



Organization Science

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To cite this article:

Raina A. Brands, Martin Kilduff (2014) Just Like a Woman? Effects of Gender-Biased Perceptions of Friendship Network Brokerage on Attributions and Performance. *Organization Science* 25(5):1530-1548. <http://dx.doi.org/10.1287/orsc.2013.0880>

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Just Like a Woman? Effects of Gender-Biased Perceptions of Friendship Network Brokerage on Attributions and Performance

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Do women face bias in the social realm in which they are purported to excel? Across two different studies (one organizational and one comprising MBA teams), we examined whether the friendship networks around women tend to be systematically misperceived and whether there were effects of these misperceptions on the women themselves and their teammates. Thus, we investigated the possibility (hitherto neglected in the network literature) that biases in friendship networks are triggered not just by the complexity of social relationships but also by the gender of those being perceived. Study 1 showed that, after controlling for actual network positions, men, relative to women, were perceived to occupy agentic brokerage roles in the friendship network—those roles involving less constraint and higher betweenness and outdegree centrality. Study 2 showed that if a team member misperceived a woman to occupy such roles, the woman was seen as competent but not warm. Furthermore, to the extent that gender stereotypes were endorsed by many individuals in the team, women performed worse on their individual tasks. But teams in which members fell back on well-rehearsed perceptions of gender roles (men rather than women misperceived as brokers) performed better than teams in which members tended toward misperceiving women occupying agentic brokerage roles. Taken together, these results contribute to unlocking the mechanisms by which social networks affect women’s progress in organizations.

Keywords: social networks; cognitions; brokerage; gender; performance; group processes
History: Published online in *Articles in Advance* December 20, 2013.

Introduction

In the race to get ahead in organizations, women benefit less than men from the occupation of advantageous social network brokerage positions (Burt 1998). But gender research suggests that women are social specialists who excel in the relational domain (see Weber 1998), in part because such social activity matches prevailing stereotypes concerning women as communal and warm human beings (Spence and Buckner 2000). There is, therefore, the possibility that prejudice against women as brokers of relationships in organizations is less evident in specific networks such as friendship, in which communality and warmth are important. On the other hand, even in the realm of collegiality and friendship, workplace social network interactions partake of the general striving to get ahead (Mehra et al. 2001). Even friendship interactions, therefore, require the kind of agency and assertiveness that tends to be associated with stereotypical expectations concerning men rather than women (Eagly 2009).

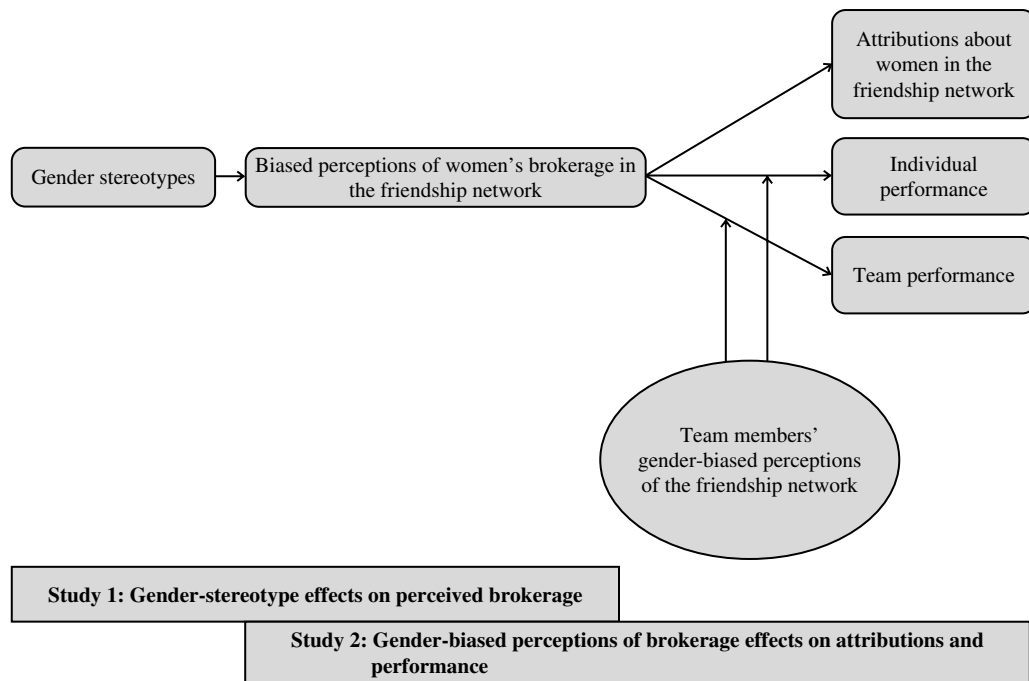
Do women, therefore, face prejudice in the social realm in which they are supposed to excel? And if so, how do biased perceptions of women’s social networks affect how they (and the groups in which they work)

perform? Cognitive social network research has explored several biases (Ibarra et al. 2005), but there has been a neglect of actual performance consequences, as noted in a recent review (Burt et al. 2013). It is one thing to identify biases in how people perceive their own social networks (e.g., Krackhardt and Kilduff 1999), but equally important is the question of whether biased perceptions affect the targets of those perceptions (Brands 2013).

Across two different studies, this paper challenges conventional thinking concerning women as social specialists. We first examine the extent to which even in the social realm of workplace friendships women’s brokerage activities tend to be underperceived (Study 1). Second, this paper explores novel territory for cognitive network research in focusing on the consequences for those who are the targets of biased perceptions (Study 2). Third, this paper also pushes into new territory for cognitive network research in exploring the performance consequences of biased perceptions, not just for individuals but also for the teams in which individuals participate (Study 2).

Figure 1 depicts the overall conceptual scheme that governs the research across the two studies. As indicated in the figure, at the center of our research is the idea

Figure 1 Theoretical Model of the Relationship Between Gender Stereotypes, Perceptions of Women’s Brokerage in the Friendship Network, and Outcomes Tested in Studies 1 and 2



that people are likely to perceive the friendship networks around women differently than they perceive the friendship networks around men. People, we suggest, will have biased perceptions of friendship relationships depending on the gender of the individual being perceived. Despite the widespread notion of women as social specialists, perceptions of the network positions of women will be distorted because of the expectation that brokerage is man’s work. In the competitive world of organizational relationships, social network positions that offer bases for informal leadership (Sparrowe and Liden 2005) are likely to be perceived as more suited to men relative to women. This is the central idea in our research, and we test it both in a small entrepreneurial company (Study 1) and with a sample of MBA teams (Study 2).

In the relationships on the right of Figure 1, we summarize the likely outcomes of biased perceptions. We go beyond the standard cognitive social structure research effort and address the “so what” question: Does being the target of biased perceptions affect individual women in terms of their reputation and performance? Furthermore, is there an effect of such bias on the performance of the team, depending on how much bias the team exhibits? Teams, as aggregates, are likely to exhibit differing amounts of bias in perceptions of the network positions of team members who happen to be women. Counterintuitively, what we suggest and find (in Study 2) is that team bias helps the team perform well even as it damages the individual performance of women.

As Figure 1 indicates, Study 1 examines the basic question of whether people misperceive the network

positions of women relative to men. It is important to establish this phenomenon in the real world of organizational work before zooming in on the micro-world of misperceptions in small team networks, which is the focus of Study 2.

Study 1: Gender Stereotype Effects on Perceived Brokerage Roles

Women’s work is often invisible in organizations—taken for granted and unrewarded (Fletcher 1999)—in part because women are expected to use their relationships to offer support and collaboration to colleagues rather than to advance their own interests (Miller 2012). In the modern workplace, women are described as “uncomfortable using their work friendships to land a deal or join a team,” whereas men are seen as willing and able to “leverage the power” of their workplace friendships to get ahead (Korkki 2011, p. MM9). We examine whether these widespread views are exaggerated in colleagues’ minds so that women’s roles in workplace friendships are systematically misperceived.

Our examination of the misperceptions of men’s and women’s friendships in the workplace bridges the gap between research on gender bias (Koenig et al. 2011) and research on social network biases (e.g., Flynn et al. 2006). Research has already shown that (for those with strong need for closure) a demographic category (race) triggers bias concerning how close two individuals are perceived to be (Flynn et al. 2010). In Study 1, we extend this research, examining whether *gender* triggers bias

concerning how connected or disconnected the network around the individual is perceived to be. Is it the case that women, despite being assumed to be social specialists, are underperceived in terms of their brokerage activities in friendship networks? Brokerage in informal networks facilitates individuals' advancement (Burt 1992) and is of crucial importance to organizing processes more generally (Stovel and Shaw 2012). Thus, discovering whether women more than men suffer a perceptual bias in how others perceive their brokerage has many ramifications for organizational behavior.

In the gender bias literature, prevailing stereotypes about men and women are characterized by two dimensions: agency and communion (Eagly 2009). Men are characterized in terms of agentic traits that include achievement-oriented descriptors such as "aggressive," "forceful," "independent," and "decisive"; women, on the other hand, are characterized in terms of communal traits that include social and service-oriented descriptors such as "kind," "helpful," "sympathetic," and "concerned about others" (Spence and Buckner 2000). Gender stereotypes arise from, and give rise to, the distribution of men and women into social roles (Eagly and Steffen 1984). Expectations about the communality of women arise because women traditionally occupy nurturing, caring roles such as mother and social worker; expectations about the agency of men arise because men traditionally occupy action roles such as soldier and firefighter (Glick 1995). These expectations extend to organizational roles, where men, relative to women, are expected to occupy roles that involve formal authority, control over resources (Kanter 1977), and leadership (Eagly et al. 1992).

