

GENDER, BROKERAGE AND PERFORMANCE: A CONSTRUAL APPROACH

RAINA A. BRANDS

**London Business School
Sussex Place
London, NW6 6AA
UK
rbrands@london.edu**

AJAY MEHRA

**Gatton College of Business and Economics
University of Kentucky
Lexington, KY 40506-0034
ajay.mehra@uky.edu**

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We present a new theory that seeks to explain differences in the performance of men and women friendship network brokers – individuals who bridge disconnected friends. In contrast to previous audience-centered explanations, our phenomenological theory emphasizes how brokers construe (i.e., perceive and interpret) their networks. We contend that when women perceive themselves as brokers in friendship networks, they experience threat, rooted in negative stereotypes about women brokers, which undermines their performance. Using data from a cohort of MBA students, Study 1 found that women (but not men) exhibited lower performance when they perceived themselves as brokers in small-group friendship networks. Using data from a larger group of MBA students, Study 2 replicated this finding and ruled out the possibility that underlying differences in the propensity to connect those who one bridges may explain the observed gender-based difference in broker performance. Using an experimental design, Study 3 found that elevated anxiety about task performance and negative social evaluations mediated the relationship between brokerage and performance for women but not for men. Women and men differ in how they psychologically construe brokerage in friendship networks; and this difference helps account for gender differences in the performance of network brokers.

Organizations are social arenas where people develop relationships with each other. Some of the interpersonal connections that arise are dictated by the formal division of labor and the assignment of work roles, yet other more informal ties also emerge as people develop discretionary bonds of friendship with certain others. The set of friendship relations an individual possesses is an important resource for successful individual performance because friendships provide access to private information, channel emotional support, strengthen commitment to work, and serve as legitimating signals of identity (Ibarra, Kilduff, & Tsai, 2005; Podolny & Baron, 1997). However, not all configurations of relations are equally valuable. A network that is merely large, for example, is less valuable for workplace performance than a network that gives a person a broker-like position spanning the disconnects (or “structural holes”) between one’s direct contacts (Burt, 1992). Brokerage positions in friendship networks have been shown to enhance the performance of individuals in organizations (Mehra, Kilduff, & Brass, 2001), but there is also evidence suggesting that they benefit men more than women. For example, a study of managers in a leading high-technology firm found that social networks rich in structural holes led to early promotions for men but delayed promotions for women (Burt, 1992: 145-166); and a different study of student teams in a MBA program showed that gendered stereotypes about brokerage in friendship networks damaged the reputation of women who were seen to occupy these roles (Brands & Kilduff, 2013).

In seeking to understand why men and women might reap different returns from broker networks prior research has implicitly relied on a structural view of brokerage. From a structural perspective, what matters for performance is that the person be in the right network position (Brass, 1984). The perceptions and interpretations of brokers themselves are set aside because the broker role is considered a “strong situation” (Mischel, 2013) that elicits

similar thoughts and behaviors from the occupant of the position, no matter who the occupant (Burt, 1992: 262-263; Padgett & Ansell, 1993). If men and women think and behave similarly when they are in brokerage positions, then it seems to follow that gender-based differences in returns to brokerage must derive from the reactions of others. One version of this audience-centered argument highlights that broker networks are stereotypically masculine, thus women who are seen to have broker networks provoke the ire of others, as evidenced by the reputational penalties they incur (Brands & Kilduff, 2013; Brands, Menges, & Kilduff, 2015). A related line of reasoning points to the fact that women suffer from a deficit of legitimacy in the workplace and this lack of insider status hampers the ability of women brokers to capitalize on the potential benefits of brokerage positions (Burt, 1998).

This previous structurally-informed work offers important insights into the role that audience-perceptions play in explaining gender-based returns to brokerage. What it ignores, however, is the potential for variance in the perceptions and interpretations of brokers themselves. Networks rich in structural holes give brokers access to information and advice that can boost their performance. Yet individuals do not respond to this information as it objectively is, but rather as they see it (Schwarz, 2009). The experience of being a network broker can be different for men and women; and this difference in how brokerage structures are construed (i.e., perceived and interpreted) could account for observed variance in returns to brokerage. In contrast to audience-centered perspectives that focus on the reactions of others to men and women brokers, the construal perspective we develop and test in this paper highlights the role played by the subjective experience of brokers in accounting for gender-based differences in the performance of network brokers.

The purpose of this paper is to examine gender differences in returns to friendship network brokerage from the perspective of the brokers themselves. Our phenomenological

theory highlights how the perceived disconnections between one's friends may be perceived, interpreted and experienced differently by men and women, and how this gender-based difference in construal may, in turn, affect brokers' performance. We focus our account on a key dimension on which men's and women's construal of brokerage is likely to differ: the perceived potential for being negatively evaluated on the basis of one's gender. Building on previous research that suggests that open networks have masculine associations (Brands & Kilduff, 2013; Brands et al., 2015), we posit (and empirically establish) the existence of a negative stereotype about women's performance as brokers in friendship networks. We further suggest that awareness of this stereotype triggers in women, but not in men, anxiety about task performance and negative social evaluations, which serves to undermine women's ability to fully capitalize on the informational benefits of their networks. Thus, we propose that gender differences in the construal of a stereotype threat (Spencer, Logel, & Davies, 2016) in broker networks help account for gender-based differences in performance in these positions. Stereotype threat is a widely studied psychological concept, but its relevance for understanding the performance consequences of broker networks represents uncharted territory.

Our study focuses on friendship ties between individuals rather than on exclusively instrumental ties, such as work-related advice. Research has found that brokerage is positively related to performance in both friendship (e.g., Mehra et al., 2001) and advice networks (e.g., Sparrowe, Liden, Wayne, & Kraimer, 2001), but it is brokerage in friendship networks that is most likely to invoke gender stereotypes (Brands & Kilduff, 2013). Women who violate the gender-stereotyped expectations of their friendship network by being seen to occupy broker roles are subject to reputational penalties (Brands & Kilduff, 2013). Diverging from the expectations of friends is a major source of emotional tension in organizations

(Krackhardt, 1992), especially for women who tend to define themselves in terms of their relationships to close others (Cross & Madson, 1997). We expect that the stereotype threat that women construe in broker networks is likely to loom large in friendship networks, and we therefore focus in this paper on brokerage in friendship networks rather than on brokerage in purely instrumental networks.

Across three studies – two student-based; one lab-based – we examine gender differences in individuals' construal of broker networks to offer a new account of the differential performance of men and women network brokers. In Study 1, we use student-based data on perceived brokerage in friendship networks to establish support for our baseline contention that women (but not men) will exhibit lower performance when they see themselves to be brokers in friendship networks. Study 2 uses data from a second student-based sample to replicate this core finding and to rule out the possibility that gender differences in brokerage orientation, rather than stereotype threat, are driving the results. In Study 3, we investigate the mechanism underlying this gender difference in the performance of network brokers by randomly assigning individuals to either a broker friendship network or a closed friendship network and asking them to solve a workplace problem based on their friends' advice. A crucial feature of our research design is that performance, across all three studies, was judged blind to the gender and network structure of the individuals being evaluated, enabling us to control for the effects of audience-centric factors on performance. Our paper develops and tests the argument that a construal perspective can help account for the differential performance of men and women in brokerage positions in friendship networks.

The Construal Perspective on Brokerage and Advantage

The structural hole theory of social capital (Burt, 1992) suggests that a key reason individuals benefit from occupying broker-like positions between disconnected others is that such positions confer their occupants with an informational advantage. The central premise underlying this theory is that closed networks (in which individuals are directly connected to each other rather than being indirectly connected through the broker) lead to information redundancy—over time, individuals in closed networks are exposed to the same information and converge upon common beliefs and norms (Coleman, 1988; Granovetter, 1973; Reagans & McEvily, 2003). The degree of connectivity in an individual’s network is, from this perspective, a proxy for his or her access to unique information: individuals whose networks are relatively sparse (i.e., broker-like) are assumed to have more access to non-redundant information than do individuals whose networks are relatively closed/interconnected (for simulation based evidence, see Borgatti, 2005). The structural theory of the broker’s information advantage relies on a “probabilistic, importation logic” (Perry-Smith, 2014: 832): If social ties are like pipes that convey information (Podolny, 2001), then network brokers – by virtue of their bridging position connecting otherwise unconnected others – are more likely to be exposed to alternative bits of information, putting them at greater “risk” for generating good ideas of their own (Burt, 2004)¹. From this perspective, knowledge is abstracted from context and easily transferred and exchanged between people (Cross & Sproull, 2004).

