn make it more likely for individuals to see connections that do not in fact exist.

We propose that network perceptions become distorted in terms of accentuated density on account of the power-holder tending to rely on preconceptions about who is related to whom. These preconceptions err in favor of a more connections, not fewer, hence our prediction in the direction of greater density. Here we draw the link between the network concepts of connectedness and density and research on entitativity—the tendency to see a set of individuals as a single entity (Campbell, 1958)—with an eye toward what consequences may face those who form perceptions of exaggerated connectedness.

Power and the Ease of Mobilizing Networks in Pursuit of Goals

What are the consequences of perceiving greater connectivity among individuals in a network? Recent evidence from experimental studies of network connectivity indicates that individuals tend to see a collection of people as an entitative group to the extent that they tend to interact with each other regularly (Igarashi & Kashima, 2011). This research highlighting the link between connectivity and entitativity is important, because studies of entitativity suggest that we make fundamentally different inferences about behavior when the target is a *group* instead of a *collection of individuals* (see Hamilton & Sherman, 1996), even when these inferences are based on the same information.

Forming an entitative perception of a set of individuals seems to have a squeezing effect on our judgments about their coordinated behavior. Instead of examining their individual motives and intentions, we tend to make sweeping judgments about the group (Hamilton & Sherman, 1996), such as believing they as a group are more agentic or homogeneous. Indeed, research on entitativity supports the assertion that the more we see a set of people as a collective

instead of a number of distinct individuals, the more we tend to see them as capable of coordinated effort and action (Spencer-Rodgers, Hamilton, & Sherman, 2007).

We apply this notion of entitativity to the concept of network connectivity to predict that powerful perceivers will see these seemingly dense networks as being more capable and willing of carrying out coordinated action as a group. Specifically, we anticipate that one such consequence of power is the tendency to think one's network contacts are more easily mobilized to pursue a single aim (when in fact nearly all individuals have multiple motivations and goals in the workplace), a phenomenon described as goal myopia (Ethiraj & Levinthal, 2009). Similarly, we also expect perceived network density to be related to goal instrumentality, or the perceived eagerness of individuals to help one with his or her goals. These elements of myopia and instrumentality are combined to form a variable we term goal mobility—seeing a set of individuals as capable of being mobilized (with more or less ease) for a given aim.

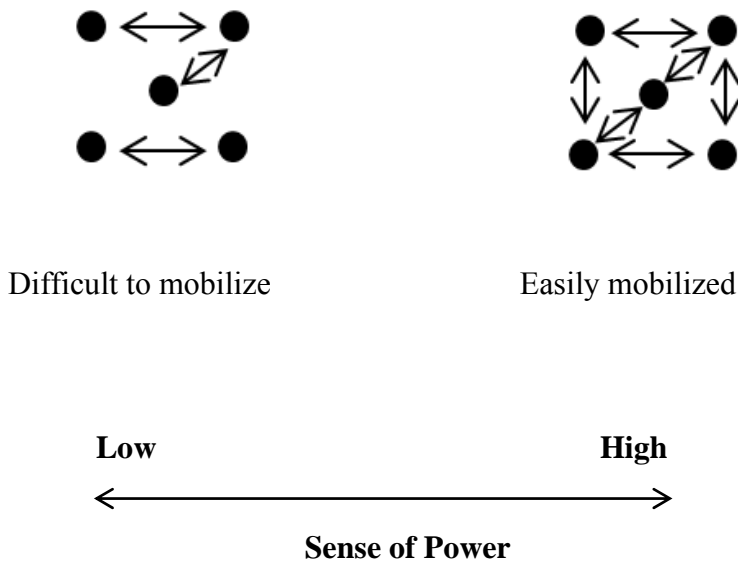
Overview and Summary of Predictions

We anticipate that power leads individuals to distort their perceptions of networks in terms of more connectedness. We base this prediction on two lines of evidence. First, power tends to promote schema-based, heuristic processing of social information, whereas the absence of power tends to focus the individual on more deliberate, detailed forms of processing (Keltner et al., 2003; Smith & Trope, 2006). Second, studies of cognitive heuristics in network perception suggest that the two default schemas for simplifying the social world, balance and linear-ordering, both involve inserting relations that may not exist (De Soto, 1962; Freeman, 1990). Taken together, power may transform the perception of social networks through an increased reliance on cognitive schemas, which leads individuals to insert relationships where none exist and accentuate their networks in terms of greater density.

We predict that one consequence of perceiving greater connectivity in a network is forming greater expectations concerning their eagerness and readiness for mobilized action. Research on entitativity has indicated that when people see a set of individuals as a group instead of a mere collection of separate individuals, they tend to believe the group is more coordinated and capable of agency (Spencer-Rodgers et al., 2007). More recently, studies have linked notions of entitativity to patterns of network connectivity, showing that perceived entitativity increases with network density (Igarashi & Kashima, 2011). On the basis of these results, one might expect that an accentuated perception of network density would produce inflated confidence in the willingness of individuals to be mobilized for action in pursuit of a particular goal. We present a summary of our predictions for perceived network connectivity and goal mobility in Figure 1.

FIGURE 1

Power Differences in Network Connectivity and Goal Mobility



METHODS: STUDY 1

Participants

We recruited individuals ($N = 122$) to participate in our study by advertising the research on the Amazon Mechanical Turk website. Participants in the sample were on average male (54.9%), on average 60.95 years old ($SD = 8.18$) and had completed at least some college (18.9%), a four-year university degree (41.0%), or a master's degree (22.1%). Most participants were employed full-time (67.2%) and indicated their occupation could be described as management, professional, or related (36.9%), service (13.1%), or sales and office (13.9%). The majority of participants resided and worked in the United States (60.7%) or India (36.9%); the sample was 48.4% White or Caucasian and 38.5% Asian. Nearly two-thirds of the sample indicated non-manager (as opposed to manager) as their rank in the organization.

Procedure

Participants were provided a link to an online survey. It was comprised of two sections. In the first section, we collected ego network data (Wasserman & Faust, 1994). In an ego network, each participant reports who they consider a friend at work. Specifically, we asked, "Over the last six months, who are the people you have been with most often for informal social activities, such as going out to lunch, dinner, drinks, visiting one another's homes, and so on? Please list the people you consider personal friends below." The names of their friends then populated a matrix in which the participant could indicate who is also friends with whom. These $n \times n$ adjacency matrices were used in the analyses of friendship network density. The maximum number of friends one could report was 11 ($M = 6.99$, $SD = 2.44$).

The second section featured a series of questions concerning their trait characteristics, perceptions of their friendship network at work, and demographic information. We describe the properties of these measures in the section below.

Measures

Personal sense of power. We measured individual differences in power with the personal sense of power scale (Anderson, John, & Keltner, 2003). We asked participants to consider friendships with the people they listed in the preceding section when responding to the items. The items included “I can get them to listen to what I say,” “I think I have a great deal of power,” and “Even when I try, I am not able to get my way” (reverse-scored). Participants rated themselves on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*). The items exhibited high internal consistency ($\alpha = .81$) and were summed to form an overall measure of personal sense of power.

Perceived friendship network density. In ego networks, it is assumed that each person is connected to the people they listed as friends. Therefore, we removed ties to ego (the participant) so that the networks consisted only of the participant’s perception of the ties among their friends. For each network, we computed a density statistic, which is the number of actual connections divided by the number of total possible connections (Wasserman & Faust, 1994).

Network size. Networks tend to become less dense with size, so we controlled for the number of contacts in each person’s network.

Goal mobility. There were no existing measures of goal mobility for use in network research to the best of our knowledge, so we created a scale capturing two aspects of mobility. The first aspect, goal myopia, refers to the tendency to impose a single goal on other individuals

to the exclusion of other goals (Ethiraj & Levinthal, 2009). We created three items to measure this aspect, asking participants to indicate the extent to which (a) it would be easy to get their friends to pursue a single goal they wanted achieved, (b) their friends would be willing to focus on just one task if they deemed it important, and (c) their friends would agree to prioritize a single goal if they felt it was necessary. Participants indicated their responses to these items on a scale from 1 (*not at all*) to 9 (*to a great extent*). The second aspect, goal instrumentality, was the extent to which their friends would help a person with his or her goals. We asked participants to indicate the extent to which (a) these people would be instrumental in helping with goals, (b) it would be easy to get these people to drop whatever they are doing and help with goals, and (c) one would be able to count on these people, no matter how busy they are, to help with goals. In this way, our measure of goal mobility captured both the perceived ease with which friends would drop everything and help with a single goal in addition to how easy it would be to mobilize them for any kind of goal. These items exhibited stronger internal consistency ($\alpha = .93$) and loaded on a single underlying dimension (eigenvalue = 4.50), explaining 75.06% of the variance. Items were summed to create an overall score for goal mobility.