Do such stereotyped expectations carry over into the social realm of friendship relationships? Clearly, this depends on the extent to which friendship relations in organizations are bound up with the everyday tasks of getting work accomplished. Network research has consistently shown the relevance of friendship for task completion. To quote one pioneering study, "Friendship networks in organizations...are systems for making decisions, mobilizing resources, concealing and transmitting information, and performing other behaviors closely allied with work behaviors and interaction" (Lincoln and Miller 1979, p. 196). People rely on their friends for expert advice and knowledge (Krackhardt 1992, Morrison 2002). More recent research demonstrates (across three different organizational contexts) that interpersonal affect is "a critical component of task-related action in organizations" (Casciaro and Lobo 2008, p. 677). Why might people systematically distort the friendship positions of women relative to men? The answer: because in organizations, these positions are bases for action.

Indeed, people who span structural holes in informal social networks at work self-describe themselves as

active, striving individuals: seeking authority, creating excitement, being outspoken, and facing the future with "unshakable resolve" (Burt 2005, p. 45). People occupying brokerage roles in organizational social networks are typically described in agentic terms, as having the potential to act as go-betweens between two actors or clusters of actors who themselves are not connected (Burt 1992). As the *tertius gaudens* ("the third who benefits"; see Simmel 1950, p. 154), the broker can potentially control interactions between disconnected parties, playing one person against another. Thus, we suggest brokerage in work friendship networks is likely to be characterized in people's minds as a relatively assertive activity (thereby more suited to the stereotypical male than the stereotypical female).

Another aspect of brokerage is the extent to which people extend many rather than few friendship nominations. Although research shows no actual difference in the number of friends men have relative to women (Caldwell and Peplau 1982), there are reasons to expect differences in the number of friendship nominations men and women are *perceived* to extend to others. Gender bias theory suggests that men relative to women tend to be seen as more active and assertive. If this general expectation transfers to the realm of friendship relations, then men more so than women will be perceived as nominating more people as friends.

Gender-stereotypical beliefs about men's social agency and women's social communion, reinforced by the actual gender sorting of men and women into informal organizational roles, will, we anticipate, bias individuals' perceptions of network roles. Rather than perceiving precisely who brokers between whom, or who regards whom as a friend, individuals, we anticipate, will perceptually assign others to roles that differ in social agency based on gender. Of course, it is possible that, in reality, men occupy brokerage roles in organizations more than women (see Burt 1992) or that men more than women tend to proliferate friendship nominations, so our research focus is on network perceptions controlling for actual network positions. Research on network cognition has shown that schematic processing of social networks leads individuals to exaggerate the social activity of popular individuals (Kilduff et al. 2008) and that people's perceptions can be biased by the demographic characteristics of others (Flynn et al. 2010). Building on this emerging tradition, we suggest that people have schematic expectations that men rather than women occupy brokerage roles in the friendship network and that men rather than women proliferate friendship nominations. People's cognitive maps are likely to exhibit such schematic properties in excess of those present in actual networks.

HYPOTHESIS 1A. *Individuals' perceptions of an organizational friendship network attribute more brokerage*

roles to men relative to women than is the case in the actual network.

HYPOTHESIS 1B. *Individuals' perceptions of an organizational friendship network attribute more friendship nominations to men relative to women than is the case in the actual network.*

Thus, Study 1 focuses on whether individuals' perceptions of friendship relations exhibit biased perceptions of the network roles of women versus men. We expect that *perceptions* of women (relative to men) will show them as less central in terms of brokering across gaps in social structure and proliferating friendship nominations. To examine the operation of gender stereotypes on perceptions, we need data concerning each individual's perceptions of the ties between all the people in the friendship network. Therefore, we tested our ideas on cognitive social structure data featuring a relatively equal number of men and women in key organizational roles (Krackhardt 1987a).

Method

Sample and Procedure. The participants were 33 (16 men and 17 women) key personnel at the head office of Pacific Distributors,¹ a regional distributor of electronic components employing 162 people over five branches. The 33 individuals were colocated in the head office of the company and included all supervisors and management personnel as well as key personnel in accounting, purchasing, and manufacturing as identified by the chief operating officer.

Perceived Friendship Networks. The data consisted of cognitive social structure data (see Krackhardt 1987a). Each individual provided a complete map of how he or she perceived friendship relations within the organization. For example, Nathan Pyper was asked a series of 33 questions concerning the friendship ties between himself and his 32 coworkers. The questions were presented in this format: "Who would Sam Bryson consider a close personal friend?" Each question was followed by the list of 32 coworkers' names. Nathan Pyper then checked the names that indicated his perception of who Sam Bryson considered a friend. This process was then repeated with each individual in the network. Each respondent, therefore, provided a complete cognitive map of his or her perceptions concerning who was friends with whom in the organization, resulting in a total of 33 cognitive maps of the single organizational friendship network.

Actual Friendship Networks. Individuals' perceptions of social network roles may differ for men and women because they actually do occupy different roles in the friendship network. To account for this possibility, we also measured the "actual" friendship network. To measure actual friendship ties, we followed prior work

(Krackhardt 1990) in considering a tie as actually existing when both parties agreed that it existed. A tie was said to exist from person i to person j only if person i claimed person j as a friend and person j agreed that person i claimed person j as a friend. An actual directed tie between two members of the network was said to exist, therefore, only when both people reported that the directed tie existed. The actual and perceived friendship networks were used to derive each variable in the study, described below.

Measures

First Outcome Variable: Perceived Brokerage. Given that we were examining across the complete network of ties, including both direct and indirect ties, we measured perceived brokerage with both a local measure (reverse-scored perceived constraint) and a more global measure (perceived betweenness centrality). We also included a measure of social agency, perceived outdegree centrality.

Constraint is the more local measure in that it represents the extent to which an individual's friends are also friends with each other (Burt 1992). Highly constrained individuals have fewer brokerage opportunities because there are fewer structural holes among their immediate contacts. Thus low constraint scores represent opportunities for local brokerage. Burt's (1992) measure of constraint—a function of density, size, and hierarchy—was calculated and then reversed to reflect perceived opportunities for brokerage. Betweenness centrality captures the extent to which interactions between unconnected individuals across the whole network depend on ego (Freeman 1979). People with high betweenness centrality have more brokerage opportunities because interactions between unconnected individuals (including individuals who may be socially distant from ego) frequently depend on them. In technical terms, betweenness centrality captures the extent to which an actor falls on the geodesics between dyads in the network (Wasserman and Faust 1994). Perceived outdegree centrality, an indicator of social agency, was measured as a count of the number of friendship ties perceived to be directed to others by each actor (Wasserman and Faust 1994).

Perceived constraint, perceived betweenness centrality, and perceived outdegree centrality were calculated for every respondent's 33×33 matrix of perceived friendship relations, yielding a perceived constraint, a perceived betweenness centrality, and a perceived outdegree centrality score for each actor in every respondent's perceived network. These scores were used to construct three perceived brokerage matrices in which X_{ij} represented j 's brokerage as perceived by i . Each row in the perceived brokerage matrices represented the brokerage (in terms of reverse-scored constraint, betweenness centrality, or outdegree centrality) of each actor in the network, as perceived by one individual. Likewise, each

column represented the perceived brokerage (in terms of reverse-scored constraint, betweenness centrality, or outdegree centrality) of one individual as perceived by every other actor in the network.

First Predictor Variable: Gender. Gender was obtained from company data. A 33×33 attribute matrix representing gender was constructed in which each column X_j was coded 0 if j was a man and 1 if j was a woman. Each column can be thought of as representing the gender of each actor as perceived by every other actor in the network. Because it can be assumed that individuals easily identify the gender of their coworkers, the scores in every column were the same (an actor in row i perceives the same gender as an actor in row g).

Control Variable: Actual Network Characteristics. People may perceive that men and women's networks differ because men and women differ in the networks they inhabit (Van Emmerik 2006). Thus, actual constraint, betweenness centrality, and outdegree centrality scores for each individual were calculated, and actual network matrices were constructed.

Other Control Variables. Because formal roles influence the characteristics of individuals' informal social networks (Ibarra 1992), we controlled for rank using the following codes: 2 denoted the top management team members, 1 denoted those with managerial responsibilities, and 0 denoted those with no formal authority. We also considered whether gender balance in the different departments might affect outcomes. There were seven departments (executive committee, purchasing, management information systems, personnel, accounting, manufacturing, and sales and marketing), but only two were gender imbalanced—the executive committee (100% men, but already controlled for in terms of rank) and the accounting department (85% women), which we controlled for using a dummy variable with 1 indicating that the individual was a member of the accounting

department and 0 otherwise. More generally, to account for the possibility that the differential availability of men and women friends might bias the results (Ibarra 1992), we controlled for the number of opportunities each individual had (a) within the individual's department and (b) within the individual's rank to make same-sex friends using the formula $(n - 1)/N$, where n indicates the number of women (men) in the same department or at the same rank as the individual and N indicates the total number of women (men) in the sample.