In contrast to this structural view, the construal approach that we put forward in this paper places a primary emphasis on brokers’ perceptions and interpretations (i.e., their

¹ Structural hole theory has become more explicitly constructivist over time. In its more recent versions, the proximal mechanism for the performance benefits of structural holes has shifted from access to non-redundant bits of information to the cognitive and emotional skills that brokers acquire over time as they cope with non-redundant bits of information (Burt, 2007:143; cf. Burt, Kilduff, & Tasselli, 2013)

construal) of social networks in shaping their understanding and use of the information available to them. From this view, social networks are not just patterns of interpersonal sentiment and interactions; they are also mental representations that help us understand our social world and how we should respond to it. We posit that these mental interpretations are an emergent product of the social structure, the context in which those relations are embedded, and the cognitive frames that are salient to the individual at the time. We use cognitive frames here as a broad term to encompass any emotion, belief, expectation, goal, schema or script, be it explicit or implicit, that is salient to individuals in broker networks (for a review of cognitive frames in mental construal, see: Schwarz, 2009).

Whereas the structural view sees information as the inputs to cognition, the construal approach emphasizes that individuals' entire self-regulatory system – i.e., their cognitions, motivations and emotions – will serve to constrain how information is understood and used. Thus, the construal perspective invokes a constructivist view of information transfer, which sees knowledge as embedded within particular social contexts (Weick & Westley, 1999) and as actively constructed by individuals (Brown & Duguid, 1991). This construal perspective on information advantage may be especially appropriate in knowledge intensive domains—e.g., professional firms, universities, and hospitals—where work problems tend to be ill-defined and complex, and often involve finding a solution that is not only feasible but also appropriate in that institutional context (cf. Cross & Sproull, 2004). Given that most of the research on the advantages of broker networks has been conducted in just such knowledge intensive domains, more recent research has begun to explore the implications of a more phenomenological perspective on brokerage. This work has demonstrated that the structure and strength of ties not only influence whether information transfer takes place, but also how information is interpreted by those receiving it (Perry-Smith, 2014). We build on this

emerging line of research to examine how gender differences in the construal of structural holes helps explain the differential performance of men and women in broker networks.

Gender Differences in the Construal of Broker Networks

When individuals perceive a pattern of disconnections around them in their friendship network, they can draw one or more inferences about others' expectations for them. For example, they may infer that others expect them to play the role of a mediator who resolves conflict between friends (Gould & Fernandez., 1989), an entrepreneur who capitalizes on information flow in the network (Burt, 1992), or a connector who brings friends together in productive ways (Obstfeld, 2005). Beyond these context-specific aspects of identity that emerge via interactions with others, broker networks might also invoke social identities that are stable across situations. In particular, because of its masculine associations (Brands & Kilduff, 2013), we propose that an individual's gender is likely to affect how that individual construes—perceives and interprets—broker networks.

We build this assertion from prior work that suggests that broker friendship networks are stereotypically masculine structures (Brands & Kilduff, 2013; Brands et al., 2015). Open networks are associated with the typically-male characteristics of status, power and control (Brands et al., 2015). Indeed, brokers tend to self-describe in masculine, agentic terms, “claiming the personality of an entrepreneurial outsider, in search of authority, thriving on advocacy and change” (Burt, 2005, p48). The association of open, broker networks with status, power and agency resonates with gender stereotypes that depict men in similar terms (Eagly & Steffen, 1984; Spence & Buckner, 2000). The association between open friendship networks and masculinity likely arises from interrelated expectations about what types of relational behaviors are expected and appropriate for men vs. women, (e.g., gendered expectations about whether and how to involve oneself in interpersonal conflict, propensity to

build social cohesion; see Brands & Kilduff, 2013). Prior work has sought to establish the association between masculinity and friendship broker networks by showing that people tend to overestimate the extent to which men, relative to women, possess broker-like networks rich in structural holes (Brands & Kilduff, 2013). We move beyond this prior work to put forward – and submit to direct empirical test – the idea that the masculinity of brokerage structures in friendship networks gives rise to a shared stereotype that women will perform worse, relative to men, when they are in a broker network.

If negative stereotypes surround women's performance in broker networks, then these stereotypes are likely to affect how men and women construe broker networks. For women, perceiving oneself to be a broker in their network of friends is likely to heighten concerns about being judged or treated on the basis of that negative stereotype, a phenomenon known as stereotype threat (Spencer et al., 2016: 416). Stereotype threat is a 'fluid, situational threat' (Lamont, Swift, & Abrams, 2015: 180) that can arise even from subtle environmental and social factors that function outside of an individual's conscious awareness (Dasgupta, Scirle, & Hunsinger, 2015; Davies, Spencer, Quinn, & Gerhardstein, 2002; Koch, Konigorski, & Sieverding, 2014; Schmader & Beilock, 2012; Steele, 1997). For example, stereotype threat effects have been observed in women who: interacted with sexist men (Koch et al., 2014); were exposed to 'geeky', masculine physical cues in scientific domains (Cheryan, Plaut, Davies, & Steele, 2009); and watched sexist television commercials (Davies et al., 2002; Davies, Spencer, & Steele, 2005). This surprising feature of stereotype threat arises because stereotypes are socially shared and thus readily activated in individuals (Kulik, Perera, & Cregan, 2016). As such, stereotypes do not have to be explicitly spelled out in order to induce threat—simply being in a domain or context where one might be judged

negatively on the basis of a group membership can trigger stereotype threat (Spencer et al., 2016; Steele, 1997; Steele, Spencer, & Aronson, 2002).

The construal of situations as threatening by members of groups who are negatively stereotyped affects their performance in the domain where the threat occurs (for a review, see: Inzlicht & Schmader, 2012; Spencer et al., 2016). Stereotype threat facilitates individuals' dominant response on the task: when the task is easy, awareness of negative stereotypes about one's group in that domain serves to bolster performance, but when the task is difficult, stereotype threat serves to undermine performance (Ben-Zeev, Fein, & Inzlicht, 2005; O'Brien & Crandall, 2003). Because high achievement in most domains requires the accomplishment of challenging tasks, stereotype threat typically results in a performance decrement (Spencer et al., 2016). For example, stereotype threat has been shown to undermine women's performance in masculine domains such as mathematics (Danaher & Crandall, 2008), engineering (Logel et al., 2009) and negotiations (Kray, Thompson, & Galinsky, 2001).

The performance consequences of stereotype threat are attributable to both automatic, unconscious processes and controlled, deliberate processes (Schmader & Beilock, 2012; Schmader, Johns, & Forbes, 2008). When situational cues trigger stereotype threat in individuals, they will experience uncertainty about their performance and unconsciously search for cues in the external environment that confirm or disconfirm this fear (Johns, Inzlicht, & Schmader, 2008; Kaiser, Vick, & Major, 2006). These processes are automatic and occur outside of individuals' conscious awareness. As such, individuals experiencing stereotype threat may not necessarily be able to articulate concerns about being judged negatively on the basis of a group identity as a cause of their reactions. Rather, the lived experience of stereotype threat for individuals is anxiety about their performance (Ben-Zeev

et al., 2005). Anxiety reduces the cognitive resources that individuals who experience the threat have available to apply to the task at hand (for an integrated review of the research in this area, see: Schmader et al., 2008). Specifically, when individuals become anxious about their performance, they switch from automatic to controlled modes of information processing, causing them to fall back on their dominant responses (O'Brien & Crandall, 2003). Individuals experiencing stereotype threat will also consciously try to suppress negative thoughts and feelings (Johns et al., 2008). Both of these processes tax working memory, reducing individuals' ability to focus on the task at hand, solve problems and regulate themselves in interactions with others (Barrett, Tugade, & Engle, 2004; Beilock, Rydell, & McConnell, 2007; Schmader et al., 2008). Individuals experiencing stereotype threat may try to compensate for the negative effects of anxiety with increased effort (Eysenck, Derakshan, Santos, & Calvo, 2007) and greater vigilance for task errors (Lewis & Linder, 1997). However, as task difficulty increases, individuals' ability to compensate with effort and vigilance decreases, resulting in performance decrements in the domain in which the stereotype threat occurs.

There is evidence that brokerage positions in friendship networks are related to superior individual performance in organizations (Mehra et al., 2001). However, the presence of negative stereotypes about women brokers means that women carry an extra burden that anything they say or do could be judged as confirming the stereotype that women do not perform as well as men in situations where their friends are not friends with each other. We theorize that this stereotype threat will be reflected in women's construal of broker networks: women who see themselves in a brokerage position in their workplace network of friends are likely to express anxiety, not just about the evaluations of others but also about their own task

performance. This anxiety reduces the cognitive resources available to individuals for intellectual tasks in the domain, and results in a performance decrement for women brokers.

Based on the logic of the preceding arguments, we expect that women's (but not men's) performance will be adversely affected when they perceive themselves to occupy brokerage positions in friendship networks. Moreover, the mechanism responsible for this gender-based difference in performance is rooted in men's and women's differing construal of the degree evaluative threat in broker networks, as evidenced by women's greater anxiety in these roles.