RESULTS: STUDY 1

Exploratory Analyses

We computed a series of correlations among the demographic variables (age, gender, education level, location, managerial status, and ethnicity) and perceived friendship network density to determine the extent to which other variables may play a role in our results. The correlation between perceived friendship network density and managerial status was .15 ($p = .08$, one-tailed) suggesting that managers tend to see their networks as more dense. We also found a significant correlation for the expected relationship between density and network size ($r = -.26$, p

< .01), indicating that individuals with larger friendship networks reported fewer connections among their friends. We included both managerial status and network size to control for their possibly confounding effects on perceived friendship network density.

Hypothesis Tests

Our first prediction was that sense of personal power would be positively related to the extent to which individuals perceived their networks as dense. To test this prediction, we conducted a hierarchical multiple regression analysis with perceived network density entered as the dependent variable, the control variables (managerial status and network size) entered as predictor variables in the first step of the equation, and sense of personal power entered in the second step. The results revealed that sense of personal power was a significant incremental predictor of perceived network density ($\beta = .21, p < .05$), controlling for managerial status ($\beta = .16, p < .05$) and network size ($\beta = -.27, p < .05$), $F(3, 117) = 6.61, MSE = .04, p < .001$, adjusted $R^2 = .12$. The addition of sense of power to the model explained a further 3% of the variance in perceived network density, significantly improving model fit, $\Delta F(1, 117) = 5.26, p < .05$. These findings provide support for the prediction that power is positively related to the degree to which individuals accentuate their perceptions of the friendship network in terms of greater density.

We next predicted that power would lead individuals to perceive these seemingly dense friendship networks as more easily mobilized to pursue goals. To test this hypothesis, we conducted another hierarchical regression analysis with sense of power entered in the second step, network size and managerial status entered in the first step, and goal mobility entered as the dependent variable. Results supported the hypothesis that power is positively related to goal mobility ($\beta = .49, p < .001$), above and beyond other potential explanatory factors such as network size ($\beta = .28, p < .001$) and managerial status ($\beta = .02, ns$), $F(3, 117) = 14.70, MSE =$

69.42, $p < .001$, adjusted $R^2 = .26$. The inclusion of power significantly improved model fit, $\Delta F(1, 117) = 5.26, p < .001, \Delta R^2 = 21\%$.

DISCUSSION: STUDY 1

Recall that we predicted an additive model where power would influence the degree to which individuals perceived their networks as (a) having more connections among members and (b) being easily mobilized to pursue goals. The results from our hypothesis tests provide support for these predictions, indicating that power is a linear predictor of both perceived network density and goal mobility, independent of network size and the actual position of the individual in the organization as a manager or non-manager. However, there are two concerns with the current design: the direction of the presumed effect of power, and the appropriateness of friendship as the perceived network, which prompted us to launch a second investigation.

First, we cannot conduct a direct test of the issue of network perception accuracy (i.e., measuring distortion as the difference between *perceived* and *actual* network connections) because we do not have a baseline measure of actual network connectivity. It is possible that individuals embedded in dense networks feel more powerful because their friends are all friends with each other, enabling greater cooperation and compliance with influence attempts between members. In theory, as networks become more closed (i.e., there few missing relationships between individuals in a social network), individuals are more likely to cooperate with each other to establish reputational stability (Burt, 2005). The positive correlation between sense of personal power and perceived network density could be the result of individuals embedded in dense friendship circles reporting more power because their friends listen to them and respond to their requests. However, controlling for the actual density of the network would address this possibility.

Second, we chose friendship networks because previous research has indicated that they can be a decision-making resource within organizations (Kilduff, 1992). Other research on power and social network perception accuracy has found that individuals with more accurate perceptions of the advice network, but not the friendship network, were credited with greater reputational power (Krackhardt, 1990). This finding may suggest that advice relations may play a more central role in the influence pathways in an organization, with more perceptive individuals being rewarded for their network acuity with peer-endowed power. As such, advice relations may be less malleable to network distortion, given the need for accuracy in earning reputational power. We therefore decided to examine advice networks in our follow-up study to test the robustness of the effect of power on network distortion.

METHODS: STUDY 2

Participants

We invited students enrolled in the M.B.A. program at a U.K. university to complete an online survey in exchange for a personalized feedback report and £20. To encourage participation from all members of each work team, we offered an additional £5 if everyone in the group participated. One hundred and twenty-eight individuals completed the survey for a response rate of 88%. The sample was 29.78 years old on average ($SD = 2.77$) and had on average 6.5 years of work experience, and was 29% female.

Procedure

Participants were sent an individualized email with a link to the online survey. The survey contained three sections. In the first part, we described the study as research on personal characteristics and workplace perceptions. Thereafter we collected data concerning individual differences in each person's personal sense of power (described below).

The second section featured instructions for capturing each person's cognitive map of advice relations within their work team. There were 30 teams, and each team was allocated a consulting project with an external company. Every team met regularly throughout the term to work on their projects and develop consulting recommendations, which they finalized in a report submitted at the end of term. At the time of the study, participants had been working in their teams for approximately seven weeks, which is approximately the same point at which data collection took place in similar cognitive network research (Flynn, Reagans, Amanatullah, & Ames, 2006).

Each participant saw an individualized matrix containing the names of their team members along the top row and the left-hand column. We instructed them to place a check mark under the person's name along the top row if they thought the person on the left sought them for advice. Specifically, we asked, "Whom do you go to for help or advice if you had a question or problem? Such help or advice might include assistance on a course assignment, copies of notes from classes you may have missed, career consultants, or other things." We chose these examples following other research examining help relations among graduate business students (Flynn, et al., 2006) and because informal interviews with several students indicated that these were common reasons for seeking advice from a fellow student. Each person's matrix represented a "cognitive map" of the advice relations within the team network (Krackhardt, 1989), containing both self-reported advice ties and perceptions of others' ties. We chose to focus only on those advice relations within the team network because asking individuals to indicate who others went to for advice would be too time-consuming and cognitively demanding.

In the third section, we asked individuals to report their perceptions of how easily the members of their work teams could be mobilized to pursue a single goal or help with them with

their own goals (goal mobility). Demographic characteristics were collected from departmental records.

Measures

Personal sense of power. As in the previous study, we measured individual differences in power with the personal sense of power scale (Anderson, et al., 2003). The internal consistency of the measure was high ($\alpha = .88$).

Perceived advice network density. We created perceived advice networks for each individual. These advice networks consisted of whom they approached for advice and to whom they thought others went for advice within their study group. In other words, each perceived advice network was an individualized cognitive map of the advice relations within the team. For each network, we computed a density statistic, which is the number of actual connections divided by the number of total possible connections (Wasserman & Faust, 1994).

Actual advice network density. We defined an actual advice relationship as one in which both parties indicated that one person went to the other for advice, consistent with earlier research defining the existence of ties in the actual (aggregated) network (Flynn et al., 2006; Kilduff & Krackhardt, 1994). As with the perceived networks, we computed density statistics for each individual's network.

Goal mobility. We employed the same items to measure goal mobility as we had in the previous study. These items showed strong internal consistency ($\alpha = .93$) and loaded on a single unrotated dimension in a principal components analysis (eigenvalue = 4.46), explaining 74.34% of the total variance.

RESULTS: STUDY 2

Descriptive Statistics

The means, standard deviations and correlations among personal sense of power, perceived advice network density, actual advice network density, and goal mobility are found in Table 1. Individuals with higher personal sense of power scores did not occupy significantly denser advice networks ($r = .02, ns$). Although this relationship is not significant, it represents an important variable in our prediction, so we controlled for the actual density of networks in the regression analyses below.

TABLE 1
Means, Standard Deviations, and Correlations

Variable	Mean	s.d.	1	2	3	4
1. Sense of personal power	40.73	6.58				
2. Actual advice network density	.14	.12	.02			
3. Perceived advice network density	.29	.28	.18*	.18*		
4. Goal mobility	33.66	11.14	.34**	.17*	.27**	

* $p < .05$

** $p < .01$

Hypothesis Tests

We proposed that the degree to which individuals saw their network connections in terms of few missing relations would be predicted by one's personal sense of power, such that elevated power would be associated with an increased reliance on cognitive network schemas, leading individuals to see more connections than were actually present. To test our prediction, we regressed actual advice network density and personal sense of power onto perceived advice network density in a Poisson regression model. We estimated robust standard errors to adjust for

the slight violation of the distribution assumption in Poisson models that the variance equals the conditional mean (Cameron & Trivedi, 2009). Consistent with our prediction, we found that power was a significant predictor ($B = .03$, $SE = .01$, Wald $\chi^2 = 5.81$, $p < .01$) while controlling for the actual density of the advice network ($B = 1.37$, $SE = .63$, Wald $\chi^2 = 4.78$, $p < .05$), likelihood ratio $\chi^2 (2, N = 124) = 206.13$, $p < .001$.