Analysis

The observations in social network data are systematically dependent on one another, thus violating the assumption of independence necessary for regression analysis. To overcome the problem of autocorrelation, the quadratic assignment procedure (QAP) nonparametric approach was used to examine the significance of bivariate correlations (Krackhardt 1987b). Similarly, the significance of regression coefficients was assessed with the Double Dekker Semi-Partialling Multiple Regression Quadratic Assignment Procedure (MRQAP). For more information on this procedure, see Dekker et al. (2007). In each analysis, two MRQAP models were compared. In the first model, the effect of the control variables on social network perceptions was tested. The second model tested the full model, including both the control variables and gender.

Results

Means, standard deviations, and correlations are reported in Table 1. Recall that Hypothesis 1A suggested that individuals would perceive that men occupied brokerage roles more so than women. This hypothesis was supported. As Models 2 and 4 in Table 2 show, women were perceived to have fewer brokerage opportunities than men in terms of their higher network constraint in the immediate network surrounding them ($\beta = -0.11$,

Table 1 Study 1: Means, Standard Deviations, and Correlations

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10
Perceived												
1 Reverse-scored constraint	-0.31	0.18										
2 Betweenness	0.03	0.05	0.23***									
3 Outdegree centrality	0.27	0.19	0.56***	0.22***								
4 Gender of target	0.51	0.50	-0.19***	-0.24**	-0.15**							
Actual												
5 Reverse-scored constraint	-0.24	0.15	0.16***	0.18***	0.14**	-0.33**						
6 Betweenness	0.03	0.04	0.14*	0.21*	0.15**	0.05	0.32***					
7 Outdegree centrality	0.31	0.16	0.13*	0.14	0.18***	-0.17	0.54***	0.67***				
8 Rank	0.60	0.49	0.25***	0.41***	0.23***	-0.43*	0.39***	0.28†	0.37*			
9 Accounting department	0.21	0.41	-0.09†	-0.11*	-0.11*	0.35*	-0.46**	-0.08	-0.29*	-0.21		
10 Opportunities for same sex ties in same department	0.15	0.09	-0.02	-0.03	-0.02	0.33*	-0.40***	0.13	-0.24†	-0.17	0.53***	
11 Opportunities for same sex	0.38	0.13	-0.16**	-0.25**	-0.11*	0.55***	-0.38***	-0.12	-0.10	-0.49**	0.32*	0.23†

† $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 2 Study 1: The Effects of Target Gender on the Perception of Three Aspects of Brokerage Behavior in an Organizational Friendship Network

	Model					
	Reverse-scored constraint		Betweenness		Outdegree centrality	
	1	2	3	4	5	6
<i>Accounting department Rank</i>	−0.03	−0.02*	−0.03	−0.02	−0.07†	−0.07†
<i>Proportion of people of the same sex in same department at the same rank</i>	0.23***	0.21***	0.35***	0.32**	0.18***	0.16***
<i>Actual network role Gender</i>	0.07†	0.09*	0.05	0.06	0.08*	0.10*
	−0.02	0.03	−0.06	−0.01	−0.01	0.03
	0.08†	0.08*	0.09†	0.11†	0.11**	0.11**
		−0.11*		−0.12†		−0.08†
Adjusted R ²	0.07***	0.08***	0.17***	0.18***	0.06***	0.07***

Note. MRQAP was performed using 2,000 permutations.
 † $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

$p < 0.05$) and in terms of their lower betweenness centrality across the whole network of interactions in the organization ($\beta = -0.12$, $p < 0.10$). In addition, consistent with Hypothesis 1B, Model 6 in Table 2 shows that women were perceived to extend fewer friendship nominations to others, as measured by outdegree centrality ($\beta = -0.08$, $p < 0.07$). These results controlled for actual network position, rank, and structural opportunities for same-sex ties. Thus, people perceived that go-betweens connecting unconnected others in the friendship network tended to be men rather than women; moreover, men were perceived to be more active in extending friendship to others. Overall, these results support the view that brokerage was seen as a male-type network role.

Robustness Checks

Two robustness checks were performed. Our hypotheses assume that it is the gender of the individual *being observed* that triggers bias. However, it could be that it is the *gender of the observer* that matters—perhaps men and women observe networks differently? To test this, we created a model in which attributes of dyads, rather than attributes of individuals, were analyzed. In addition, we wanted to check whether unobserved features of the targets or the dyads were influencing the analysis. Thus we also conducted an analysis that modeled the influence of these crossed random effects. The results of these robustness checks—both of which supported the hypotheses—are reported in the appendix.

Discussion of Study 1

The results show that women’s occupation of brokerage roles in the organizational friendship network was significantly underperceived. Prior research on cognitive social structures explained biased perceptions in terms of the processing limits of the human mind when faced with the complexity of social network information

(e.g., Freeman 1992). Recent work established that the characteristics of others can cue such biased processing (Flynn et al. 2010). Building on this research, our results suggest that gender stereotyping is also a factor in biasing network perceptions. Men, according to our analyses, are seen as active agents, roaming the free spaces of the network and proliferating friendship bids, whereas women are seen as communing within more tightly knit groups of individuals.

That women’s brokerage in friendship networks goes relatively unnoticed is surprising from the perspective of one strand of gender research. Women, we are told, tend to see themselves and be seen by others in terms of making and maintaining relationships (Miller 2012), as social rather than task specialists (Meeker and Weitzel-O’Neill 1977, Nebenzahl et al. 1993). In the competitive arena of modern organizations, however, brokerage roles are bases of power and influence (Burt 1992). Is brokerage, therefore, an activity that is seen as characteristically male? This is the first question we address in Study 2.

The second question addressed in Study 2 concerns the performance of women who are perceived by their colleagues to be connecting others in friendship networks—acting as brokers. We know that in male-type jobs there tend to be negative views of women (e.g., Heilman and Haynes 2005, Heilman and Okimoto 2007), but we have no knowledge as to whether such negative perceptions afflict women’s engagement in informal social networking roles. To the extent that women are perceived by teammates to be engaged in brokerage, how will these perceptions relate to teammates’ attributions concerning women’s warmth and competence? And how will teammates’ perceptions of women’s brokerage affect women’s performance? Prior research shows that individuals’ biased perceptions of their own social networks can affect their network-related tasks (Janicik and

Larrick 2005). We go beyond prior research in examining how network biases affect the performance of those who are the *targets of bias*. Furthermore, we address the question of how bias at the team level affects team outcomes.

Study 2: Friendship Brokerage Bias Effects on Attributions and Performance

Study 1 showed that people underperceive women's occupation of brokerage roles in friendship networks in organizations. In Study 2 we zoom in on the friendship interactions of small work teams to explore the effects of gender-biased perceptions of network brokerage on individual and group outcomes. One strand of gender research (see Meeker and Weitzel-O'Neill 1977 for a review) suggests that men tend to be seen as contributing more effectively to task completion than women (Bales and Slater 1955, Wood and Rhodes 1991), whereas women tend to be seen as social specialists concerned with the welfare of the team (Wood and Rhodes 1991). Thus, within teams, social agency in friendship could fall within women's remit of paying attention to the social dynamics of the group. But if the gender stereotypes we discussed in Study 1 transfer to the social networking domain, women who are perceived to engage in friendship brokering may be seen not as social specialists but as trespassers on male types of activity. Women brokers, therefore, would be potentially subject to bias that could affect how they are seen and how they perform their work. In Study 2 we help resolve this discrepancy between differing views—women brokers as fulfilling social specialist expectations versus women brokers as trespassers on male prerogatives for brokerage activity. Specifically, we examine the extent to which misperceptions of women's brokerage entails individual- and group-level consequences.

Bias Effects on Attributions of Warmth and Competence

Women's work tends to be associated with communal characteristics such as selflessness and concern for others (Glick 1995). Accordingly, women who adhere to gender role prescriptions by undertaking women's work are attributed with communal characteristics such as warmth (Eagly and Steffen 1984, Fiske et al. 1999). In contrast, women who undertake work considered characteristically male are seen as lacking the nurturing, communal qualities associated with femininity (Heilman and Okimoto 2007). Such women are seen to be in competition with men (Fiske et al. 1999) and are downgraded on characteristics associated with femininity (Fiske et al. 2002, Glick et al. 1997).

According to gender role theory, there is a payoff for women who cast off the demands of female gender role prescriptions. Because male-type jobs are high status,

women who occupy such jobs are ascribed with opposite qualities—namely, competence (Fiske et al. 1999). Acknowledgement of the competence of women who succeed in male domains can be thought of as a kind of grudging respect that is accompanied by downgrading on warmth to justify resentment and prejudicial treatment (Glick et al. 1997). In contrast, regardless of actual skills, women in female-type work tend to be perceived as less competent than women who perform male-type work (Cuddy et al. 2004).

Women, then, tend to be seen as “competent but cold” or “warm but incompetent,” depending on their perceived adherence to conventional gender expectations. The networking activities of individuals in organizations differ considerably from the stylized roles investigated in the gender role literature. To what extent does this literature apply to the networking domain? Women engaged in bridging across social gaps in friendship relations might conceivably be seen either as fulfilling gender expectations concerning the communality of women or as overly assertive and independent and therefore violating gender expectations. There is, therefore, considerable interest in seeing whether and how stereotyped expectations concerning women relative to men carry over into the more fluid realm of informal social relations.