Hypothesis 1: To the extent that women (but not men) perceive themselves as brokers in their surrounding network of friends, they will perform worse.

Hypothesis 2: Anxiety about task performance and negative social evaluations will mediate the relationship between perceived friendship broker networks and performance for women but not men.

We emphasize that these effects will occur due to the presence of shared beliefs about women's versus men's performance in brokerage structures, regardless of whether men and women endorse these stereotypes personally (Steele et al., 2002). Although there is prior evidence to suggest the presence of such a stereotype, we sought to more directly establish the presence of the stereotype before testing our hypotheses. The methods and results supporting the presence of the stereotype are described in Appendix A.

STUDY 1

The goal of Study 1 was to demonstrate gender differences in performance among individuals who perceive themselves to have broker friendship networks in a real-world setting, thus establishing the external validity of our theory. Although there is some previous field-based work on gender differences in returns to brokerage (e.g., Burt, 1998), that work

did not distinguish between perceived and actual broker networks, making it impossible to determine whether the observed brokerage effects were the result of the reactions of others to brokers or, instead, the result of ego-centric processes. Moreover, in previous work, the judgement of performance was not blind to the gender and network position of the focal individual. It is quite possible, therefore, that the lower performance of women in previous work was the result of the judges' gender stereotypes and/or the judges' perceptions (or misperceptions) of the focal individual's network position (Brands & Kilduff, 2013).

Method

Sample and procedure. Participants were 160 students Master of Business Administration (MBA) students at a business school (79 men, 31 women) located in England. The students were formally assigned to study groups, each consisting of five individuals. The study groups were designed by administrators of the MBA program to be the primary task and learning groups. Respondents were asked to report their perception of the friendship networks within these five-person groups. The response rate was 69 percent. The sample consisted of 110 individuals in 20 study groups. The average age of the respondents was 29.78 years ($SD = 3.66$). Following an in-class briefing, respondents were invited to participate in the research via an email that linked them to an online survey. The survey was administered approximately two weeks after the participants had been allocated to their study groups.

The data were obtained from the same MBA cohort as the one used in a previously published paper Brands and Kilduff (2013). This prior paper examined individuals' perceptions of the extent to which other people occupied brokerage positions in the network. The current research, by contrast, examines individuals' perceptions of the extent to which they themselves occupy brokerage positions in the network. These self-perceptions, which are key to testing our theory of network construal, are included for the first time in this

paper—they were not included in Brands and Kilduff (2013). Both papers use individual performance as the outcome of interest.

Social networks. We used Krackhardt's (1987) cognitive social structures (CSS) approach to capture each individual's perception of the friendship network in their study group. The CSS approach is the gold standard for measuring network perceptions, but it is cognitively taxing and best suited to small groups, such as those in Study 1. Each respondent (ego_1) provided a complete map of the friendship relations that existed in their study group (consisting of ego and four others, $alters_{1-4}$). Ego_1 was presented with the list of names of everybody in her study group and was asked to indicate who she would consider a friend. Then, ego_1 was asked to put herself in the shoes of $alter_1$ and choose who $alter_1$ would consider a friend in the study group (from among ego_1 , $alter_2$, $alter_3$, $alter_4$). Next, ego_1 was asked to put herself in the shoes of $alter_2$ and choose who $alter_2$ would consider a friend in the study group (from among ego_1 , $alter_1$, $alter_3$, $alter_4$). This process was repeated for each alter so that ego_1 contributed a 5 x 5 matrix of the friendship relations she perceived in her study group. We represented friendship relations as directed ties: a directed friendship tie from i to j was said to be perceived by respondent k ($R_{i,j,k}$) if k said that i chose j as a friend. The 110 perceived friendship network matrices provided by the respondents were used to calculate the extent to which each individual perceived themselves to have a broker friendship network.

To extract the actual network of friendship relations from the CSS data, we performed a 'Row Dominated Local Aggregation': A directed friendship relation R_{ij} was considered real if i says that i considers j a friend. Each directed friendship tie was defined from the perspective of the person who claimed the tie (see the discussion in Krackhardt, 1987: 116-117). We used directed ties because they allow for the possibility that i chose j as a friend even if j did not choose i as a friend. As we explain in greater detail in footnote 2, our results were robust to other ways of defining a real friendship tie from one person to another. Each

study group, therefore, had a single matrix of actual friendship relations, which was used to calculate actual brokerage scores for each respondent.

Measures

Outcome variable: Individual performance. Each individual's score (out of 100) on the final exam for the course was taken as a measure of individual performance. Exams were identified by student numbers, and thus were graded blind to the student's gender and network relations. The course was a required component of the MBA. The final exam was administered at the end of term.

First predictor variable: Perceived Brokerage. Perceived brokerage was measured with Burt's network constraint measure (1992: 50-54), calculated on the matrix representing the friendship network as seen by the focal respondent (ego). Network constraint is an index of the extent to which ego's alters are also connected with each other, and mathematically is comprised of size, density and hierarchy (Burt, 1992). Constraint was calculated for each respondent's matrix of perceived friendship relations within their respective study groups. Because constraint is inversely related to structural holes, we reversed the scores (1-constraint) so that higher scores indicated higher brokerage. The respondent's scores were taken as the measure of perceived brokerage in the friendship network.

Second predictor variable: Gender. The gender of each participant was collected from the MBA profiles published by the school.

Control variables. Our theory emphasizes the importance of individuals' perceptions of their surrounding social structure for their performance, regardless of whether those perceptions are borne out in the actual pattern of interactions. To check the robustness of this assertion, we controlled for respondents' 'actual' brokerage in the analysis, measured by reverse scored constraint calculated on the actual friendship relations matrix for each study group. For a tie to count as an actual friendship tie from i to j , i had to report that i chose j as

a friend ($R_{i,j,i} = 1$). Because stereotype threat may be accentuated or attenuated by the sex of work group members (Dasgupta et al., 2015; Logel et al., 2009), we controlled for the number of women in the team (team gender composition: 1 or 2).

Analysis

To account for the nested structure of the data, we used Hierarchical Linear Modeling (HLM) to model individual (level 1: gender and perceived and actual brokerage) and team (level 2: gender composition) effects. The effects were robust to other model specifications.

Results

Means, standard deviations and correlations are provided in Table 1. Hypothesis 1 predicted that to the extent that women (but not men) perceived themselves to be brokers in their surrounding network of friends, they would perform worse. Hypothesis 1 was initially supported by a significant *gender x perceived constraint* interaction, $B = -22.39$, $p = .009$ (Table 2, Model 2, Figure 1). We examined the performance of men and women at one standard deviation below the mean for perceived constraint (i.e., high brokerage) and one standard deviation above the mean for perceived constraint (i.e., low brokerage). In line with our predictions, we found that women were susceptible to a stereotype threat in brokerage networks, performing significantly worse than women in closed networks ($z = -2.29$, $p = 0.02$). In contrast, men's performance was unaffected by their perception of themselves as brokers in the friendship network ($z = 1.65$, $p = 0.10$).

Robustness Check. We examined whether there were gender differences in performance when we used individuals' actual (rather than perceived) brokerage scores. As anticipated by our theory, the *gender x constraint* interaction term was not significant ($B = -2.42$, $p = .75$; Table 2, Model 3). We also examined whether symmetrizing the perceived and

actual friendship matrices would change the results. We examined symmetrized ties using both the maximum rule and the minimum rule² – neither changed the results.

 Insert Tables 1-2, Figure 1 about here

Discussion

The pattern of results in Study 1 supports our baseline contention: Women’s, but not men’s, performance is adversely affected when they perceive themselves to broker in friendship networks. Although a previous study (Burt, 1998) reported a similar pattern of results, the outcome variable in that study was speed of promotion not performance. Promotions and performance tend to be positively related, but they are not interchangeable. Speed of promotion can vary for women and men even when they exhibit the same level of performance (Heilman, 2004). It was important, therefore, to demonstrate in a real-world setting that gender based differences in returns to broker networks apply directly to performance. Moreover, performance was judged “blind” to gender and network position, ruling out the possibility that gender-bias on the part of evaluators may have directly shaped performance.