As before, we anticipated that power would relate to the degree to which they saw their seemingly dense advice networks as willing and easy to be mobilized in pursuit of a single goal. In a least-squares multiple regression analysis, sense of power was a significant predictor of goal mobility ($\beta = .38$, $p < .001$), controlling for the actual density of the advice network ($\beta = .17$, $p < .05$), $F(2, 107) = 11.43$, $MSE = 95.22$, $p < .001$, adjusted $R^2 = .16$.

GENERAL DISCUSSION

Consistent with our proposition that power would relate to the degree of connectedness in advice networks, we found that sense of power led individuals to accentuate their networks in terms of greater connectedness, controlling for the actual density of advice network connections. This finding suggests that the psychological state of experiencing power may promote an increased reliance on heuristics, and such heuristics lead individuals to see relationships that do not exist (cf. Freeman, 1992; Simpson et al., 2011). We also found that power was a predictor of goal mobility, the tendency to think others will be easily mobilized to pursue a particular goal.

Theoretical Contributions

Our chief contribution lies in demonstrating how power is connected to heuristic processing and an increased reliance on cognitive schema, leading to distorted perceptions of network connectedness. This insight rests on joining two disparate streams of evidence. In one vein, psychologists examining how power affects social cognition have found that increases in

power are associated with more schema-based, heuristic processing of social information (Keltner et al., 2003; Smith & Trope, 2006). In another vein, cognitive network researchers have discovered that individuals tend to rely on two schemas when simplifying relations in social networks—balance and linear-ordering (De Soto, 1960; Freeman, 1992; Janicik & Larrick, 2005). One concerns the tendency for relations to be perceived as mutual and reciprocated, and the other concerns perceptions of the completeness of triads or hierarchical relationships. Use of either schema would lead individuals to anticipate a greater number of connections in a social network than may actually exist. By connecting research on power and heuristic processing to studies of network heuristics, we demonstrate the role of power in how individuals come to distort their perceptions of advice networks in the direction of greater connectedness. Powerful perceivers also exhibit goal myopia, assuming that their seemingly dense advice contacts will exhibit a strong willingness to pursue a single goal they want achieved.

Our research helps bring new understanding to the way in which characteristics of the perceiver (his or her sense of power) influence network perceptions. There is a cognitive tradition in network research emphasizing the characteristics of those being perceived reflected by researchers inspired by mathematical sociology emphasizing the properties of relations between people (e.g., De Soto, 1960). There is a similar tradition in cognitive social psychology investigating perceptions of togetherness and entitativity (e.g., Ip, Chiu, & Wan, 2006). Our research and theorizing presented here helps connect this research on connectedness to an important characteristic of the perceiver—his or her sense of personal power.

Limitations and Future Directions

Our findings should be interpreted in light of several considerations. First, one drawback of correlational research is that it provides limited evidence for causal inference. Does perceiving

an organizational advice network as a connected entity promote a heightened sense of personal power? Or is it the case that, as we argue, power influences the degree to which a network will seem connected? Future research could provide stronger evidence of the direction of this relationship by manipulating power (Magee & Galinsky, 2008) in an experiment and examining its effects on advice networks. If real advice networks differed significantly in their connectedness as a result of this manipulation, then one may have a stronger empirical basis for inferring the causal effect of power on network density.

Second, we investigated advice networks because they are important for gaining new insights and acquiring help from co-workers in organizations. Is it likely, however, that advice networks are the only form of network that is susceptible to distortion? Kilduff and Krackhardt (1994) studied (and found evidence for) extensive bias in friendship networks; Kilduff et al. (2008) did as well. Janicik and Larrick (2005) studied influence relations in Study 5 of their research on the learning of incomplete networks, and Simpson and colleagues (2011) built from the materials developed in their research when testing the experimental effects of power on network accuracy. In light of such results, it seems probable that other types of networks (e.g., friendship, influence) are susceptible to the distorting influence of power. Future research should examine different networks with an eye toward understanding the boundary conditions of the power—network distortion relationship.

Finally, there are multiple conceptualizations and measures of power (see Anderson, John, & Keltner, 2011, and Magee & Galinsky, 2008, for recent reviews). Some have defined it as control over valued resources (e.g., Magee & Galinsky, 2008), whereas here we have employed a conceptualization of power as a state variable. Although previous researchers have often found the same effects of power across different measurements, future research should

nevertheless combine different measures of power to ascertain the stability of these effects across measurement approaches.

Practical Implications and Conclusion

The research presented here suggests that managers in organizations may be more likely to overlook fragmentation in work teams than employees, given manager-subordinate differences in power. If our findings extend to networks in the workplace, we would expect powerful perceivers, such as leaders, to accentuate the extent to which the people they call upon for help and advice to be more connected than they really are. Misjudging the informal network of advice relations in an actual organization could lead to communication issues, such as when managers rely on certain individuals to pass along information to others who they do not in fact exchange advice with.

The organizational social networks in which we are embedded are susceptible to bias, including bias originating from systematic differences in power. To the powerful, individuals in advice networks appear cohesive and interconnected; to the powerless, advice contacts appear fragmented and divided. It is therefore important for leaders and other individuals with a strong sense of power to understand their tendency to overstate the degree to which their advice networks are connected—and in doing so, they may avoid the consequences of misjudging such informal relations.

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FROM LOCAL PERCEPTIONS TO NETWORK-WIDE PATTERNS: THE EFFECTS OF STATUS BIAS ON JOB SATISFACTION^a

Abstract

We investigate how individuals systematically misperceive the pecking order in an organizational friendship network. People generalize from the perceived structure of their local friendship connections to the structure of the whole network, misperceiving more or less status differentiation, depending on their actual positions in the friendship network. In an analysis of 47 key employees of a high-tech organization, we found that people misperceived the extent to which a few people garnered most of the social capital. Individuals who were in actual fact central players in the network tended to overestimate the extent of status differentiation. They saw the friendship network as exhibiting gross inequality – a few actors with access to many friendship opportunities, whereas other actors were perceived as having few friendship opportunities. Marginal individuals tended to underestimate status differentiation locally and across the organization. The extent to which the individuals over- (or under-) estimated status differentiation in the perception of the whole network was mediated by the extent of perceived status differentiation in the local network. The more that individuals perceived status differentiation across the whole friendship network in the organization, the less the individuals found their jobs in the organization satisfying. Further, individuals felt better about their jobs if they saw little rivalry from their colleagues for positions of high popularity in the friendship network. This paper depicts the individual as occupying a distinctive perceptual niche from which an idiosyncratic social world is constructed, with implications for work outcomes.

^a Paper co-authored with Soong Moon Kang (University College London) and David Krackhardt (Carnegie Mellon University).

Status is important to human beings in work organizations, both formal status (e.g., hierarchical position) and informal status (e.g., popularity). But the informal status ordering of others in the workplace -- the pecking order of who is more popular than whom -- can be difficult for the individual to gauge. Even perceiving accurately who is friends with whom proves to be a difficult task for many people (cf. Krackhardt 1990). People create simplified cognitive maps of friendship relations in organizations (cf. Freeman 1992) to anticipate likely coalitions and cliques (cf. Janicik and Larrick 2005). We have little knowledge, however, of how status orderings of relationships in organizations are perceived, nor what the effects of such perceived status orderings are likely to be on individuals. In this paper, we examine how individuals perceive status both among their immediate contacts and across the network; and we gauge the effects of such perceived status ordering on how satisfied people are with their jobs.

Most jobs involve social interactions with colleagues. This is true for not just for office jobs, but for all work in which people depend on others for social support, evaluation, and job completion. Thus, in the Hawthorne research, wire bonders established social relationships within and across groups. The wire bonder with the most friendship connections in his group enjoyed the highest social status, and was seen as a leader by his colleagues (Roethlisberger and Dickson 1939: 374-375). This informal social status was, according to the research, causally related to job satisfaction (Roethlisberger and Dickson 1939: 375).

In the modern history of job design, the social aspect of work was at first included in terms of two dimensions -- dealing with others and friendship opportunities (Hackman and Lawler 1971). But these two dimensions were dropped from the dominant job design model (Hackman and Oldham 1976). More recently, social relationships have been shown to affect employees' well-being (Myers 1999), and these social relationships have been posited to

facilitate many outcomes including prosocial behavior (Grant 2007). A social network approach to job design has suggested moving forward the emphasis on social relationships with specific reference to the perception of social relations, and especially brokerage (Kilduff and Brass 2010a).

Work, it is argued, tends to be viewed through the prism of social relations within which the job is embedded (Kilduff and Brass 2010a: 315). But individuals' perceptions of friendship relations differ widely even though these individuals perceive the same set of relations among the same group of people (Kilduff and Krackhardt 1994). Evidence suggests that it is the individual's perceptions of social relations immediately surrounding the individual that affect outcomes such as promotions and bonuses (Burt 2007). But how these perceptions of the local landscape of relationships relate to the larger landscape across the whole organization has not been studied. Nor has there been an attempt to relate differences in social network perceptions to affective outcomes such as job satisfaction. In this paper we examine perceptions of the friendship network among the complete set of managers and supervisors of a small electronics company to test hypotheses relating to status ordering (locally and across the whole network) and job satisfaction.