Given that the informal realm of work-related networking is characterized by competition for influence (Sparrowe and Liden 2005) and reputation (Kilduff and Krackhardt 1994), we expect that gender stereotypes of men as active and assertive and women as communal and caring will be cued in project teams. In the context of work teams, friendship is likely to have a more work-related meaning than in other contexts (Fischer 1982). Indeed, prior research has confirmed the importance of friendship networks for the completion of work in teams (e.g., Balkundi et al. 2007, Krackhardt and Stern 1988, Mehra et al. 2006). As such, we posit that in this specifically work-focused setting of project teams, brokerage roles in the friendship network will be prescribed to men. Thus, we anticipate attributional bias against women (but not men) perceived to occupy brokerage roles and against women perceived to be active in the proliferation of friendship bids to others.

HYPOTHESIS 2A. *To the extent that a team member misperceives a woman (but not a man) to occupy a brokerage role in the friendship network, the woman is seen as less warm but more competent.*

HYPOTHESIS 2B. *To the extent that a team member misperceives a woman (but not a man) to make many friendship nominations, the woman is seen as less warm but more competent.*

Bias Effects on Performance

Being misperceived to occupy brokerage roles and being misperceived to proliferate friendship bids might, therefore, affect a woman's warmth and competence in the

eyes of others. But what are the likely effects of such misperceptions on performance? Is it possible that these misperceptions concerning social networking activities can diminish or enhance performance outcomes? We go beyond current research on social network biases to examine the effects of biases on the performance of both individuals and the teams to which they belong.

Research suggests that others' expectations can cause individuals to behave in ways that confirm stereotypes (Allen and Hecht 2004). Stereotypes not only affect attributions but also affect targets' behaviors. We know that if women are reminded that they are expected to perform poorly on certain tasks, then these women are likely to succumb to such prescriptive stereotyping (Geary et al. 2003). Perceivers' expectations about how women should behave across a range of situations such as job interviews and social occasions tend to elicit confirming behavior from women (von Baeyer et al. 1981, Zanna and Pack 1975).

Gender stereotypes are pervasive and are easily and automatically activated in social situations (Eagly and Karau 2002). Each individual entering the team social context brings with him or her preexisting expectations concerning gender roles. Prior experimental work, for example, on randomly composed mixed-sex groups that met for 15 minutes showed that men solely by virtue of their gender were perceived by themselves and other group members as more competent than women (Wood and Karten 1986). However, individuals differ in the extent to which they routinely stereotype women (Shamir and Howell 1999). Thus, teams are likely to differ in the aggregate amount of gender prejudice they exhibit, solely as a result of the composition of the members making up the team.

Some teams, compared with other teams, are therefore likely to exhibit greater aggregate misperceptions of women's compliance with prevailing notions of gender-appropriate network roles. To the extent that there are such misperceptions in a team, the performance of individual women in the team is likely to suffer as a result of self-fulfilling expectations. But if women are misperceived by members of the team to occupy brokerage roles typically associated with men, the individual performance of women is likely to be enhanced. The emphasis here is on aggregate misperceptions of brokerage and friendship bidding and the extent to which biased perceptions affect performance outcomes.

HYPOTHESIS 3A. *Women (but not men) perform better on individual tasks to the extent that, on average, team members misperceive them as occupying friendship network brokerage roles.*

HYPOTHESIS 3B. *Women (but not men) perform better on individual tasks to the extent that, on average, team members misperceive them as extending many friendship bids to others.*

We have speculated that biased perceptions of social networks can trigger gender stereotypical behavior on the part of targets, with consequences for the performance of women in organizations. However, informal networks are not just prisms through which people view others (Podolny 2001); they are also the means by which individuals coordinate with others to achieve shared goals. Following the logic of the previous hypotheses we expect that in the work-oriented arena of project teams in which people vie for influence and reputation, social networking will be subject to gender stereotyping. Individuals in teams are likely to differ, however, in the extent to which they view men rather than women as the appropriate people to be active in brokering and extending friendship bids. Here, we examine how these individual-level biases affect how team members coordinate with others, with resultant effects on team performance.

Building from the gender role literature, we anticipate that the extent to which individuals in teams, on average, exhibit gender bias will actually reduce conflict and enhance team coordination. Women who are seen to be in violation of gender role prescriptions elicit hostility and antipathy from those around them (Glick et al. 1997). Where individuals tend to perceive women as "stepping out of turn" in their occupation of male-type roles, they are likely to hold negative opinions about women team members (Heilman 2004). Indeed, individuals may filter their perceptions of the behavior of women through the lens of hostile gender stereotypes (Heilman 2001), leading to disparagement of women's ideas and interpersonal discord. Relationship conflict is likely to spill over to task conflict that may ultimately detract from team performance (Lee and Farh 2004). By contrast, where individuals perceive women to *adhere* to gender role prescriptions by refraining from male-type roles, the potential disruptive effect of gender discrimination lies dormant. Individuals fall back on well-rehearsed gender roles entailing scripts for interaction and division of labor, ultimately enhancing team performance.

Thus, we expect team performance to decline to the extent that, on average, individuals in the team tend to misperceive women rather than men undertaking brokerage in the network. There is, of course, a counter-argument drawn from the stereotype-threat literature: to the extent that groups elicit competence from individual women in the group, team performance will improve. However, group performance is more than the sum of individuals' abilities (Steniner 1972). Thus, we expect that the interpersonal hostility triggered by the perception that women are in violation of gender role prescriptions is likely to result in group process loss, overriding any gains in competence at the individual level.

HYPOTHESIS 4A. *Team performance is negatively affected to the extent that, on average, team members*

misperceive women within the team as occupying brokerage roles in the team friendship network.

HYPOTHESIS 4B. *Team performance is negatively affected to the extent that, on average, team members misperceive women within the team as extending many friendship bids.*

Method

Sample and Procedure. Participants were 160 students enrolled in a leading MBA program. Asking participants about the perceived social network of the whole cohort would be cognitively taxing and would be likely to result in high attrition from the study. Thus, each person was asked to report perceptions of his or her study group (a method pioneered by Flynn et al. 2006). The MBA cohort was divided into study groups, each consisting of five individuals. The final sample size was 110 individuals nested in 20 teams, representing a 69% response rate. Participants were mostly men (79 males, 31 females) with an average age of 29.78 years. The participants were ethnically diverse: there were 59 whites, 24 East Asians, 18 Indians, and 9 classified as other. The research was conducted approximately two weeks after participants had been allocated to their study teams. Participants were briefed on the nature of the research in one of their classes. Following the briefing, respondents were invited to participate in the research via an email that linked them to an online survey. Participants who completed the survey were entered into a prize drawing. The online survey contained two sections. The first section measured social network perceptions. In the second section, participants were asked to rate the warmth and competence of the members of their study team.

Perceived Social Networks. Replicating the method used in Study 1, participants (egos) provided a complete map of the friendship relations that they perceived to exist between their study team members (alters). For example, Tom Nelson was presented with the list of names of everybody in his study team and was asked to indicate who Gina Lockhart would consider a close friend. Tom Nelson repeated this for each of the five individuals in his study team (including himself), yielding a 5×5 matrix of the friendship relations perceived by Tom Nelson. The 110 cognitive maps provided by the participants were used to calculate the perceived network measures.

Measures

First Outcome Variable: Perceived Warmth and Competence. Each participant rated all of his or her study team members on dimensions of warmth and competence. The 12-item, five-point Likert scale (1 = low to 5 = high) measured six dimensions ($\alpha = 0.85$) of warmth (friendly, warm, well intentioned, trustworthy,

good natured, and sincere) and six dimensions ($\alpha = 0.78$) of competence (competent, confident, capable, efficient, intelligent, and skillful) (Fiske et al. 2002). An example item from the scale is, “How trustworthy is Gina?” (1 = not very trustworthy to 5 = very trustworthy).

Second Outcome Variable: Individual Performance. This was assessed via the individual’s grade out of 100 on the final exam for the strategy course. This course was both the core module for the term and the capstone course for the MBA program, and evaluation was relatively gender neutral: the correlation between gender and performance in the course (controlling for the Graduate Management Admissions Test (GMAT)) was $r = -0.07$, nonsignificant.

Third Outcome Variable: Team Performance. Each team completed several pieces of assessment over the duration of the course. Each piece of assessment was awarded a score out of 100 by two of the teachers associated with the course. The average of the scores was used as the measure of team performance.

First Predictor Variable: Perceived Network Roles. Following the procedure in Study 1, we measured perceived brokerage network roles in respondents’ cognitive maps as reverse-scored constraint and outdegree centrality. Because we were studying five-person teams, there was little scope in these small networks for the indirect brokerage captured by betweenness centrality (see Oh and Kilduff 2008). Given that each team consisted of five members, each respondent provided four observations (one for each team member—a “target”) to the perceived data set. The gender of each participant was collected from the MBA profiles published by the school.