Although the effect was not statistically significant, the data indicate a trend towards men performing better in broker networks, which could be attributed to “stereotype lift.” Stereotypes that disparage women’s capabilities, relative to men, in masculine domains have been shown to bolster the performance of men (Johnson et al., 2012) by increasing their

² Under the maximum rule, a perceived friendship tie ($R_{i,j,k}$) is said to exist between i and j if k perceived that either i claimed j as a friend or if k perceived j claimed i as a friend; and an actual tie is said to exist between i and j if either i claimed j as a friend or if j claimed i as a friend. Under the minimum rule, a perceived friendship tie ($R_{i,j,k}$) is said to exist between i and j if k perceived that both i claimed j as a friend and j claimed i as a friend; and an actual tie is said to exist between i and j when both i claimed j as a friend and j claimed i as a friend (see Krackhardt, 1987).

expectations that they will be judged positively by others (cf. Cohen, Steele, & Ross, 1999). This expectation reduces men's performance-related anxiety and boosts their feelings of self-efficacy, freeing up cognitive resources for the task at hand, with positive consequences for their performance (Schmader et al., 2008; Walton & Cohen, 2003).

Our theory emphasizes the importance of a broker's perceptions of network structure for their performance. Our use of CSS data (Krackhardt, 1987) allowed us to measure both the perceived and the actual network position the person occupied, so we were able to statistically control for the effects of the actual network position on performance. The results clearly showed, as predicted, that the effect of gender on performance in broker networks was only discernible when the person saw himself/herself as having a broker network. Prior research on network cognition has tended to focus on the degree to which people are accurate in their mental representations of the networks around them. We are suggesting here that accuracy is an aside when it comes to understanding individuals' psychological reactions to their networks. The inaccurate perception that one is a broker may nonetheless trigger real, tangible reactions in an individual. To understand gender differences in performance as network brokers, it is important to understand how individuals, accurately or inaccurately, construe their networks.

STUDY 2

Study 2 was designed to address two limitations of Study 1. First, Study 1 examined individuals' perceptions of their broker positions in the context of small, five-person groups. A strength of this design choice is that it allowed us to collect complete cognitive social structure data, the gold-standard for capturing network perceptions (Krackhardt, 1987). However, it is possible that the small group context in Study 1 biased our results in favor of finding an effect because we only considered within-group friendship ties. Women may

experience greater stereotype threat related to within-group ties because such ties are likely to be especially salient in small task groups. Moreover, it is possible that the performance of individuals within a group is influenced by their ties to MBA students who were not part of their study group. We therefore sought in Study 2 to replicate our findings in a context that allowed us to capture friendship ties between individuals even if they were not members of the same task group. Second, we wanted to examine whether gender differences in brokerage orientation could account for our findings. In particular, in Study 2 we examined whether the *tertius iungens* orientation (Obstfeld, 2005) to brokerage underlie gender differences in performance in perceived broker networks. Individuals who adopt a *tertius iungens* orientation to brokerage tend to introduce disconnected individuals in their networks and facilitate coordination between their network members (Obstfeld, 2005). Since closed networks are associated with female gender stereotypes (Brands et al., 2015), women may be more likely than men to adopt a *tertius iungens* strategic orientation to brokerage. We designed a second student-based study to examine these possibilities.

Method

Sample and procedure. Participants were 164 students Executive MBA (EMBA), MBA, Masters and exchange students (113 men, 58 women) at a UK business school. The students were enrolled in three classes of the same elective running consecutively, with 56, 37 and 71 members respectively. The average age of the respondents was 33.26 years ($SD = 4.92$). The students participated in the research as part of an in-class exercise. Only students who gave permission for their data to be used were included in the research (response rate = 94%).

Social networks. We again captured both perceived and actual friendship relations in each class. Given the large network size, it would be cognitively taxing to ask each individual

about the perceived friendship networks of everyone in their group, so we used a sampling procedure adapted from Flynn, Reagans, Amanatullah, and Ames (2006). Each respondent (ego) was provided with a list of names of everyone in their class and was asked to indicate up to ten individuals whom they considered a friend. Subsequently, respondents were asked to indicate who each of the individuals they nominated as their friend would consider a friend within the class. For example, if Megan Dutton indicated that Sam Brown was her friend, she would then be presented with the list of names of everyone in the class and be asked to indicate who Sam Brown considered a friend. This was repeated for each of the people Megan Dutton nominated as her friend within the class. The data were used to construct a matrix of the friendship relations perceived by individuals within their class. We again used directed ties, such that a directed friendship tie was said to be perceived between i and j by respondent k ($R_{i,j,k}$) if k said that i chose j as a friend. The 164 perceived friendship network matrices provided by the respondents were used to calculate each individual's perceived brokerage position in the friendship network in their class.

To capture the actual friendship ties, we used the Row Dominated Local Aggregation method described in Study 1. Each respondent (ego) was provided with a list of names of everyone in their class and was asked to indicate up to ten individuals whom they considered a friend. We used these responses to construct a matrix of actual directed friendship network relations, in which R_{ij} is real if i said i considered j to be a friend. Each class, therefore, had a single matrix of actual friendship relations, which was used to calculate actual brokerage scores for each respondent.

Measures

Outcome variable: Individual performance. Each individual's score (out of 100) on the final paper for the course was taken as a measure of individual performance as there was no exam for this course.

First predictor variable: Perceived Brokerage. Perceived brokerage was measured, as in Study 1, via Burt's (1992: 64) measure of network constraint, reverse-scored.

Second predictor variable: Gender. The gender of each participant was collected from the MBA profiles published by the school.

Tertius iungens Orientation. In order to examine this possible explanation for our findings, respondents completed the six item *teritus iungens* orientation scale, $\alpha = .84$ (Obstfeld, 2005).

Control variables. To confirm that perceptions of brokerage rather than actual brokerage were driving our effects, we controlled for respondents' actual networks using Burt's (1992) network constraint measure in network of confirmed friendships, reverse-scored. In addition, we controlled for the degree program each respondent was enrolled in.

Analysis

The data contained both nested (observations of individuals within the same class are not independent of one another) and crossed effects (observations of individuals from the same degree program are not independent of one another). We therefore used a linear mixed model. Modelling the random effects of class and degree program yielded the best fit for the data in the unconditional random effects models. However, once we added in fixed effects, the variance attributable to the random effects was 0, so they were removed from the analysis.

Results

Means and standard deviations and correlations are provided in Table 3. We hypothesized that to the extent women (but not men) perceived themselves to have a broker network in the friendship network, their performance would be negatively affected. This hypothesis was initially supported by a significant *gender x perceived constraint* interaction,

$B = -9.64, p = .03$ (Table 4, Model 2, Figure 2). We examined the performance of men and women at one standard deviation below the mean and one standard deviation above the mean of perceived reverse-scored constraint. In line with our predictions, to the extent women perceived themselves to be brokers in their friendship networks, they performed worse ($t = -1.95, p = 0.05$). However, men's performance was unaffected by their perceptions of themselves as brokers ($t = .9, p = 0.37$). Notably, our hypothesis was supported even controlling for *tertius iungens* orientation.

Robustness Checks. We examined whether there were gender differences in performance when we used individuals' actual brokerage scores. The *gender x constraint* interaction term was approaching significance ($B = -8.71, p = .15$; Table 4, Model 3), with the pattern of effects replicating those for perceived constraint. We speculate that this may be because individuals had somewhat accurate views of their immediate friendships – an idea supported by the significant (but modest) correlation between actual and perceived constraint ($r = .14, p = .06$). To check whether perceptions or reality were driving our effects we examined whether the *gender x constraint* interaction term remained significant when we included the *gender x perceived constraint* interaction term in the analysis. The results of this analysis (Table 4, Model 4) showed that the *gender x constraint* interaction term was not a significant predictor of performance ($p = .29$) while the *gender x perceived constraint* term was marginally significant ($p = .06$), supporting our hypothesis that perceptions of brokerage underlie gender differences in performance. Finally, we also examined whether symmetrizing the perceived and actual friendship matrices (using the maximum and minimum rule—see footnote 2 above) would change the results – it did not.

 Insert Tables 3-4, Figure 2 about here

Discussion

Study 2 allowed us to test Hypothesis 1 in a second student setting using an alternative method to capture network perceptions, one that was better suited to assessing network relations among members in groups of a larger size than the five-person groups we examined in Study 1. It is possible that the stereotype threat women construe in brokerage positions is different in small, task-focused groups than in larger ones, so it was important to replicate support for Hypothesis 1 in a larger network. We also used Study 2 to account for the possible effects of an important individual difference variable—*tertius iungens* orientation—that could co-vary with gender and performance. We found that this variable was not significantly related with gender, and the inclusion of this variable did not diminish support for Hypothesis 1. Gender-based differences in broker performance were not the result of underlying dispositional differences in the tendency to introduce disconnected others. Taken together, Studies 1 and 2 provide robust support for the idea that men and women perform differently when they perceive themselves as occupying brokerage positions.