THEORY AND HYPOTHESES

When people enter a new social situation they are motivated to develop an overall picture of the whole group so as to be able to find a place for themselves within that group (von Hecker 1993). The process of understanding the social network and one's place in it is of importance in many settings, including work organizations where social networks are vital aspects of coordination and control. However, the task of forming a complete cognitive picture of even a small social organizational network poses a cognitive challenge given the necessity of

monitoring hundreds of possible pairs of relationships. Thus, people rely on various cognitive shortcuts and simplifications (Freeman 1992). We ask the question in this paper: to what extent do people generalize from the local structure around them in forming a picture of the distribution of social status across the whole social network and what effect does this have on job satisfaction?

In organizational settings, it is the immediate set of connections surrounding the individual that affects important outcomes such as pay and promotions (Burt 2007). Therefore, it is this immediate network and its structure to which the individual is likely to be most influenced by and to pay most attention to (Pattison and Robins 2002). We investigate whether people overestimate the extent to which their local experience of a social network generalizes to the whole network of social interaction in an organization. Given the complexity of keeping track of all the social network connections, do people fall back on the heuristic that the whole network is likely to resemble in its structuring the local part of the network with which they are familiar?

Of particular interest is the perceived structuring of status inequality. Social status is, in part, the extent to which an individual is admired by others (Magee and Galinsky 2008: 359). This admiration is signaled by the extent to which the actor is the recipient of many social ties: “an actor’s status is fundamentally a consequence of the network ties that are perceived to flow to the actor” (Podolny 2005: 5). As this last definition makes clear, social status is inherently subjective -- it “exists entirely in the eyes of others” (Magee and Galinsky 2008: 364). But the process by which people attribute either high or low status to others is poorly understood despite its importance in organizations and in society more generally (Cattell 2001).

One contribution of the current paper is a better understanding of this status differentiation process. A second contribution is to the developing literature on network

cognition. Theory and evidence suggest that people develop expectations (i.e., cognitive schemas) concerning social structure based on their prior network experiences. For example, people who have experienced disconnected networks are likely to anticipate finding patterns of disconnections when attempting to learn new networks or deal with social network problems in new settings (Janicik and Larrick 2005). But the extent to which people generalize from the local to the global in trying to keep track of the status differentiation in friendship networks has not hitherto been studied. A third contribution of the current research concerns a possible outcome of social network bias. Prior work has identified systematic distortions in how people perceive friendship networks (see the summary in Kilduff and Brass 2010a), but has neglected to investigate whether such distortions relate to job satisfaction.

Local-to-Global Cognitive Extrapolation of Status Differentiation

We approach this local-to-global cognitive extrapolation process with two related ideas. First, is the idea that people build cognitive maps that anticipate the structuring of the complete organizational network within which they participate, and these cognitive maps are subject to systematic distortion (Krackhardt and Kilduff 1999). But second, is the idea that each person does in actuality occupy a distinctive status in the social network (in terms of how much admiration they receive from others) and this personal experience in the network forms the basis for anticipating the structure of the social network. Across several areas in social psychology there is evidence that people bias their perceptions by overweighting their personal experience. For example, people exaggerate the degree to which their future preferences will resemble their current ones (Loewenstein et al. 2003), they tend to be biased concerning the extent to which their own choices and judgments are shared by others (Ross et al. 1977) and, for aspects of organizational life that are not highly visible, the more central individuals are, the more they

suffer from a false consensus bias -- overestimating the extent to which others share their views (Flynn and Wiltermuth 2010). Thus, the actual experience of people is likely to be the basis upon which they develop schematic understandings of how status is distributed across the difficult-to-discern friendship network, with the individual's status in the network the key to understanding how global structures are assembled from local experience.

Building from network schema theory (e.g., De Soto 1960; Freeman 1992), we predict that individuals will learn from local, salient experience of social network status differentiation to anticipate that the structures experienced locally will tend to repeat across the whole network. In network research, there are various models that can serve as bases for cognitive schema including the extent to which the individual perceives brokerage (Janicik and Larrick 2005). The extent to which individuals perceive brokerage in organizations has been linked theoretically to entrepreneurial motivation (Burt 1992: 35-36), but not to job satisfaction. Figure 1 illustrates both high and low brokerage in an organization. The top half of the figure (Figure 1a) shows the case of three brokers whose contacts are themselves disconnected, exhibiting the classic situation of spanning across structural holes (Burt 1992). These three brokers dominate the status ordering of this particular organization in that they are the recipients of many friendship connections, whereas each other actor has only one connection. This, then, is a picture of high status differentiation in which there is gross inequality between the few actors who have access to many friendship opportunities and many other actors who have much less access.

In Figure 1b there is much less evidence of brokerage. The outer ring of disconnected dyads and triads exhibits closure in that all possible connections are present. The inner two rings in Figure 1b exhibit a pattern in which no actor within one of the rings has any advantage over any other actor: all actors have the same number of connections, and, therefore, there is no

brokerage advantage. Thus, Figure 1b illustrates the situation in which each actor has zero status differentiation in that every actor is connected to others who have the same number of connections.

Figure 1 about here

Our interest is in perceptions of friendship networks. Who is likely to see the network more in terms of the top half of Figure 1 rather than the bottom half? We predict that individuals who experience the admiration of many others -- who have many people seeking them out to be friends -- are likely to overestimate the extent to which highly central people like themselves tend to be recipients of such friendship importuning. Like nobles receiving the admiration of their numerous dependents, the highly central will, we anticipate, tend to see both their local neighborhood and the whole network in terms of an elite structure. Centrally located actors are likely to perceive many connections to a few central hubs -- a bias toward overestimating the extent of status differentiation.

HYPOTHESIS 1A. *The more central the individual is in the actual network, the more status differentiation the individual will perceive in the local network.*

HYPOTHESIS 1B. *The more central the individual is in the actual network, the more status differentiation the individual will perceive across the whole network.*

The bottom half of Figure 1 illustrates the situation of marginally located people who will tend to see the whole network in terms of their own perceived local network of lowest status differentiation: marginal people connected to other marginals, whereas high status people are connected to other high status people. From the perspective of marginal people, who have no

experience of numerous others seeking to be their friends, the world is likely to be fragmented into like seeking like: marginals connecting with other marginals whereas the highly central seek each other. The marginal individual is likely to cognitively structure the whole network in terms of a caste system so that people of the same network status (in terms of numbers of connections) will tend to be connected to each other.

What this discussion highlights is the idea that to the extent that actors have low status, they will tend to underestimate the extent of local and global status differentiation, whereas to the extent that actors have high status, they will tend to overestimate the extent of local and global status differentiation. Thus, a proper test of Hypothesis 1 will require checking to see if both parts of the hypothesis are supported equally for high and low status individuals.

Figure 2 about here

Hypothesis 1B is indicated by the arrow across the top of Figure 2, indicating the relationship between actual actor status and perceived global status differentiation; and Hypothesis 1A is indicated by the arrow leading from actual actor status to perceived local status differentiation. But, the process by which actor status leads to global perceptions across the whole network is, we believe, likely to be mediated by the perception of status differentiation locally (as depicted in Figure 2 by the arrows in the bottom half of the figure).

Thus, we predict:

HYPOTHESIS 2. The relationship between the individual's actual status in the friendship network and the extent to which the individual overestimates status differentiation in the

perception of the whole network will be mediated by the extent of perceived status differentiation in the ego network.

Job Satisfaction

Does it matter whether the individual sees the whole network in terms of status differentiation? That is, are there any consequences for viewing the organizational friendship network as consisting of a few people who are intensely admired, with each admired person connected to many less connected admirers? Although there is no research on this topic, we can extrapolate from some related ideas concerning status and reputation to assert that, in all likelihood, perceiving status differentiation is likely to have negative effects on the individual's experience at work. According to one argument, if high status people are perceived to associate with those of lower status, then this tends to undermine respect for those of high status (Podolny 2005). High status people in organizations who are perceived to befriend those of lower status confer reputational benefits on their perceived friends irrespective of their friends' actual performance (Kilduff and Krackhardt 1994). Thus, the perception of status differentiation is likely to be associated in the perceiver's mind with the persistence of inequality and unfairness. At the more macro level, perceptions of inequality in society tend to make people unhappy (Alesina et al. 2004). Thus, we predict:

HYPOTHESIS 3. The more the individual perceives status differentiation across the whole friendship network in the organization, the less the individual will find his or her job in the organization satisfying.