Second Predictor Variable: Team Members’ Perceptual Gender Bias. Our theory suggests that each individual potentially brings to the team setting a chronic bias toward misperceiving the extent of gender roles but that there are individual differences in the extent to which such bias is present. Because gender bias is a pervasive aspect of social life, we make no assumptions about gender bias construction or emergence in the particular teams we studied. Thus, we are not looking for or expecting distinctive gender bias culture to emerge within teams. Rather, we anticipate that the extent of gender bias varies across individuals and, therefore, that some teams will exhibit average levels of gender bias that are higher than other teams as a result of team composition.² To measure the average level of gender bias in each team, we calculated a partial correlation between perceived network role (brokerage and friendship bids) and target gender, controlling for the target’s actual position in the network. This partial correlation measured the extent to which the members of each team on average tended to see women (relative to men) as role occupants. We made no assumptions concerning shared

consensus. In measuring brokerage bias, for example, the partial correlation indicated the average extent of bias irrespective of whether individuals agreed on which team members a particular man or woman was brokering between. Because gender was coded as 0 for male and 1 for female, positive scores indicated the extent to which team members saw women as occupying that network role, whereas negative scores indicated the extent to which (on average) individual team members saw men as occupying that network role (controlling for actual network roles).

Control Variables. Demography can affect network patterns (McPherson et al. 2001) and network perceptions (Mehra et al. 1998); therefore, the age, ethnicity, and gender of participants were collected from the MBA profiles published by the school, and this information was used to construct demographic control variables as explained below. General cognitive ability can affect network perceptions (Janicik and Larrick 2005), so we collected GMAT scores from the school administration to construct control variables. We controlled for team age variability (standard deviation of the ages of the individuals in the team), team ethnicity variability (standard deviation of the number of different ethnicities in the team), and team gender composition (number of women in the team: 1 or 2), as well as team mean GMAT. Furthermore, replicating the method used in Study 1, actual constraint and outdegree centrality were calculated and included in models to control for the possibility that reputation and performance consequences were driven by actual gender differences in network roles.

Analysis

Observations from the same individual can be assumed to be correlated, as can observations of the same individual and of the same team; thus a regression analysis would be inappropriate as observations are not independent. To account for the nested structure of the data, we used random coefficient modeling for the analyses of warmth/competence and individual performance. To determine whether the models specified in the hypothesis tests yielded a significant improvement in fit over the unconditional random effects model, the significance of the change in fit of each model was calculated (Vuong 1989).

For the warmth/competence analysis, the random effects of both the targets and the observers were modeled because these models were found to be a better fit for the data than those with one level (observations of targets) or those with three levels (observations of targets nested in individuals nested in teams). Following the unconditional random effects model, fixed effects were added to the analyses. Target ethnicity (0 = white, 1 = Indian, 2 = Asian, 3 = other) and target age were included as control variables. For the bivariate correlations, ethnicity was dummy-coded as 0 for

white and 1 for nonwhite. In addition, for analyses in which perceived competence was the dependent variable, target warmth was added as a control, and vice versa. Perceived network role and target gender were included as fixed effects of interest, as was the interaction between them.

For the analysis of individual performance, individual (level 1) and team (level 2) effects were modeled. Individual-level controls were GMAT, age, and ethnicity; team-level controls were team age and ethnicity variability and number of women in the team. Individual gender was the level 1 predictor and team perceptual gender bias was the level 2 predictor. First, intercepts-as-outcomes models were calculated to test for main effects; then slopes-as-outcomes models were calculated to test for cross-level moderated effects.

To examine the effect of team perceptual gender bias on team outcomes, an ordinary least squares regression was conducted. In the first step, control variables—team mean GMAT, team age variability, and team ethnicity variability—were added to the regression. In the next step, team gender composition (the number of women in the team) and team perceptual gender bias were added as the key variables of interest.

Results

First, we checked whether the effects of Study 1 still held in the much smaller (team) contexts of Study 2. We found marginal support for predictions. Individuals tended to see women in the MBA teams as having fewer opportunities for brokerage ($\beta = -1.65$, $p < 0.09$) and as initiating fewer ties ($\beta = -1.88$, $p < 0.06$) than men.

Attributions of Warmth and Competence. Means, standard deviations, and correlations are reported in Table 3. Recall that Hypothesis 2A suggested that, to the extent that a woman was perceived to occupy a role high in brokerage, she would be seen as less warm but more competent. The results supported the hypothesis (Table 4, Model 1: $\beta = -1.05$, $p < 0.05$).³ First, the results for warmth: as Figure 2 shows, women perceived to undertake brokerage in terms of occupying positions of lower constraint were attributed less warmth than women whose networks were perceived to be higher in constraint ($z = -2.03$, $p < 0.05$). In contrast, attributions about the warmth of men were unaffected by their perceived constraint within the friendship network ($z = 1.53$, ns; see Figure 2). So women perceived to broker in the team friendship network were seen as less warm, but were they also seen as more competent? The results suggest they were (Table 4, Model 3: $\beta = 1.69$, $p < 0.001$). Figure 3 confirms that women were seen as more competent to the extent that their perceived constraint was low ($z = 2.8$, $p < 0.01$), whereas (unexpectedly) men were seen as less competent to the extent that their perceived constraint was low ($z = -2.5$, $p < 0.05$).

Table 3 Study 2: Means, Standard Deviations, and Correlations for Analysis of Attributions of Warmth and Competence

Variable	Mean	SD	1	2	3	4	5	6	7	8
1 Warmth	4.11	0.65								
2 Competence	3.97	0.66	0.56**							
3 Perceived reverse-scored constraint	-0.85	0.17	0.02	0.01						
4 Perceived outdegree centrality	0.59	0.39	0.03	0.02	0.39**					
5 Actual reverse-scored constraint	-0.69	0.37	-0.09	-0.08	0.08	0.05				
6 Actual outdegree centrality	0.68	0.35	0.24**	0.09	-0.07	-0.01	-0.10*			
7 Age	29.87	3.39	0.02	-0.05	0.07	0.06	0.02	-0.02		
8 Gender	0.28	0.45	0.04	-0.02	-0.03	-0.07	-0.05	0.05	0.03	
9 Ethnicity	0.62	0.48	0.08	-0.07	-0.18**	-0.16**	0.01	-0.01	0.02	0.01

† $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Hypothesis 2B predicted a similar pattern of results for outdegree centrality and this prediction was supported (Table 4, Model 2: $\beta = -0.33$, $p < 0.05$).⁴ As Figure 4 shows, women perceived to occupy positions of higher outdegree centrality were seen as less warm than women perceived to make fewer friendship nominations ($z = -1.60$, $p < 0.10$). In contrast, attributions about the warmth of men were unaffected by their perceived outdegree centrality ($z = 0.58$, ns; Figure 4). The results

for perceptions of competence showed the same pattern (Table 4, Model 4: $\beta = 0.33$, $p < 0.10$)⁵ as illustrated in Figure 5: women perceived to extend more friendship bids were seen as more competent than women perceived to extend fewer bids ($z = 1.59$, $p < 0.11$). However, men were perceived to be similarly competent regardless of their perceived outdegree centrality ($z = -0.72$, ns).⁶

Table 4 Study 2: The Effects of Individuals' Gender and Perceived Friendship Brokerage on Perceptions of Their Warmth and Competence

Variable	Perceived warmth		Perceived competence	
	Model 1	Model 2	Model 3	Model 4
Control for competence	0.48***	0.49***		
Control for warmth			0.60***	0.61***
Age	-0.01	-0.01	-0.02	-0.01
Ethnicity				
White	-0.52†	-0.36	0.59*	0.52
Indian	-0.45	-0.23	0.49	0.38
Asian	-0.32	-0.31	0.41	0.29
Other				
Gender	-0.91*	0.17	-1.4***	-0.17
Actual constraint	-0.12		-0.02	
Perceived	0.18		0.15	
reverse-scored constraint				
Gender × Perceived reverse-scored constraint	-1.05*		1.69***	
Actual outdegree centrality		0.24***		0.05
Perceived outdegree centrality		-0.01		-0.08
Gender × Perceived outdegree centrality		-0.33*		0.33†
Model fit	385.74**	377.88**	431.51**	414.60**

Notes. Random coefficient modeling with $N = 440$ observations of targets (level 1) and $n = 110$ individuals (level 2). Model fit is the overall model goodness of fit; the larger the value, the worse the goodness of fit. Significance value of the statistic compares model fit to the fit of the unconditional random effects model.