STUDY 3

Having established support for Hypothesis 1 in two student settings, the purpose of Study 3 was to test Hypothesis 2, which focuses on the mechanism responsible for gender differences in brokerage performance. To accomplish this, we moved our investigation into the controlled environment of the laboratory, where we randomly assigned individuals to either a broker friendship network or a closed friendship network and asked them to solve a workplace problem based on their friends' counsel. According to the logic underlying Hypothesis 2, we expected that women assigned to broker networks (versus those assigned to closed networks) would express greater anxiety about their task performance and the potential for negative social judgements. That is – women would experience a stereotype

threat. In contrast, we expected that men's construal of broker versus open networks would not be affected by a stereotype threat. Thus, Study 3 presents a direct test of Hypothesis 2, which states that elevated anxiety about task performance and social judgements will mediate the relationship between brokerage and performance for women, but not for men.

Method

Participants and Design

Participants were 232 US and Canadian residents, all currently employed, recruited from Amazon's Mechanical Turk: 172 were White Americans, 27 were African Americans, 20 were Hispanic Americans, 15 were Asian Americans, 4 were Native American, 1 was Indian and 4 did not indicate their ethnicity. On average, participants were 33.96 years old ($SD = 9.13$) and had worked for 14.22 years ($SD = 9.29$). Study 3 manipulated network structure (broker vs. closed) in a between-participants design. Participants self-reported their gender.

Procedure

We adapted the procedure set out in Perry-Smith (2014; see supplementary material online). After providing informed consent, participants were told that they would assume the role of HR Director of a steel company and were provided with a brief description of the role. Next, participants were told that over the years in their job, they had made three close friends. The relationships between their friends were described and accompanied by a network diagram with nodes (labeled with friend's names) and lines (representing friendship ties), depicting the participant's friendship network. Nodes were given gender neutral names to avoid the possibility that participants would interpret their network differently depending on whether their ties were to women or to men.

Network manipulation. Participants in the *closed network condition* were told that all of their friends were friends with each other, and saw a network diagram in which all the nodes were connected to each other (i.e., all possible relationships existed). Participants in the *broker network condition* were told that none of their three friends were friends with each other, and saw a network diagram in which the only ties were between the participant and the friends (i.e., there were no connections between the friends). Thus, the number of ties held by ego in each condition was constant, with only the ties between their friends varying between the closed and broker network conditions. All participants were asked to imagine what it would be like to be in the friendship network and write a few sentences describing those feelings and their typical interactions they imagined they would have in the network. We conducted extensive manipulation checks, described in Appendix B, establishing that the network manipulation (1) corresponds to individuals' broker network schemas, (2) primes these broker network schemas in individuals and (3) does not result in gender differences in the perception of task or relational conflict.

Anxiety. Prior work on stereotype threat has predominantly used measures of test anxiety or generalized state anxiety (see Appendix B). However, our theory suggests that women will experience anxiety not only about task performance but also about social judgments because network brokerage is an inherently social phenomenon. As such, we used a measure that captures anxiety about both task performance and social performance: the State Self Esteem scale (Heatherton & Polivy, 1991). We used the performance and social dimensions of the scale. The performance dimension captures anxiety about ability and task performance. The items were: *I feel confident about my abilities (R); I feel frustrated or rattled about my performance; I feel that I am having trouble understanding things that I read; I feel as smart as others (R); I feel confident that I understand things (R); I feel that I*

have less scholastic ability right now than others; I feel like I am not doing well. The social dimension captures anxiety about negative social evaluations. The items were: *I am worried about whether I am regarded as a success or a failure; I feel self-conscious; I feel displeased with myself; I am worried about what other people think of me; I feel inferior to others at the moment; I feel concerned about the impression I am making; I am worried about looking foolish.* Participants responded to the items on a 7-point Likert scale (1 = strongly disagree to 7 = strongly agree). The overall reliability of the scale was $\alpha = .94$. We conducted checks to ensure it was equivalent to measures of anxiety used in other stereotype threat research, as described in Appendix B.

After completing the anxiety measure, participants received an email from a manager in the firm asking for help with a human resources problem. Before responding, participants were told that they described the problem in separate conversations with their friends, each of whom gave them some advice. They then read the advice of each of their friends. After reading the advice of their friends, participants were asked to write a response to the manager, advising the manager on a course of action.

Performance. Two independent HR experts, who were blind to the hypotheses of the study and to each participant's gender and network condition, rated the quality of participants' advice to the manager. This quality rating was a composite of the effectiveness of the proposed solution (1 = very ineffective to 7 = very effective) and the appropriateness of the proposed solution (1 = very inappropriate to 7 = very appropriate)³. Cronbach's alpha was .81; the ICC = .68.

Results

³ Although this task originates from creativity research which would examine novelty and appropriateness (Shalley, 1991), the raters were not asked to make any creativity judgements.

Hypothesis test. Table 5 presents the means, standard deviations and correlations. Hypothesis 2 predicted that elevated anxiety about task performance and negative social evaluations would mediate the relationship between brokerage and performance for women but not for men. Statistically this represents a first-stage moderated-mediation, in which gender moderates the effect of brokerage on anxiety, which in turn affects performance. We tested this model using Hayes' PROCESS macro (Model 7); the results are presented in Table 6 and Figure 3. In line with our prediction, there was a significant *gender x network* interaction on anxiety, $B = .61, p = .03$. Women who were assigned to the broker network condition reported greater anxiety about their task performance and negative social evaluations ($M = 2.94, SE = .15$) than women assigned to the closed network condition ($M = 2.33, SE = .13$), $B = -.61, p = .002$. In contrast, men's anxiety was unaffected by whether they were assigned to the broker network condition ($M = 2.46, SE = .14$) or the closed network condition ($M = 2.45, SE = .14$), $B = .005, p = .98$. Anxiety, in turn, predicted performance such that to the extent that individuals reported higher anxiety, they performed worse, $B = -.23, p = .005$.

Next, we tested the conditional indirect effect of network condition on performance via anxiety for women versus men. Based on a bootstrap sample of 5000, zero fell outside the 95% confidence interval for women (-.32 to -.04), indicating that anxiety mediated the relationship between network condition and performance for women. In contrast, based on a bootstrap sample of 5000, zero fell inside the 95% confidence interval for men (-.10 to .08), indicating that anxiety does not mediate the relationship between network condition and performance for men. The index of moderated mediation was $B = -.14 (SE = .08)$, 95% CI -.36 to -.02. Thus, consistent with our theorizing, women assigned to the broker network tended to report greater anxiety about their task performance and negative social evaluations,

and this hindered their performance. By contrast, anxiety did not mediate the link between network condition and performance among men.

 Insert Tables 5-6, Figure 3 here

Discussion

Study 3 allowed us to test the theorized mechanism underlying gender differences in returns to brokerage. We found that women (but not men) assigned to a broker position in a hypothetical friendship network reported greater anxiety about their task performance and the potential for negative social evaluations than women assigned to the closed network condition; and we found that this anxiety mediated the relationship between network condition and performance. A strength of the experimental approach is that it allowed us to establish causality via random assignment of individuals to broker and closed networks. Moreover, performance was judged blind to both gender and network condition, and individuals received the same information from their friends regardless of network condition, allowing us to rule out alter-centric factors such as gender bias as an alternative explanation for our findings. Finally, by bringing the investigation into the lab, Study 3 allowed us to precisely measure men's and women's differing construal of brokerage. Even when men and women had the same broker network, their construal—in terms of psychological anxiety about task performance and negative social evaluations — varied; and this variance in how they interpreted and experienced their networks helped account for gender-based variance in the performance of network brokers.

GENERAL DISCUSSION

In this paper, we have presented a new approach to friendship network brokerage, one that emphasizes that individuals' construal (i.e., perception and interpretation) of the disconnections in the social structure around them is critical in determining how they perform

in that network. Our work demonstrates that men's and women's construal of broker friendship networks differs on a fundamental dimension: the extent to which they experience stereotype threat in these networks. This threat of negative evaluations, in turn, leads to a performance difference between men and women who see themselves as having broker networks, with women underperforming relative to men. The construal approach deepens structural perspectives by highlighting that the manner in which the broker experiences network structure can be a key to understanding the broker's performance.

Our research contributes to a growing literature on gender differences in returns to social networks. Returns to social networks differ for men and women, particularly when it comes to occupying brokerage positions (Brands & Kilduff, 2013; Brands et al., 2015; Burt, 1998). Prior work suggests that women who are seen to occupy brokerage positions in friendship networks incur penalties, levied by network members for violating gender norms (Brands & Kilduff, 2013). While the perceptions and beliefs of others in the network no doubt play an important role in shaping the benefits men and women are able to extract from a broker network, audience-centered explanations ignore the phenomenology of brokers and the potential it has to shape network returns. Negative stereotypes about the performance of women in broker networks mean that a woman who sees herself as having a broker network must not only endure the emotional tension inherent in networks where her friends are not friends with each other but must also endure the added psychological burden of potentially confirming these stereotypes. Social psychological research suggests that members of negatively stereotyped groups suffer performance decrements when stereotypes about their performance in a domain are salient to them (e.g., Spencer, Steele, & Quinn, 1998). Yet we are aware of no previous research that has examined whether and how gender stereotypes about women's ability to perform in broker networks affects the performance of men and women who see themselves in these positions.