But this prediction tells only part of the story we would expect to see exhibited in actual organizational life. The individual is likely to weigh his or her status relative to what others in

the organization appeared to have achieved. Extending social comparison theory (Festinger 1954) and cognitive network comparison research (e.g., Burt 1982) to this case, we make the following moderation hypothesis involving both local status differentiation and global status differentiation. We predict that individuals who perceive their own status to be high in terms of themselves receiving many friendship nominations will be more satisfied with their jobs to the extent that they perceive status in the organization more generally to be evenly distributed -- in which case they perceive few if any rivals for prominence. However, individuals who perceive their own status to be low in terms of themselves receiving few if any friendship nominations will be less satisfied with their jobs to the extent that they perceive status in the organization more generally to be unequally distributed -- in which case they perceive others enjoying much more prominence than themselves. More formally stated, we expect:

HYPOTHESIS 4. Perceived local status differentiation will moderate the effect of perceived global status differentiation on job satisfaction such that job satisfaction will be high when perceived local status differentiation is high and perceived global status differentiation is low; but that job satisfaction will be low when perceived global status differentiation is high and perceived local status differentiation is low.

METHODS

Sample

The research site was a small regional distributor of electronic components that employed 162 people at its headquarters and four branch offices.¹ Forty-seven of the employees (24 men and 23 women) were paid \$10 each to complete a questionnaire.² These employees consisted of all the supervisors, management personnel, and other key operating personnel in accounting,

purchasing, and manufacturing. Thus the sample consisted of the entire operational core of the organization. (See Krackhardt and Kilduff 1990, for more details concerning the sample.)

Perceived friendship network. To capture participants' perceptions of friendship relations, we asked each respondent the following question about every other person on the questionnaire: "Who does this person consider to be a personal friend? Please place a check next to the names of those people who that person would consider to be a friend of theirs." Each question was followed by a list of all 48 names of coworkers so that we were able to calculate for each respondent a complete cognitive map of his or her perception concerning who was friends with whom across the whole sample. A perceived friendship tie between persons i and j was presumed to exist when the respondent indicated on the questionnaire that person i considered j a friend and also that person j considered person i a friend.

Actual friendship network. To measure the actual friendship network we determined the locally aggregated structure (Krackhardt 1987) as follows: a friendship tie existed from person i to person j only if both people agreed that it existed. Note that this definition allows for asymmetric friendship ties in cases where both people agree that a friendship tie is unreciprocated.

Variables

Actual status was measured as a count of the number of friendship nominations received by each individual, i.e., indegree centrality (Freeman 1979). In this study, given the asymmetric nature of friendship ties, indegree was the natural measure of status, or prominence. In social network research, "Prominent leaders are the objects of extensive relations from followers, while the latter are the objects of few relations" (Knoke and Burt 1983: 199).

Perceived status differentiation. For each individual in the organization we collected the complete set of perceptions of the friendship network, so that we had a cognitive map of how each person saw the relationships among colleagues. From prior research (e.g., Kilduff and Krackhardt 1994) we know that individuals' perceptions of the very same set of actual friendship relations vary dramatically. In the current instance, we were interested in differences in how individuals perceived the distribution of status across the friendship network. We anticipated that some people would see a pattern resembling the top half of Figure 1 (Figure 1a) whereas other people would see a pattern resembling the bottom half of Figure 1 (Figure 1b). That is, some individuals would perceive the friendship network in terms of status differentiation (relatively few people garnering most of the admiration), whereas other individuals would perceive less differentiation.

More formally, perceived status differentiation was measured for each individual in the sample as the extent to which the individual's cognitive map of the friendship network exhibited dissimilarity in terms of centrality based on Euclidean distance. (See Kang 2007, for further information and illustrations of this measure.) *Perceived local status differentiation* represented the extent to which the respondent depicted the pairs of friends within his or her own self-perceived ego network as exhibiting dissimilar centralities, and was given by the expression:

$$\text{local status differentiation for ego } p = \left[\frac{\sum_{\{p \leftarrow q\}} (c_p - c_q)^2}{D_p} \right]^{1/2}$$

where c_p and c_q indicate the normalized indegree centrality of ego p and alters q ; and D_p is the indegree of ego p . The term $(c_p - c_q)^2$ is summed for all q that have a directed tie to p . The local status differentiation measures the average dissimilarity between ego and alters in terms of

centrality. For example, for actor 1 in Figure 1a, the local status differentiation is .351. For any actor in Figure 1b, the local status differentiation is zero because connected pairs of actors, c_p and c_q , have the same centrality, and thus have the lowest possible status differentiation.

Perceived Global Status Differentiation represented the extent to which the respondent depicted pairs of friends across the whole friendship network beyond the perceived ego network as exhibiting dissimilar centralities, and was given by the expression:

$$\text{global status differentiation for ego } p = \left[\frac{\sum_{\{i \leftarrow j\}, i \neq p} (c_i - c_j)^2}{M - D_p} \right]^{1/2}$$

where c_i and c_j indicate the normalized indegree centrality of actors i and j ; and M is the total number of edges in the network. The term $(c_i - c_j)^2$ is summed for all j that have a directed tie to i and i is not p . We exclude ego p in order to avoid an artificial confound between local status differentiation and our assessment of global status differentiation. The global status differentiation measures the average dissimilarity in terms of centrality between all pairs of connected actors in the network, excluding the ego network. For the network depicted in Figure 1a, the global status differentiation for actor 1 is .347. For the network illustrated in Figure 1b, because the connected pairs of actors have the same centrality, the global status differentiation is zero.

Job satisfaction was measured using the five items from the Michigan Organizational Assessment Questionnaire (Cammann et al. 1983). These items consisted of seven-point Likert scales with end points labeled “strongly disagree” and “strongly agree.”

Hierarchical level in this sample was distributed across five levels, with the five members of the top executive committee given the value 5, the heads of departments and branch

offices given the value 4, managers given the value 3, supervisors given the value 2, and other employees given the value 1.

Perceived density was measured in each cognitive map of the friendship network as the proportion of ties in the map divided by the maximum possible number of ties. Thus, for each respondent we calculated a number between 0 and 1 that indicated the proportion of all possible friendship links that were perceived to exist.

Other controls. We investigated the effects of age, tenure, and local and global dissimilarity measures based on age and tenure, but none of these variables had significant effects in our models, and were therefore dropped.

Testing for Structural Artifacts

One common problem in performing traditional statistical tests on data derived from networks is that the structural features in the data may induce artificial associations in constructed variables (Krackhardt and Kilduff 1999; Faust 2007). For example, obviously density of perceived graphs could have an impact on all the network variables constructed in this paper – hence we control for density in the perceived graphs in the regressions. Less obvious is the linearity of these relationships. It could be, for example, that lower densities in the perceived graphs provide little opportunity for (random) status differentiation; moderate densities induce far more (random) instances of status differentiation; and high densities may tend to ameliorate these (random) differentiated instances. Other types of structural features may also bias the statistics in our linear models. For example, the proposed relationship between “actual status” (that is, centrality on the “actual” network) may be related to perceived local status differentiation simply because a high status individual is going to have a higher than normal indegree, and therefore it is likely that their neighbors (randomly selected) will have lower

indegree, and thus there will be a natural tendency toward seeing a more status differentiation even if the network is randomly generated.

Statistically it is difficult to model all of these sources of confounds that may occur due to (random) structural features in the graphs, perceived and real. Therefore, we conducted a series of Monte Carlo simulations to determine whether these features may indeed be driving the results reported in this paper. Specifically, we generated 10,000 random network data sets that mimic the structural features in our observed networks. Thus, the rules for generating each random network carefully preserved the density of the perceived friendship network of each respondent. That is, in each generated data set, we generated 47 “perceived” 48-node networks; the first network had an expected density that was identical to person #1’s perceived friendship network in the real data; the second network had an expected density equal to person #2’s perceived friendship network in the real data, etc. In this way we captured both the structural features and the variance in these features as might be induced randomly. We then re-ran the following regression models 10,000 times each on these randomly generated data sets and compared the distribution of resulting regression coefficients found in these analyses with the observed ones in our data:

$$\text{Perceived Global Status Differentiation} = \alpha_1 + \beta_1 \text{Actual Status} + \gamma_1 \text{Density} + \varepsilon_1 \quad (1)$$

$$\text{Perceived Global Status Differentiation} = \alpha_2 + \beta_2 \text{Local Status Differentiation} + \gamma_2 \text{Density} + \varepsilon_2 \quad (2)$$

$$\text{Perceived Local Status Differentiation} = \alpha_3 + \beta_3 \text{Actual Status} + \gamma_3 \text{Density} + \varepsilon_3 \quad (3)$$

where α_i is the intercept, β_i and γ_i the unstandardized coefficients, and ε_i the error term. The resulting unstandardized coefficients, β_i , formed distributions of 10,000 values against which

the actual unstandardized coefficients, $\hat{\beta}_i$, from our data could be compared to see the extent to which our reported results could have been achieved by chance.