† $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Individual Performance. Means, standard deviations, and correlations are presented in Table 5. Hypothesis 3A suggested that women (but not men) would perform better on individual tasks to the extent that team members misperceived them as occupying friendship network brokerage roles. This prediction was supported (Table 6, Model 2: $\beta = 14.67$, $p < 0.01$). Where there was a tendency for team members to misperceive women as being brokers (i.e., having low constraint), women's performance was higher relative to women in teams where there was a tendency toward misperceiving men as brokers ($z = 2.21$, $p < 0.05$). Figure 6 shows a difference of over 7.5% in women's individual performance

Figure 2 Study 2: The Effects of Women's vs. Men's Perceived Brokerage on Attributions of Warmth

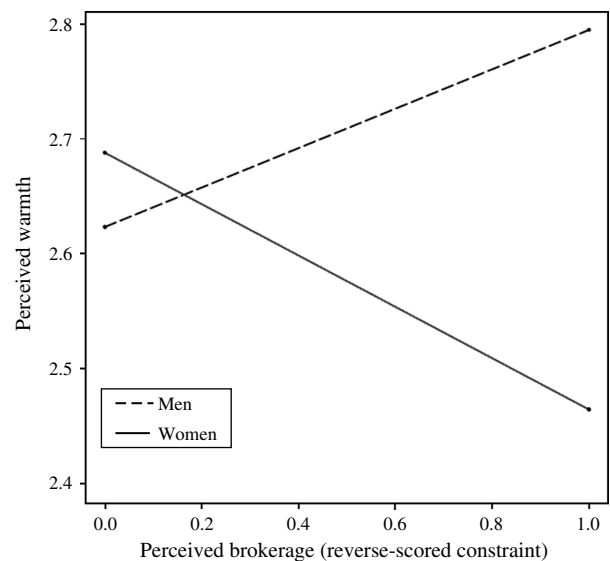


Figure 3 Study 2: The Effects of Women’s vs. Men’s Perceived Brokerage on Attributions of Competence

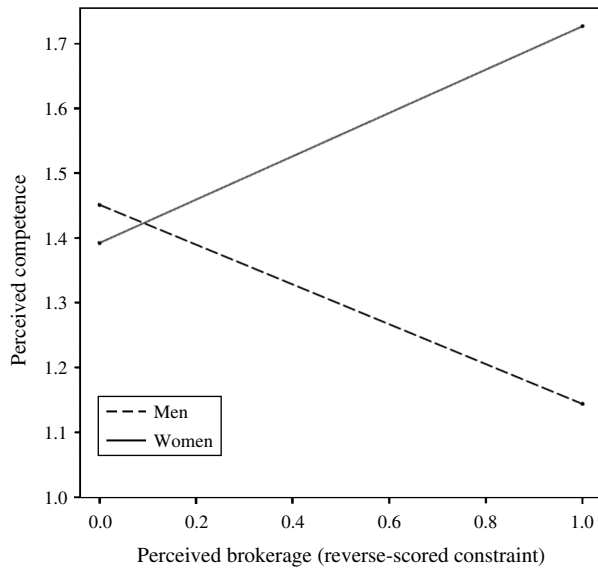


Figure 5 Study 2: The Effects of Women’s vs. Men’s Perceived Friendship Nominations on Attributions of Competence

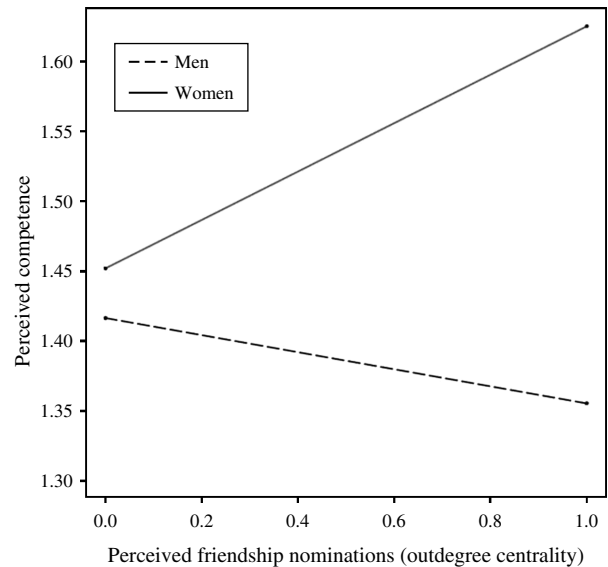
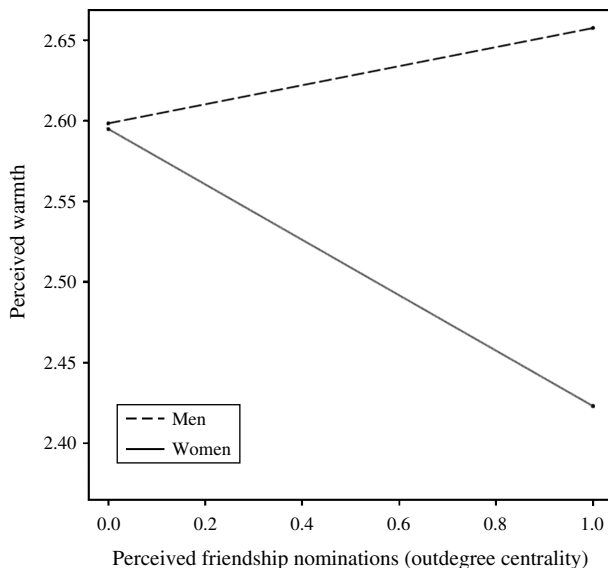


Figure 4 Study 2: The Effects of Women’s vs. Men’s Perceived Friendship Nominations on Attributions of Warmth



between teams with low versus high bias (individual performance of 57.13 versus 64.77). However, men’s performance was unaffected by team perceptual bias concerning whether men or women were brokers ($z = -0.56$, ns).

Hypothesis 3B predicted a similar effect for the extent to which women were misperceived to extend many friendship bids to others. This prediction was also supported (Table 6, Model 4: $\beta = 11.32$, $p < 0.05$). Where there was a tendency for team members to misperceive women as active in making bids in the friendship network (i.e., exhibiting high outdegree), women’s

performance was higher relative to women in teams where there was a tendency toward misperceiving men as active in making such bids ($z = 1.96$, $p < 0.05$). Figure 7 shows a difference of more than 3.5% in women’s individual performance between teams with low versus high bias (individual performance of 60.25 versus 64.12). Surprisingly, as Figure 7 illustrates, men’s performance was negatively affected by the extent to which team members tended to misperceive women as making friendship bids ($z = -1.98$, $p < 0.05$).

Team Performance. Means, standard deviations, and correlations are presented in Table 7. Recall that Hypothesis 4A anticipated a negative effect on team performance of team members misperceiving women as occupying brokerage roles. This hypothesis was supported, as shown in Table 8, Model 2 ($\beta = -0.51$, $p < 0.05$). Hypothesis 4B anticipated a similar negative effect on team performance to the extent team members misperceived women as extending many offers of friendship. This was also supported as shown in Table 8, Model 4 ($\beta = -0.61$, $p < 0.05$). The effects of misperception were meaningful: for every standard deviation increase in team tendency toward misperceiving women as brokers or as initiating friendship bids, team performance decreased by 1.8% and 1.9%, respectively. Relative to teams that exhibited the smallest tendency toward misperceiving women as brokers, teams that exhibited the largest tendency incurred a 7% penalty. The equivalent penalty as measured by outdegree centrality was 9%.

Study 2 Discussion

One of the paths to high performance in organizations is the occupation of central, agentic positions in the

Table 5 Study 2: Means, Standard Deviations, and Correlations for Analysis of Individual Performance

Variable	Mean	SD	1	2	3	4	5	6	7	8	9
1 Individual performance	64.56	7.76									
2 Gender	0.28	0.45	-0.12**								
3 TPGB reverse-scored constraint	-0.02	0.17	-0.19***	0.06							
4 TPGB outdegree centrality	0.05	0.20	-0.08†	0.05	-0.19***						
5 GMAT	677.28	96.72	0.08†	-0.11*	-0.13**	0.08†					
6 Age	29.89	3.39	-0.26***	-0.30***	0.11*	-0.26***	-0.17***				
7 Ethnicity	0.62	0.48	-0.12*	-0.03	0.03	-0.12*	0.10*				
8 Team age variability	2.40	1.01	0.21***	0.06	-0.02	0.21**	-0.01	0.06	-0.03		
9 Team ethnicity variability	3.50	0.65	-0.04	-0.23**	0.10*	-0.04	0.07	0.17**	-0.07	-0.03	
10 Number of women	1.45	0.49	0.04	0.20**	0.04	0.28**	0.05	0.18**	-0.07	0.15**	-0.06

Note. TPGB, team perceptual gender bias.

† $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

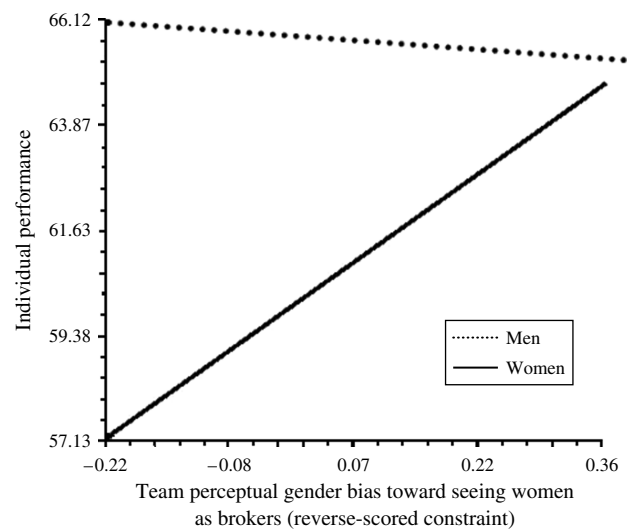
friendship network (see Mehra et al. 2001). The results of Study 2 suggest that, within teams, when women are misperceived by team members to occupy such central roles, they are attributed competence (but not warmth) and go on to perform well on individual tasks. To the extent that a team member misperceived a woman within the team to occupy gender-stereotypical roles of low brokerage and low outdegree centrality in the friendship network, the team member tended to see that woman

Table 6 Study 2: The Effects of Team Perceptual Gender Bias of Women's vs. Men's Friendship Brokerage on Team Member's Individual Performance

Variable	Individual performance			
	1	2	3	4
Level 1 controls				
GMAT	0.004	0.004	0.009	0.009
Age	-0.16	-0.36	-0.15	-0.15
Ethnicity	0.88	0.74	0.41	0.41
Level 2 controls				
Team age variability	-1.42	-1.31	-1.34	-1.34
Team ethnicity variability	0.01	0.02	-0.11	-0.11
Number of women in team	2.76	3.44	2.13	2.13
Level 1 predictor				
Gender	-0.78	-5.78**	-0.28	-3.30*
Level 2 predictor				
TPGB reverse-scored constraint	-0.16	-1.65		
TPGB outdegree centrality			-2.76	-6.38
Interactions				
Gender × TPGB reverse-scored constraint		14.67**		
Gender × TPGB outdegree centrality				11.32*
Model fit	841.68***	828.16***	841.72***	831.17***

Notes. Random coefficient modeling with $N = 110$ individuals (level 1) and $n = 22$ teams (level 2). Model 1 includes intercepts-as-outcomes, and Model 2 includes slopes-as-outcomes.