The current research addresses this gap in the literature with an ego-centric approach to gender differences in returns to broker networks. We empirically demonstrated that the association between broker networks and masculinity underlies a shared stereotype that women, relative to men, will perform worse as brokers in friendship networks. Moreover, we found evidence that this stereotype fundamentally alters the way women and men construe broker networks. When women perceive themselves to have a broker network, they experience elevated anxiety about their performance and the potential for negative social evaluations, and this undermines their performance on intellectual tasks. The results of Study 3, in particular, underscore the role played by the construal of a stereotype threat in dampening broker performance: women in the broker network condition received the same information as women in the closed network condition yet women assigned to the broker condition were less able to capitalize on the information. Our work, therefore, complements existing accounts of gender differences in returns to friendship brokerage that focus on audience effects (Brands & Kilduff, 2013) by emphasizing that the negative reactions to women who are seen to have broker networks can be internalized by women, and this internalization can go on to inhibit their performance.

Beyond helping to establish that men and women perform differently when they see themselves as occupants of brokerage positions in friendship networks, our research also contributes to the broader literature on the performance-benefits of workplace social networks. Research in this area has predominantly taken a structural approach, which assumes that brokerage and other social network roles elicits similar behavior from different kinds of people because they are a “strong situation” (Mischel, 2013). That is, regardless of whether individuals choose to be a broker, if they find themselves connected to people who themselves are not connected, they are likely to capitalize on the inherent advantages associated with structural holes (Burt, 1992; Padgett & Ansell, 1993). However, more recent

scholarship has pointed out that there is variance in returns to brokerage, such that some individuals whose networks are rich in disconnections perform no better than individuals surrounded by closed networks (Burt et al., 2013).

The construal perspective that we offer in this research provides insight into the question of why some individuals reap greater rewards from occupying brokerage positions in social networks than do other individuals. Like behavioral (Obstfeld, Borgatti, & Davis, 2014) and dispositional (Mehra et al., 2001; Obstfeld, 2005) perspectives on returns to brokerage, the construal approach places a primary importance on the role individuals play in extracting benefits from broker networks. We contribute to this line of work by providing a distinctive theoretical and empirical account of variance in returns to brokerage that links social structure and performance through cognition. In particular, our theory emphasizes that individuals' brokerage responses are not entirely determined by social structure—different people can construe the “same” social structures differently; and these differences in construal help account for why they perform differently when they find themselves embedded in these structures. In support of this emphasis on the broker's cognition, we found (in Studies 1 and 2) that the performance of the individuals we studied was more affected by their perception that they occupied brokerage positions than by whether they actually occupied such positions in the network. Moreover, gender differences in the performance of brokers were not explained by an underlying dispositional tendency to connect those who one is brokering (as captured by the *tertius iungens* orientation scale – Obstfeld, 2005), suggesting the construal perspective on brokerage provides unique insights beyond those offered by this dispositional approach to brokerage. Furthermore, Study 3 found that individuals exposed to the same information performed differently depending on whether they thought they were in a closed or an open network structure. Returns to brokerage can vary even when the information the brokers receive is the same— differences in how

individuals construe their networks shapes performance above and beyond the real informational benefits networks have to offer.

Our work speaks to the literature on network cognition. The predominant focus of this work has been on the nature and form of the network schemas that individuals use to organize their perceptions of social networks (Brands, 2013). This work has highlighted that individuals' perceptions of the social structures around them determine their actions, even if those perceptions are biased relative to reality (e.g., Krackhardt & Porter, 1986). Thus, the network cognition approach has tended to replicate the structural emphasis of social network research, with its main point of departure being that it situates structure in the minds of the individuals rather than in the patterns of interactions around them. However, a large body of research in psychology suggests that individuals' interpretations of their social environments are determined by a dynamic and recursive interplay between their emotions, cognitions, motivations and the environment (Semin & Garrido, 2015; Smith & Semin, 2004). With few exceptions (e.g., Smith, Menon, & Thompson, 2012), these insights have not yet been incorporated in to the literature on network cognition.

Our research begins to address this shortcoming. The construal perspective that we developed in this paper highlights that network schemas are just one component of cognition that affect individuals' construal of social networks. In particular, our experimental manipulation of broker versus closed networks primed sparser and denser networks respectively, as described in Appendix B. However, gender schemas also affected individuals' construal of these networks, such that women interpreted the broker network as indicating a higher potential for negative evaluations than men. This finding suggests the blended approach of the construal perspective, which selectively incorporates theoretically relevant (and societally important) individual attributes into network thinking, may offer a

fuller account of network cognition than can be gained from an exclusively cognitive perspective on networks (see Casciaro et al., 2015).

Managerial Implications

Managerial and professional work in contemporary organizations routinely requires individuals to build bridges across groups in different parts of a company. If, as our research suggests, women are more likely to experience stereotype threat when they occupy such broker networks, what practical measures can organizations take to enhance women's performance in such roles? Existing research (for a summary, see: Spencer et al., 2016) points to several possibilities: (a) raise consciousness about the potential triggering of stereotype threat; (b) make explicit the illegitimacy of the stereotype (e.g., provide and stress counter-stereotypic information); and (c) raise women's awareness about the potential for stereotype threat to detract from their performance and help them learn to reappraise and reframe their experience of threat as something else (e.g., something challenging but accomplishable). These interventions can be readily incorporated into existing career training and professional education, which often include an explicit focus on topics surrounding networking for managers and other professionals (Ely, Ibarra, & Kolb, 2011).

Limitations and Future Research

The business context in which we conducted our research may represent a boundary condition for our theory. Women are regularly devalued on the basis of their gender in business contexts (Heilman, 1983; Heilman & Eagly, 2008). Business is seen as a man's world: men are presumed to be more competent than women (Heilman, Brett, & Rivero, 1991), and stereotypes about the ideal worker (Acker, 1990) and the ideal business leader (Eagly & Karau, 2002; Heilman, Block, Martell, & Simon, 1989) also favor men over women. Our work suggests that, for women, seeing themselves in a broker network is one

means by which the chronic social identity threat present in business settings becomes a concrete, experienced stereotype threat (cf. Steele et al., 2002). However, although gender is a primary identity used in both self and other characterization, people usually also go on to categorize people in other ways (Fiske, Lin, & Neuberg, 1999). It may be that in formal work organizations other identities, such as nationality, ethnicity, or even organizational rank/role offer more powerful definitions of self (and others) and thus frames for brokerage than does gender (see Ridgeway, 2011: 69).

Our theory and analyses focus on friendship relations. Friendship relations are ubiquitous in organizations (Morrison & Cooper-Thomas, 2013). Although friendship ties are a resource for workplace performance, they also enmesh individuals in obligations and expectations that can be a source of psychological strain (Berman, West, & Richter Jr, 2002). The key tenet of brokerage theory is that advantage arises from social structure, thus both theory (e.g., Burt, 1992: 8; Burt, 1997: 357) and research (e.g., Burt, 1992; Burt, 1997; Kleinbaum, 2012; Seibert, Kraimer, & Liden, 2001) have been agnostic to the instrumentality vs. expressiveness of tie content. Indeed, the jury may still be out on the relative performance benefits of brokerage in friendship networks versus more instrumental networks (Fang et al., 2015). What our study contributes to the debate is new theory and evidence that establishes gender-based differences in the performance of individuals who broker friendship networks in an organizational context. Future work might examine whether the perception of stereotype threat is dampened when one considers brokerage in networks of purely instrumental relations, especially those that are more or less mandated by the nature of one's job. A woman who brokers a workflow network as part of her job may not perceive the same level of stereotype threat as a woman who brokers between friends at work. We call for future studies to examine whether network content is in fact a boundary condition for our theory.

Our research adopts an egocentric approach to understanding gender differences in returns to network brokerage. We deliberately focused on ego's perceptions and interpretations of network structure to complement previous research, which has largely focused on the negative reactions of others towards women who are seen to broker in their workplace networks. Nevertheless, we have speculated that there may be interplay between ego and alter effects: we suggested that the threat experienced by women who broker their workplace friendships may be partly attributable to women anticipating the negative reactions of others. Future research could explore this interplay more explicitly to provide an integrated understanding of how and why gender differences in brokerage emerge. One could, for example, directly manipulate what the broker is told about the expectations of others for the broker's performance. Perhaps women might act to more fully capitalize on the potential benefits of brokerage if they are led to believe that others hold positive rather than negative expectations of their performance in broker networks. Of course, how readily these beliefs, which are embedded in broadly shared gender stereotypes, can be manipulated and/or reversed is unclear.