The results of the Monte Carlo tests of the regression coefficients were as follows: the distribution of unstandardized regression coefficients of perceived global status differentiation on actual status (β_1 from Equation 1 above) shows that 99 percent of the β_1 coefficients generated in these random networks ranged from -0.1 to 0.1, with a mean and mode around 0. The estimated $\hat{\beta}_1$ parameter in our observed data was 0.307 ($p < 0.01$), larger than any of the coefficients generated in the 10,000 simulated graphs. Thus, it is prudent to say that the observed estimate for Equation 1 is not an artificial consequence of the structure of the perceived graphs.

The results for perceived global status differentiation regressed onto perceived local status differentiation (β_2 in Equation 2) are important because if we were to find any association between the network structures and these measures, it was likely to show up here. Indeed, we saw in the histogram of the Monte Carlo simulation that an artificial expected coefficient emerges (mean $\beta_2 = 0.041$), with a wide range of possible coefficients over these 10,000 simulated networks ranging from -0.24 to 0.30. However, our observed estimated $\hat{\beta}_2$ coefficient is 0.320 ($p < 0.001$), suggesting that this relationship is also greater than we could ascribe to an artificially induced one by the structure of the network data themselves.

The result for β_3 in Equation 3, regressing perceived local status differentiation on actual status was another example where we might speculate that there is likely to be an induced relationship. Indeed, we saw that there is a naturally induced positive coefficient that results from these structures (mean $\beta_3 = 0.142$), with an even greater range than we have seen in the

prior cases (from -0.4 to 0.61). However, the estimated coefficient from our observed data ($\hat{\beta}_3$) is 0.986 ($p < 0.001$), which is 62 percent larger than the maximum found across 10,000 simulated data sets. Again, we conclude that this observed coefficient is greater than we would expect due to the variations in structural features across these perceived networks.

RESULTS

Table 1 presents the means, standard deviations, and zero-order correlations among the variables. The table shows that most people perceived both the local and the global network as exhibiting low status differentiation. The means for perceived local and perceived global status differentiation were quite low (both 0.09). People in this organization were relatively happy in their jobs, with the average job satisfaction score on a seven-point scale equaling 5.62. In terms of the predicted relationships among the variables, we see that the actual status of the individual correlated significantly with the extent to which the individual perceived local status differentiation ($r = 0.88, p < 0.001$) and global status differentiation ($r = 0.63, p < 0.001$), whereas the individual's perceptions of local status differentiation also correlated highly with the individual's perceptions of status differentiation across the whole network ($r = 0.74, p < 0.001$). So, the elements were in place for possible support for the mediation model depicted in Figure 2.

Tables 1 and 2 about here

First, was it the case that high status people (relative to low status people) perceived the local networks around them as ones in which they garnered many nominations from admirers, as suggested by Hypothesis 1A? Table 2 shows that the answer was: yes. The first model in this table shows that the control variables captured 63 percent of the variance. But Model 2, in which

the variable representing the actual status of the individual was introduced, shows that variance explained was boosted significantly to 84 percent.

We provide in Figure 3 a graphical depiction of the relationship between actual status and perceived local status differentiation to check whether Hypothesis 1A is supported for both those of high status and those of low status. This figure shows the test of the idea that individuals occupying central positions in the friendship network will tend to overestimate, whereas individuals occupying marginal positions will tend to underestimate, the extent to which status differentiation characterizes the perceived local network. Figure 3 indeed shows that low status actors are clustered around the perceived status differentiation regression line as it falls below the line representing actual status differentiation, whereas high status actors are clustered around the perceived local status differentiation regression line as it rises above the line representing actual status differentiation.

Statistically speaking, for us to have confidence in these depictions, the intercept of the regression line of the perceived local status differentiation on actual status should be lower than the intercept of the regression line of the actual local status differentiation on actual status, and the regression coefficient of the perceived local status differentiation should be greater than the regression coefficient of the actual local status differentiation. The intercept of the perceived local status differentiation regression line was 0.004 with the 95 percent confidence interval between -0.015 and 0.022, whereas the intercept of the actual local status differentiation regression line was 0.035 with the 95 percent confidence interval between 0.022 and 0.048. The regression coefficient of the perceived local status differentiation was 1.195 with the 95 percent confidence interval between 0.994 and 1.396, whereas the regression coefficient of the actual local status differentiation was 0.35 with 95 percent confidence interval between 0.217 and

0.484. So, these patterns in Figure 3 support Hypothesis 1A for both low status and high status people.

Second, was it the case that people enjoying high status in the organization (in terms of receiving many friendship nominations from others) perceived, when looking across the network, a pattern similar to the one that they themselves enjoyed: status inequality in terms of a few people having lots of nominations connected to others with few nominations (Hypothesis 1B)? The answer is: yes. Looking at Table 3, we see that Model 1 (incorporating the control variables) captured over 50 percent of the variance in perceived global status differentiation. In Model 2, we add the independent variable actual status of the individual, and this contributed significantly to explain variance, boosting the adjusted variance explained to .58. So, there was a tendency for high status people to see the whole friendship network in terms of other high status people like themselves connected to lots of admirers as suggested in Hypothesis 1B.

But was this hypothesis supported equally for high status and low status individuals? Figure 4 shows that this was indeed the case. Low status actors tended to underestimate the extent of global status differentiation. This is shown in Figure 4 with the tendency for low status actors to be clustered around the perceived regression line as it falls below the line representing actual global status differentiation. Similarly, high status actors tended to overestimate the extent of global status differentiation. Figure 4 shows high status actors to be generally clustered around the perceived regression line as it rises above the line representing actual global status differentiation.

Statistically speaking, for the results in Figure 4 to hold, the intercept of the regression line characterizing the perceived global status differentiation on actual status would have to be less than 0.084 (the average actual global status differentiation) and the regression coefficient

(i.e., the slope) would have to be greater than zero. The intercept of the regression line was 0.051 with 95 percent confidence interval between 0.032 and 0.07. The regression coefficient was 0.558 with 95 percent confidence interval between 0.353 and 0.763. The patterns in Figure 4, therefore, support Hypothesis 1B.

Table 3 and Figure 4 about here

So, we know that the extent to which people actually achieved status in this organization predicted the extent to which they saw the whole friendship network in terms of people of high status connected to people of low status, and this pattern also occurred locally in their own friendship network. But was this perceived local pattern the key to understanding how individuals constructed their perceptions of the whole network? That is, were perceptions of the global network mediated by perceptions of the local network, as predicted by Hypothesis 2? The answer is: yes. Model 3 in Table 3, shows that perceptions of the extent of local status differentiation were significantly predictive of global patterns, and this relationship between local perceptions and global perceptions remained significant even when we included the actual status of the individual (Model 4). Thus, there was complete mediation as predicted. To the extent that people actually had status in this organization in terms of receiving friendship nominations, they tended to see the network within which they were locally embedded as one in which they were recipients of admiration nominations. Support for the mediation model suggests that people extrapolated from this perceived local pattern to construct a global cognitive map of how the whole friendship network was structured.³

To check this result, we used the bootstrapping method with bias-corrected confidence estimates proposed by Preacher and Hayes (2004; 2008). The analyses and bootstrap estimates were based on 10,000 bootstrap samples. The bootstrap results showed that the total effect of actual status on perceived global status differentiation (total effect = 0.29; $p < 0.01$) became non-significant when perceived local status differentiation was included in the model (direct effect of actual centrality = -0.09; *ns*). The total indirect effect through the mediator was significant with a point estimate of .38 for actual status and a 95 percent bias-corrected and accelerated confidence interval of 0.12 to 0.63.

Table 4 about here

Job Satisfaction

Does it matter if people see the friendship network in terms of low or high status differentiation? We predicted that it would matter in terms of how much people expressed satisfaction with their jobs (Hypothesis 3). And the regression models in Table 4 provide support for this prediction. Model 1 in Table 4 shows that people of higher hierarchical level tended to be more satisfied with their jobs ($\hat{\beta} = 0.18, p < 0.1$). But when we add the measure of the extent to which people perceived status differentiation across the whole friendship network in model 2, we see that perceiving such status differentiation was associated with significantly lower job satisfaction ($\hat{\beta} = -11.05, p < 0.01$) in support of Hypothesis 3.

Figure 5 about here

We also predicted that this effect of perceived global status differentiation on job satisfaction would be moderated by how people perceived their own statuses locally (Hypothesis 4). That is, people would tend to feel worse about their jobs to the extent that their own local status was perceived to be low whereas they saw others in the organization enjoying high status. This hypothesis was supported, as shown in Table 4, Model 3, where the interaction term boosted explained variance by 8 percent ($\hat{\beta} = -81.47, p < 0.05$). Figure 5 illustrates the interaction effect, showing that job satisfaction tended to be high when local status differentiation was perceived as high and global status differentiation was perceived as low; and job satisfaction tended to be low when local status differentiation was perceived as low and global status differentiation was perceived as high. Interestingly, when local status differentiation was perceived as high and global status differentiation was also perceived as high, the individual experienced the lowest job satisfaction.