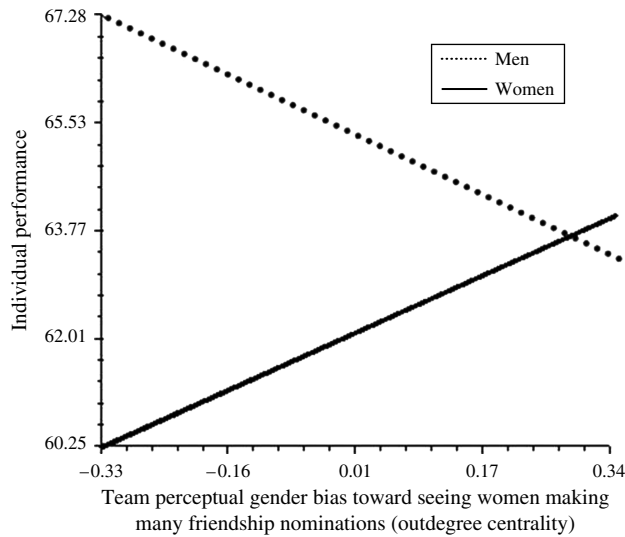
† $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Figure 6 Study 2: Team Brokerage Bias Effects on Individuals' Performance

as warm but less competent. In teams in which people tended to misperceive women as occupying these female-type roles, women in those teams tended to perform poorly on individual tasks. However, these gender-stereotyping teams outperformed teams with bias that favored women. Thus, gender stereotyping damaged the performance and reputation of women as individuals even as stereotyping bolstered team performance. Study 2 significantly extended the findings of Study 1 by demonstrating both attributional and performance effects of gender stereotypes concerning friendship network roles.

In bridging the gap between gender role theory and cognitive network research, we originated the idea that network patterns indicative of brokerage and bid proliferation were likely to be associated with expectations concerning men's agency. However, an alternative explanation for Study 2's findings of attributional and performance consequences for women engaged in agentic networking behavior takes into account that women's networking was directed mainly at men because women

Figure 7 Team Friendship Nomination Bias Effects on Individuals' Performance



were in the minority in all teams. A woman's agency in such circumstances may be seen as a self-interested attempt to gain status over men. Study 1 helps ameliorate the concern that biased perceptions simply result from the relative frequency of men versus women: in Study 1, there were approximately equal numbers of men and women; respondents tended to see men, rather than women, as occupying agentic brokerage roles.

Nevertheless, future research should explore the possibility that women's brokerage may be particularly salient (and thus likely to trigger stereotyping) when they are in the minority. We know that homophily pressure is greater on members of minority groups relative to members of majority groups and that such pressure can alter self-perceptions and network patterns (Mehra et al. 1998). In Study 2 we controlled for actual network positions in our tests, so the effects we report constitute the effects of misperceptions on the part of team members. It is particularly striking that even in small groups of five people such misperceptions lead to performance consequences, congruent with other research detailing the drawbacks of brokerage for women in much larger contexts (Burt 1998). But clearly, the conclusions concerning the differing effects of misperceptions on

Table 8 Study 2: The Effects of Team Perceptual Gender Bias of Men's vs. Women's Friendship Brokerage on Team Performance

Variable	Team performance			
	1	2	3	4
Team mean GMAT	0.12	0.01	0.12	0.01
Team ethnicity variability	-0.39	-0.48*	-0.39	-0.69*
Team age variability	0.46*	0.54	0.46*	0.60*
Number of women	-0.12	-0.29	-0.12	-0.24
TPGB reverse-scored constraint		-0.51*		
TPGB outdegree centrality				-0.61*
Adjusted R ²	0.10	0.34*	0.10	0.47*

Note. Multiple linear regression with $N = 22$ teams.

† $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

performance outcomes for individual women and for the teams in which they work are tentative and subject to further research on groups in which men and women are more evenly represented.

General Discussion

Across two studies we investigated whether the networks around women were systematically misperceived and whether there were effects of such misperceptions on the women themselves and their teammates. We answered the call to bring contemporary research on heuristics and biases into the area of organizational social networks (Moore and Flynn 2008) and built from gender role theory to investigate how biased perceptions affected attributions and performance. Other research examining bias in social network perceptions has focused on the attributes of observers (Casciaro 1998, Flynn et al. 2006), relational schemas such as influence (De Soto 1960, Delia and Crockett 1973), and small-world principles (Kilduff et al. 2008). The current research extends this line of work by demonstrating that the characteristics of the targets being observed (in this case, their gender) may also cue schemas that result in biased perceptions of social structures (see Flynn et al. 2010). Perceptions of brokerage may be cued not only by the individual's prior experience of sparse networks (Janicik and Larrick 2005) but also by the gender of those the individual is observing.

Table 7 Study 2: Means, Standard Deviations, and Correlations for Analysis of Team Performance

Variable	Mean	SD	1	2	3	4	5	6
1 Team performance	67.22	2.7						
2 TPGB reverse-scored constraint	-0.02	0.17	-0.40 [†]					
3 TPGB outdegree centrality	0.05	0.20	0.04	-0.41 [†]				
4 Number of women	1.45	0.49	0.16***	-0.17	0.04			
5 Team GMAT	690.1	19.23	0.08	-0.19	0.33	-0.26		
6 Team ethnicity variability	3.5	0.65	-0.20	-0.08	-0.04	-0.48*	0.42*	
7 Team age variability	2.4	1.01	0.41 [†]	0.01	0.21	0.08**	0.21	0.17

† $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Gender role theory has advanced the notion that women are likely to be stereotyped as social specialists focused on interpersonal relations and the fostering of cooperation (see Wood and Lindorff 2001 for a review). But this research has neglected the issue of agency (stereotypically ascribed to men) when it comes to social networking. To the extent that women, even in the social specialist realm of friendship networks, are perceived to be connecting the unconnected and proliferating friendship relations, these activities are likely to be seen as aligned with the aggressiveness, independence, and decisiveness typically associated with men, and therefore they are in violation of expectations concerning women.

Indeed, research on women who engage in entrepreneurial networking activities has suggested the possibility that these women, in the eyes of colleagues, lack the legitimacy to play the social specialist role of coordinating other people (Burt 1998). From this research we infer that gender stereotypes may handicap women even in the realm of friendship networks, but these gender stereotypes are likely to operate in ways that are surprising from gender role perspectives. Because social network brokerage in organizations is characterized by entrepreneurial activity (Burt 1992, 1998), brokerage is likely to be aligned with stereotypical expectations associated with men rather than women.

Our research helps identify and resolve the discrepancy between the gender role view of women as social specialists and the evidence from structural hole research concerning women's lack of legitimacy in active networking roles. We contribute to structural hole theory a psychological underpinning for the apparent lack of legitimacy that afflicts many women engaged in building entrepreneurial networks in organizational settings. Brokerage is at the very heart of structural hole theory in terms of explaining why some individuals outcompete others in the race for life's prizes (Burt 1992, 2005). Building on prior work showing that some individuals are better than others at perceiving brokerage opportunities in social networks (Janicik and Larrick 2005), we found evidence that individuals tend to perceive men, not women, as occupying brokerage roles. Furthermore, because brokerage is a male-type social network role, women perceived to occupy this role may be seen to be in violation of gender role expectations and may be sanctioned. Thus, we contribute to unlocking the "puzzle of women" (Burt 1992) to show a more nuanced picture for women perceived to occupy brokerage roles. Women perceived by team members to be brokers receive negative attributions but go on to achieve positive individual performance outcomes. This research supplements work showing gender differences in returns to the occupation of central network positions (e.g., Ibarra 1992).

A second contribution of our research is to focus on performance implications of network biases. To the

extent that the network cognition literature has discussed behavioral outcomes, it has focused on how individuals' perceptions affect their own outcomes such as career decisions (Krackhardt and Porter 1986) and decision making (Janicik and Larrick 2005). In Study 2 we moved the research agenda forward by examining how team members' network perceptions affect the behavior of other team members both as individuals and in teams. Performance outcomes of network perceptions have been neglected in the past (Burt et al. 2013), but our research opens up this area to the examination of both positive and negative consequences of perceptual bias.

The third contribution is to network cognition research in expanding the focus from the individual man and woman to the informal social teams within which individuals are embedded. Despite considerable research on the gender typing of occupations (Masser and Abrams 2004), parental roles (Cuddy et al. 2004, Masser et al. 2007), and leadership (Eagly and Karau 2002), little is known about how gender stereotypes affect the perception and sanctioning of social roles across wider patterns of friendship interactions. Our results suggest that gender stereotypes influence the perception of social network roles, resulting in schematic representations of networks that exaggerate the likelihood that men, relative to women, will initiate ties and strive for roles of control (brokerage). Furthermore, even among those aspiring to careers in management (in Study 2), we found a reliance on stereotyping.