A useful direction for future research would be to examine how context affects the salience of gender versus other cognitive frames relevant for brokerage. The salience of gender can be driven by relative numbers (Mehra, Kilduff, & Brass, 1998), cultural artefacts that surround individuals in their workplace (Davies et al., 2002), as well as social desirability, personal needs and motivations (McGuire & Padawer-Singer, 1976). Research could examine how men's and women's construal of broker networks shifts with these contextual features. Another possibility that we did not examine but strikes us as a promising direction for future research concerns how prior experience and success in broker networks may serve to buffer women against the negative psychological consequences of stereotype threat by reducing the perceived mismatch between being a woman and being a broker.

Similarly, the presence of women in positions of formal authority (as reflected most visibly in rank and role) could dampen the negative effects of stereotype threat on the performance of women brokers both because of the signal it sends about others' expectations and because the (lack of) possession of status is directly linked to stereotype threat (Kray et al., 2001). Future research could also examine other consequences of network-based stereotype threat. For example, prior research suggests that individuals who experience stereotype threat are more likely to withdraw from the domain in which it occurs (Schmader, Johns, & Barquissau, 2004). We encourage researchers to examine network-based stereotype threat as an explanation for withdrawal and organizational turnover. Similarly, because network-based stereotype threat is likely to be related to withdrawal and perhaps even to the transformation of networks, it could offer new insights for theories of network change.

Conclusion

Network theory has emphasized the performance benefits of broker networks but why women generate lower returns to brokerage relative to men has been a puzzle. Previous research has suggested that women underperform as brokers because they lack the legitimacy necessary to benefit from broker networks. By contrast, the ego-centric theory that is the focus of our paper has argued that the experience of perceiving that one is surrounded by disconnects among one's contacts is different for women than it is for men. When women perceive that they are brokers in a friendship network, they worry not just about the evaluations of others but also their own ability to perform effectively, and therefore underperform. To gain a better understanding of gender differences in returns to network-based advantage, we urge scholars to more closely examine how brokers construe the social network structures they inhabit.

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TABLE 1
Study 1: Means, Standard Deviations and Correlations

Variable	Mean	SD	1	2	3
1 Performance	64.56	7.76			
2 Gender ^a	.28	.45	-.12		
3 Perceived constraint	.29	.30	.10	-.05	
4 Actual constraint	.18	.26	-.008	.02	.04

^a 0 = man, 1 = woman;
 Correlations greater than $|.13|$ are significant at $p < .05$

TABLE 2**Study 1: The Effect of Perceived Network Brokerage on the Performance of Men and Women**

	Model 1	Model 2	Model 3
Intercept	65.19***	65.16***	65.2***
	(.98)	(.95)	(.98)
Level 2			
Group gender composition	2.23	1.99	2.26
	(1.74)	(1.67)	(1.74)
Level 1			
Gender	-2.74	-3.11	-2.68
	(1.84)	(1.79)	(1.86)
Perceived constraint	1.94	4.64	1.79
	(2.71)	(2.81)	(2.76)
Actual constraint	-.38	-2.2	.29
	(3.5)	(3.45)	(4.10)
Two-way interactions			
Gender x Perceived constraint		-22.39**	
		(8.32)	
Gender x Actual constraint			-2.42
			(7.74)

Note. $N = 110$ observations at Level 1 and $N = 22$ observations at Level 2; ^a 0 = man, 1 = woman;

* $p < .05$;

** $p < .01$;

*** $p < .001$

TABLE 3
Study 2: Means, Standard Deviations and Correlations

	Mean	SD	1	2	3	4	5	6	7
1 Performance	86.93	7.88							
2 Gender	.34	.48	-.06						
3 Perceived constraint	.51	.29	.02	.07					
4 Actual constraint	.64	.21	.19	-.10	.14				
5 Executive MBA	.27	.44	-.27	-.07	-.13	-.31			
6 Masters	.06	.25	-.04	-.19	.02	-.10	-.16		
7 Exchange	.16	.37	.01	.15	.12	-.16	-.27	-.12	
8 <i>Tertius iungens</i> orientation	5.62	.71	.08	-.05	-.11	-.003	-.03	-.004	.06

Correlations greater than $|.15|$ are significant at $p < .05$

TABLE 4

Study 2: The Effect of Perceived Network Brokerage on the Performance of Men and Women

	Model			
	1	2	3	4
Intercept	72.81*** (6.25)	70.86*** (6.24)	70.64*** (6.41)	69.47*** (6.38)
Executive MBA	-4.2 (1.58)	-3.97 (1.57)	-4.09 (1.74)	-3.94* (1.56)
Masters	-4.29 (2.7)	-4.11 (2.68)	3.75 (2.83)	-3.79 (2.69)
Exchange	-1.45 (1.74)	-.93 (1.74)	1.34 (1.89)	-.94 (1.74)
Gender	-.69 (1.29)	4.43 (2.72)	4.13 (1.58)	8.06 (4.42)
<i>Tertius iungens</i> orientation	.73 (.87)	.8 (.86)	.58 (.87)	.68 (.87)
Perceived constraint	-.66 (2.17)	2.29 (2.55)	-.54 (2.16)	2.09 (2.56)
Actual constraint	3.71 (3.32)	5.1 (3.35)	9.05 (4.99)	8.9 [†] (4.95)
Two-way interactions				
Gender x Perceived constraint		-9.64* (4.53)		-8.68 [†] (4.63)
Gender x Actual constraint			-8.71 (6.08)	-6.43 (6.15)

^a 0 = man, 1 = woman

[†] $p < .10$

* $p \leq .05$

** $p < .01$

*** $p < .001$

TABLE 5
Study 3: Means, Standard Deviations and Correlations

Variable	Mean	SD	1	2	3
1 Network role ^a	1.47	.50			
2 Gender ^b	1.49	.50	-.08		
3 Anxiety	5.48	1.09	-.13*	-.07	
4 Performance	3.7	1.34	-.04	.21**	.19**

^a 1 = closed, 2 = broker

^b 1 = man, 2 = woman

* $p < .05$

** $p < .01$

TABLE 6
Study 3: Moderated Mediation Regression Results

	Model 1	Model 2
	Anxiety	Performance
Gender ^a	-.73	
Network role ^b	-.60	-.03
Gender x Network role	.61 [*]	
Anxiety		-.23 ^{**}
<i>R</i>	.21	.19
<i>R</i> ²	.04 [*]	.04 [*]

^a 1 = man, 2 = woman

^b 1 = closed, 2 = broker

^{*} $p < .05$

^{**} $p < .01$

FIGURE 1

Study 1: The Effect of Perceived Friendship Network Brokerage on the Performance of Men and Women