In summary, we found support for the proposed mediation model by which people of low status tend to underestimate and people of high status tend to overestimate the extent of status differentiation in the friendship network. The results support the view that people tend to extrapolate from the status differentiation they perceive locally in constructing their cognitive maps of the whole network. Further, the results show that to the extent that people tend to perceive friendship relations exhibiting status differentiation, they tend to be less satisfied with their jobs, and this tendency is exacerbated to the extent that people see others enjoying high status differentiation.

DISCUSSION

People perceive status structuring within organizational friendship networks through the prism of their local set of network relationships. Prior work has shown individuals tend to

perceive the structure of their own friendship connections in organizations as similar to the structure of friendship connections among those at the edges of their social networks (Krackhardt and Kilduff 1999). There is also evidence that, in general, status hierarchies tend to be accepted by both those with low status as well as those with high status (Magee and Galinsky 2008). But how individuals distribute their perceptions of status across organizational networks has hitherto been neglected.

There is extensive evidence that the higher the social status of the individual in terms of work grade the healthier the individual and the longer lived -- see the celebrated UK civil service studies (Marmot et al. 1991; 1995). Compatible with these findings, we found that the level of the individual in the formal hierarchy of the organization significantly predicted job satisfaction. But on top of this effect, we found that how people perceived their own informal status relative to how they saw the distribution of status across the organization also significantly affected job satisfaction. It wasn't the enjoyment of high informal status that made people feel positive about their work. Rather, individuals felt better about their work if they saw little rivalry from their colleagues for positions of high popularity in the friendship network.

Job satisfaction and job design research are both undergoing a renaissance with new evidence concerning a genetic component affecting job satisfaction (Song et al. 2011) and new emphases on the importance of social characteristics with respect to job satisfaction (e.g., Humphrey et al. 2007) and job design (see Grant and Parker 2009, for a review). Our paper contributes to this resurgence of interest an emphasis on perceptions of status ordering, bringing to bear on this typically micro organizational behavior topic an emphasis from the more macro realm of organizational status (see Magee and Galinsky 2008, for a review). People enjoying high informal status in organizations may well protect their feelings of privilege by biasing their

perceptions to accentuate status inequalities. Ironically, we found low job satisfaction to be the experience of individuals who not only saw themselves as popular but also perceived the rest of the organization to be organized in favor of a few highly popular people.

More generally, in emphasizing perceptions of networks, we contribute to the growing literature on the importance of cognitive networks (e.g., Janicik and Larrick 2005), literature that complements the emphasis in sociology on how social networks function as prisms that can either distort or focus actors' relational identities (Podolny 2005). Our research moves this cognitive social network research forward by connecting perceptions with one of the standard outcomes of organizational behavior research -- job satisfaction. Cognitive social structure research has tended to neglect organizationally relevant dependent variables, although there are exceptions such as the emphasis on accuracy of perceptions predicting power (Krackhardt 1990). But we still have a long way to go to answer the question as to whether differences in how people perceive social networks in organizations really matters.

One of the continuing debates in the social network literature concerns an emphasis on cooperation versus an emphasis on competition (Kilduff and Brass 2010b). The influential structural-hole approach (Burt 1992) emphasizes “competition, control, relative advantage, and manipulation” according to one commentator (Obstfeld 2005: 120). Individuals who perceive high status differentiation in a social network are perceiving a social system in which brokers play key roles in spanning across structural holes. To the extent that such perceptions are biased, individuals may find themselves frustrated in attempting to connect across nonexistent spaces, and may also find themselves engaged in purely imaginary rivalry with other perceived high status actors.

In terms of implications for managers, the current research reinforces how difficult it is to create a truly egalitarian organizational culture. Managers are unable to control people's friendship affections, and conventional human resource management tools do not provide for debiasing of people's network perceptions. To the extent that people falsely perceive a few elite members garnering most of the friendship nominations in the organization, people may well feel relatively deprived in the popularity stakes, with implications for job satisfaction. Trying to boost people's job satisfaction through traditional job design efforts alone, may, therefore, prove difficult.

What can managers do in these circumstances? One possibility is to conduct a social network audit of the organizational unit to reveal the actual network problems that may be preventing communication and cooperation (Krackhardt and Hanson 1993). A network audit may reveal people central in the friendship network whose socializing detracts from their performance (cf. Mehra et al. 2001) and others whose work requires much more informal contact with people across the organization. By clarifying actual patterns of networking, managers may be able to mitigate the importance of network biases and remove some of the mystery surrounding hidden patterns of ties. Further, managers can rotate people between tasks and jobs to encourage necessary new connections and, in the long-term, work with building designers to promote more effective structures for social networking (cf. Allen 1970).

The current paper is limited in that all of the data are cross-sectional so that causal claims cannot be established. Although the mediation results are suggestive of a local to global extrapolation process on the part of individuals, further work is necessary to help confirm this. We have focused on status in friendship networks given that friendship relations (in contrast to advice relations) are difficult to discern and are therefore more open to misperceptions. The

friendship network is a system for making decisions (Kilduff 1990) as well as for “mobilizing resources, concealing and transmitting information, and performing other behaviors closely allied with work behaviors and interaction” (Lincoln and Miller 1979: 196). The extent to which other kinds of networks exhibit status ordering biases represents future work. In particular, even relatively transparent network relations such as advice may be misperceived to the extent that organizations are large and cognitive demands, therefore, correspondingly large.

In conclusion, this paper clarifies how individuals in organizations assess status ordering in friendship networks both close to the individual and across the whole organization, with implications for job satisfaction. Contributing to the social network approach to organizational phenomena a distinctively cognitive perspective, this paper depicts individuals as occupying distinctive perceptual niches from which idiosyncratic social worlds are constructed. If this paper has one overarching message it is that the individual is embedded not only in a social milieu of actual network relationships, but also in a perceived web of relationships which can distort important work outcomes.

ENDNOTES

¹ We investigated 3 other organizations (cf. Krackhardt and Kilduff 1999) for which we had the perceived friendship network data and obtained similar results concerning the mediation effect of perceived local status differentiation. We do not report them here because the job satisfaction data for these organizations are not available.

² The original sample contained 48 employees. However, one person did not fill out the questionnaire. Thus, only the responses from the 47 people who completed the instrument were included in the analysis.

³ To check the possibility that mediation was reversed, we tested whether perceived global status differentiation was a mediator between actual status and perceived local status differentiation. When regressing perceived local status differentiation on perceived global status differentiation and actual status, both coefficients remained significant. This pattern of results makes it unlikely that there was extrapolation from global to local.

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Table 1 Descriptive Statistics and Correlations

Variable	Mean	S.D.	1	2	3	4	5
1. Hierarchical Level	2.68	1.32					
2. Perceived Density	0.05	0.04	-0.12				
3. Actual Actor Centrality	0.07	0.06	0.45 ***	0.54 ***			
4. Perceived Local Status Differentiation	0.09	0.08	0.33 *	0.67 ***	0.88 ***		
5. Perceived Global Status Differentiation	0.09	0.05	0.14	0.72 ***	0.63 ***	0.74 ***	
6. Job Satisfaction	5.62	0.93	0.25 †	-0.01	-0.07	-0.04	-0.24

Notes. $N = 44$ for cells corresponding to perceived local status differentiation; $N = 47$ for all other cells.

† $p < 0.10$, * $p < 0.05$, *** $p < 0.001$

Table 2 Summary of Regression Analyses Predicting Perceptions of Local Status Differentiation in the Friendship Networks

Independent Variables	Model 1	Model 2
Intercept	-0.65 **	-0.03 †
Hierarchical Level	0.03 ***	0.01
Perceived Density	1.64 ***	0.78 ***
Actual Status		0.90 ***
Adjusted R^2	0.63	0.84

Notes . Unstandardized coefficients are reported; $N = 44$

† $p < 0.10$, ** $p < 0.01$, *** $p < 0.001$

Table 3 Summary of Regression Analyses Predicting Perceptions of Global Status Differentiation in the Friendship Network

Independent Variables	Model 1	Model 2	Model 3	Model 4
Intercept	0.01 ***	0.03	0.04 *	0.04 *
Hierarchical Level	0.01 *	0.00	0.00	0.00
Perceived Density	1.09 ***	0.83 ***	0.52 *	0.51 *
Actual Status		0.26 *		-0.10
Perceived Local Status Differentiation			0.32 **	0.38 *
Adjusted R^2	0.54	0.58	0.59	0.58

Notes. Unstandardized coefficients are reported; $N = 44$

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4 Summary of Regression Analyses Predicting Job Satisfaction