Thus, our paper contributes to the social psychology of gender interactions within groups and teams. There has been a tendency to focus on inequality at the societal level within the gender role literature (e.g., Ridgeway 1991) and inequality at the individual level within the organizational social network literature (e.g., Ibarra 1992). But team networks have long been of interest to social network researchers in terms of their composition and performance (for a review, see Balkundi and Harrison 2006) partly because teams rarely deliver the performance benefits expected from the combination of individuals' knowledge and skills (Allen and Hecht 2004). Team dynamics are particularly interesting from a network perspective because people in teams must work closely with each other to achieve common goals. As such, friendship relations are likely to be particularly salient (Krackhardt and Stern 1988) and are often examined (e.g., Balkundi et al. 2007), although not from the perspective of cognitive social structures (CSS; see Krackhardt 1987a). In adding to the CSS literature (see Brands 2013 for a review), we show that, in the context of teams, misperceptions of women as occupiers of brokerage roles were associated with higher performance for women as individuals. But such misperceptions were associated with lower overall team performance. This tension between outcomes for the individual and outcomes for the team is a likely area for future CSS research.

Practical Implications

Our research suggests that managers need to be aware of the biasing influence of gender stereotypes on their own and others' social network perceptions. Indeed, moving beyond other research that shows that accurate social network perceptions correlate with organizational influence (Krackhardt 1990) and effective action (Janicik and Larrick 2005) at the individual level, this research suggests that managers need to be aware of the disruptive influence of gender stereotypes on network perceptions for team performance. Research suggests that training individuals can be an effective way of improving the accuracy of individuals' social network perceptions (Burt and Ronchi 2007). Brief interventions designed to make teams aware of the importance of accurate network perceptions may ameliorate the effects uncovered in this research.

Limitations

We recognize a major limitation that affects the set of two studies reported here: the current research studied actual social networks rather than experimentally induced setups, precluding the possibility of causal inference. We hypothesized that gender stereotypes underlie biased perceptions of social network roles, but the use of a correlational design means that the possibility of reverse causality cannot be excluded. Although all individuals are exposed to broadly held stereotypes about gender (as evidenced in Study 1), stereotyped views of social networks are more or less shared across teams (as evidenced in Study 2). This suggests that beyond individually held stereotypes, team-level dynamics accentuate their effects on individually held perceptions with consequences for performance. An investigation of these dynamic, team-level processes underlying shared bias about social networks would be an intriguing direction for future research and could incorporate consideration of the possible effects of differing proportions of men and women within teams.

Another limitation of both studies pertains to the possibility that our results are constrained by cultural norms active in Western contexts. Societies characterized by strong familial ties (e.g., Japan) tend to view relationships of trust such as friendship quite differently from societies in which interpersonal ties are generally weaker (e.g., Yamagishi et al. 1998). Network brokerage may be viewed quite positively in the United States but can be disparaged in China (Xiao and Tsui 2007). Future research can investigate the ways in which cultural views of friendship, brokerage, and networking affect expectations concerning appropriate gender role behavior.

Conclusion

Informal networks of interaction are where much of the business of the modern world is accomplished. Our

research highlights the gender stereotypes that bias individuals' perceptions of others' social networks, with significant effects on individual and team performance. If this research has an overriding message, it is that combating stereotypes in the workplace must extend from the formal to the informal realms, targeting the social interactions that are at the very heart of organizational life.

Appendix. Robustness Checks

Dyadic Effects Model. Hypothesis 1 assumed that it is the gender of the individual *being observed* that triggers bias. However, it could be that it is the *gender of the observer* that matters—perhaps men and women observe networks differently? To test this, we created a model in which attributes of dyads, rather than attributes of individuals, were analyzed. First, three dummy variables were created: women observing women, women observing men, and men observing women (men observing men being the default category). Then, dyadic variables were created to indicate whether each dyad was in the same (versus different) department, to indicate whether each dyad was at the same (versus lower or higher) rank, and to indicate the difference between the observer's and target's actual network roles (in terms of brokerage and outdegree centrality). Three matrices were constructed, one for constraint, one for betweenness centrality, and one for outdegree centrality. In each 33×33 matrix, X_{ij} represented the difference between i 's (the observer) and j 's (the target) actual network role, obtained by subtracting j 's score from i 's score (for constraint, betweenness centrality, and outdegree centrality).

The results, reported in Table A.1, tend to replicate those of the main analyses. In brief, women saw other women as less likely to occupy brokerage roles than men, both in terms of reverse-scored constraint ($\beta = -0.21, p < 0.05$) and betweenness centrality ($\beta = -0.17, p < 0.05$). Men also saw women as less likely to occupy brokerage roles than men in terms of reverse-scored constraint ($\beta = -0.14, p < 0.01$) and betweenness centrality ($\beta = -0.17, p < 0.05$). Men also saw women as making fewer friendship bids as measured by outdegree centrality ($\beta = -0.16, p < 0.05$).

Crossed Random Effects Model. A crossed random effects analysis was undertaken to account for the possibility that some unmeasured feature of the individual providing the observation affected the perception of the ties of their coworkers and likewise, whether some unmeasured feature of the individual being observed affected the analysis. Following the procedure outlined by Raudenbush et al. (2011), a model with observations of targets (level 1) cross-classified by observers (level 2) was examined. The level 1 model examined whether the target's gender affected perceptions of their brokerage, controlling for their actual brokerage, structural opportunities for same sex friendship, membership in the accounting department, and rank. The level 2 model examined whether observer's characteristics, in terms of gender, rank, and departmental membership affected their perceptions of their coworkers brokerage and in particular, the degree of gender bias evident in their perceptions of their coworkers' brokerage. The results, reported in Table A.2, confirm Hypothesis 1: women were less likely to be perceived as brokers (relative to men) in terms of reverse-scored constraint ($\beta = -0.04$,

Table A.1 Study 1: Analysis of Whether Perceiver's Gender Biases Perceptions of Three Aspects of Men's and Women's Brokerage in an Organizational Friendship Network

Variable	Model		
	Reverse-scored constraint	Betweenness	Outdegree centrality
Same department	0.11***	0.09**	0.16***
Same rank	-0.11	-0.18***	-0.23**
Target's actual network role relative to perceiver's actual network role	-0.26**	0.17*	0.33***
Women observing women	-0.21*	-0.17*	-0.15
Women observing men	-0.03	-0.01	-0.08
Men observing women	-0.14**	-0.17*	-0.16*
Adjusted R^2	0.13***	0.14***	0.08***

Note. MRQAP was performed using 2,000 permutations.
[†] $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table A.2 Study 1: Crossed Random Effects Modeling of the Effect of Target Gender on Observers' Perceptions of Target's Brokerage

Variable	Model		
	Constraint	Betweenness	Outdegree
Target effects			
Accounting department	-0.01	-0.01	-0.03
Rank	0.10***	0.03**	0.05*
Proportion of people of the same sex			
In same department	0.01**	0.01	0.01
At the same rank	-0.01	-0.02	-0.01
Actual network role	-0.10 [†]	0.10	0.18
Gender	-0.04*	-0.02*	-0.05*
Observer effects			
Accounting department	-0.02	-0.01	0.02
Rank	0.01	0.01*	-0.03
Gender	0.01	0.01	0.06*
Model fit	-1,459.36***	-3,807.56***	-1,284.15***

Note. Crossed random effects modeling with $N = 33$ targets crossed with $N = 33$ observers.

[†] $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

$p < 0.05$), betweenness centrality ($\beta = -0.02$, $p < 0.05$), and outdegree centrality ($\beta = -0.05$, $p < 0.05$).

Endnotes

¹We included gender and department variables for the first time in any analysis of these data. For more details of the company's culture, see Krackhardt and Kilduff (1990); see Krackhardt and Kilduff (1999) and Kilduff et al. (2008) for analyses of friendship perceptions.

²If gender bias was created within teams rather than being brought in by individuals, then it might be possible to conduct

a consensus analysis to detect team underlying shared bias as reflected in social network patterns (Romney et al. 1986; see Borgatti and Halgin 2011 for a review of consensus analysis). However, a preliminary analysis of our data from a cultural consensus perspective showed low eigenratios in approximately 40% of our sample, indicative of an absence of necessary underlying consensus, rendering any consensus analysis meaningless. Nonetheless, for the analysis for individual performance, our effects replicate for outdegree centrality but not for constraint using the consensus network. We were unable to conduct a replication of the group-level analysis because the consensus analysis produced too much missing data at the group level. Thus, gender bias at the team level in our data represents an aggregate of individual-level biases rather than a shared consensus.

³If demographic control variables were excluded from the analysis, the interaction between perceived constraint and gender became marginally significant ($p < 0.07$).

⁴If demographic control variables were excluded from the analysis, the interaction between perceived outdegree centrality and gender was not significant ($p < 0.15$).

⁵If demographic variables are excluded, the interaction fails to reach significance ($p < 0.12$).

⁶We also examined whether the gender of the observer affected perceptions of warmth and competence. Models with this variable included produced F -values that were not significant; thus the gender of the observer was excluded from the analysis.

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