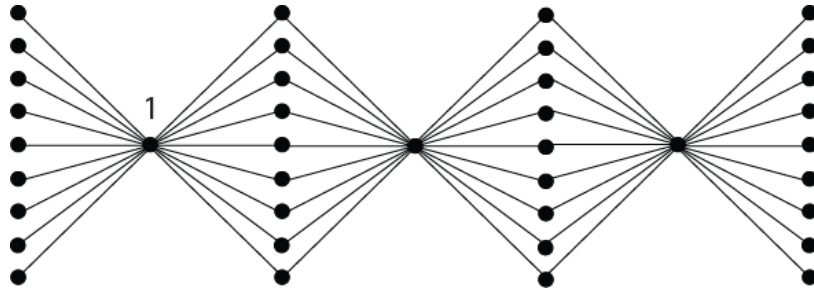
Independent Variables	Model 1	Model 2	Model 3
Intercept	5.13 ***	5.21 ***	4.39 ***
Hierarchical Level	0.18 †	0.36 **	0.40 **
Perceived Density	0.60	14.10 *	15.92 **
Actual Status		-6.22	-8.06 †
Perceived Local Status Differentiation		2.62	14.82 *
Perceived Global Status Differentiation		-11.05 **	-4.81
Perceived Local Status Differentiation X Perceived Global Status Differentiation			-81.47 *
Adjusted R^2	0.02	0.19	0.27

Notes. Unstandardized coefficients are reported; $N = 44$

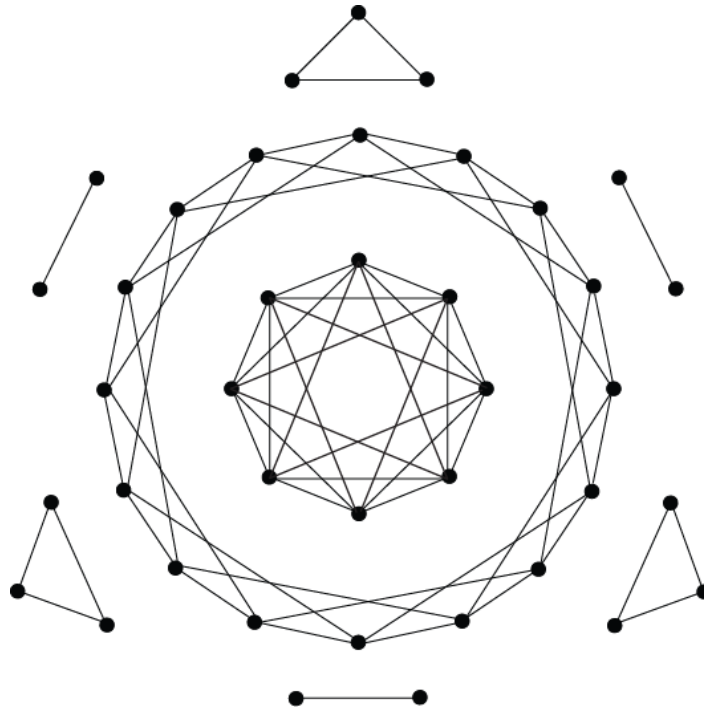
† $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 1 Examples of High and Low Status Differentiation

(a) High Status Differentiation: All actors have high status differentiation because their individual centrality is different from the centrality of their contacts



(b) Low Status Differentiation: All actors have low (zero) status differentiation because their individual centrality is the same as the centrality of their contacts



Notes. All ties are directed and symmetric; arrows have been removed for visual clarity.

Figure 2 Mediation Model

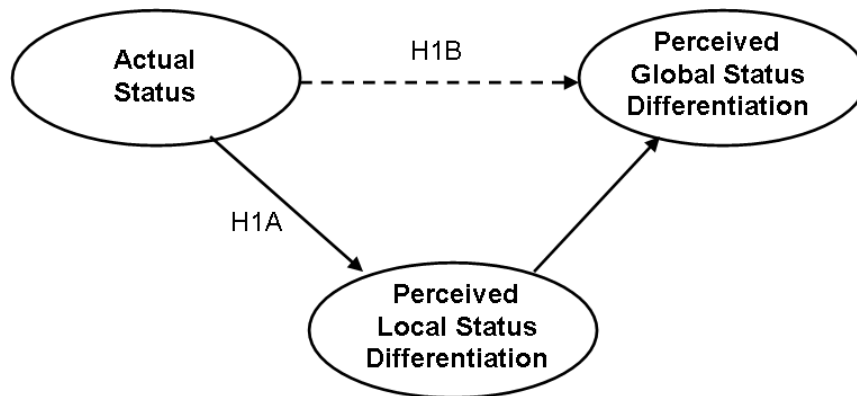


Figure 3 How High and Low Status Actors Perceive Status Differentiation Locally

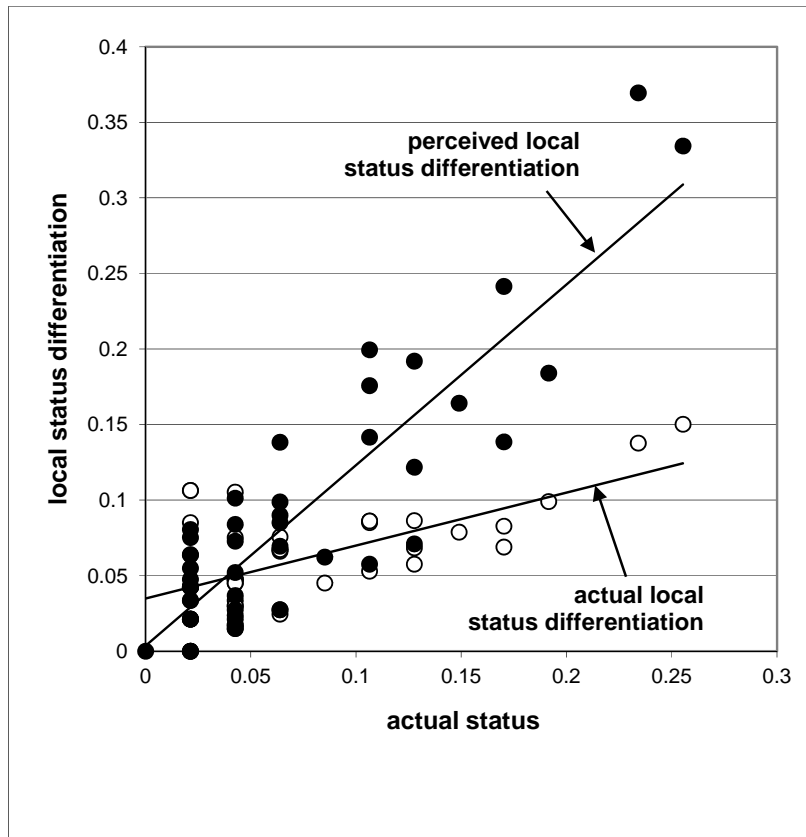


Figure 4 How High and Low Status Actors Perceive Status Differentiation Across the Whole Organization

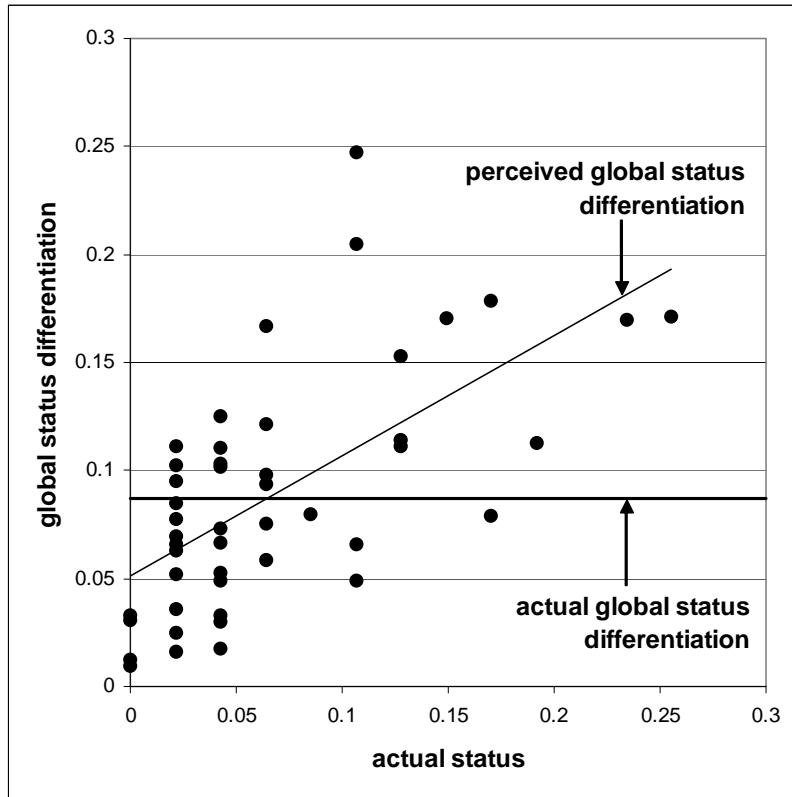


Figure 5 The Interaction of Perceived Local Status Differentiation and Perceived Global Status Differentiation on Job Satisfaction

Status Differentiation on Job Satisfaction