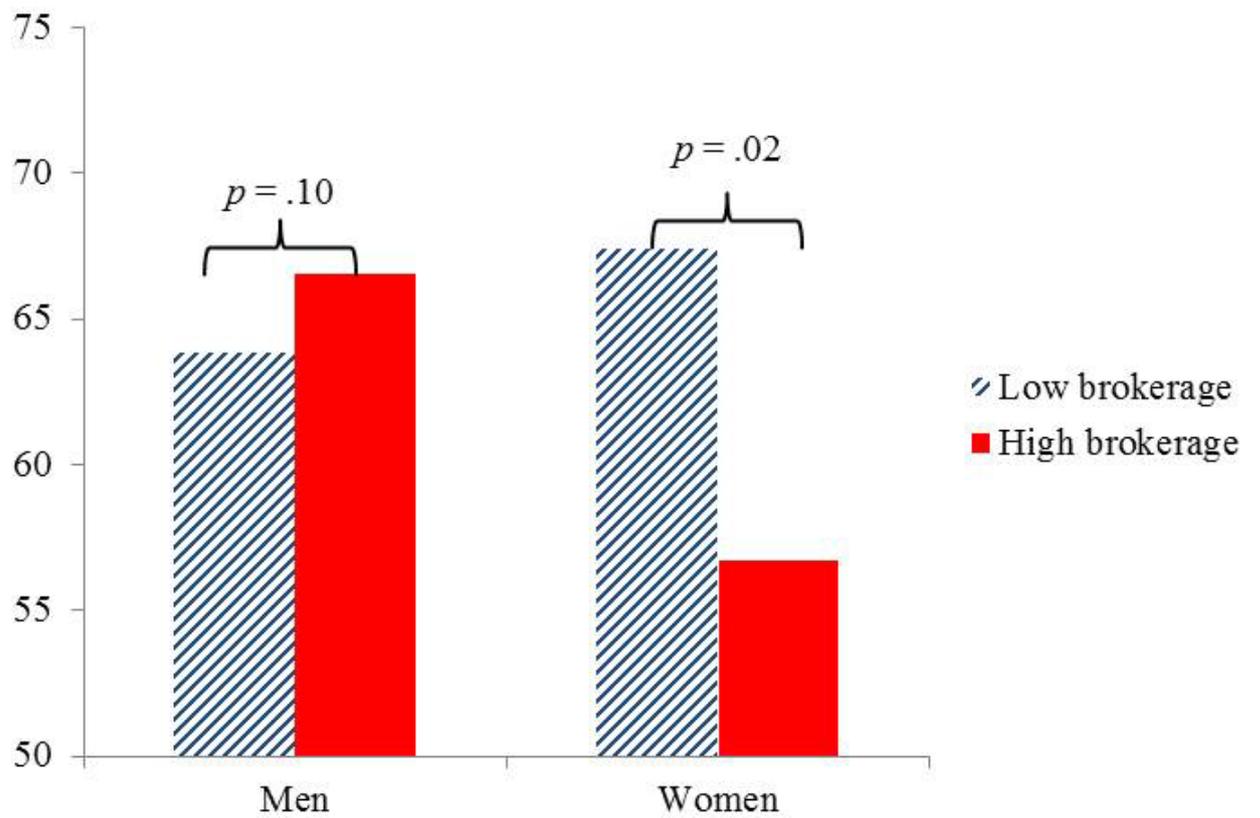


FIGURE 2

Study 2: The Effect of Perceived Friendship Network Brokerage on the Performance of Men and Women

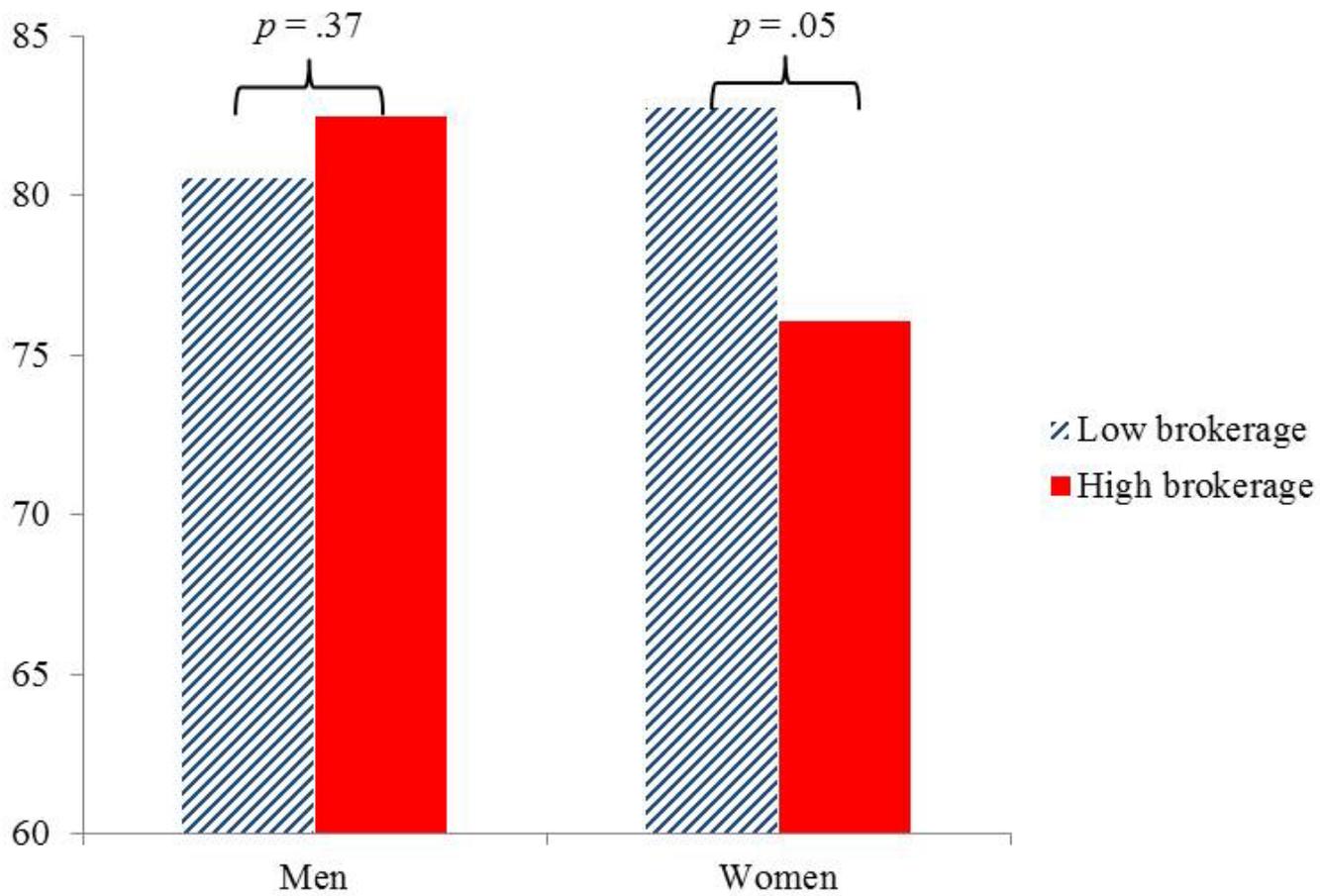
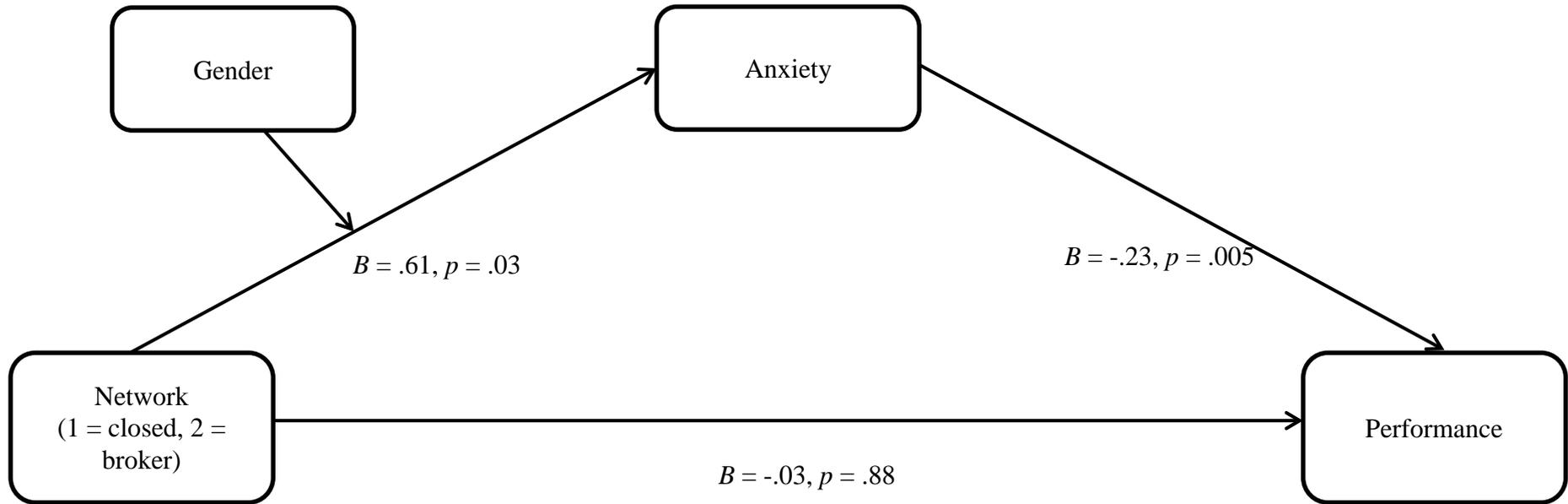


FIGURE 3

Study 3: Theorized and Estimated Model



APPENDIX A

Empirical Evidence for a Gender Brokerage Stereotype

A gender stereotype is a shared belief that ascribes particular skills, abilities and attributes to men and women on the basis of their gender (Eagly & Wood, 1982). Although there is indirect evidence that open networks have masculine associations (Brands & Kilduff, 2013; Brands et al., 2015), previous research has not directly examined whether this association underlies a shared belief about men's and women's ability to perform in broker networks. Because our empirical work was conducted in both the US and the UK, it was important to establish that the stereotype existed in both contexts.

We recruited 97 men and 110 women (108 from the US and Canada from Amazon's Mechanical Turk and 99 from the UK from Prolific Academic) to take part in the study. Participants were presented with two network diagrams, one depicting a broker network (an individual with three friends with no connections between the friends) and one depicting a closed network (an individual with three friends with all possible connections between the friends). The written description that accompanied the broker network diagram was: "None of your friends are friends with each other. This is called a broker network." The written description for the closed network diagram was: "All of your friends are friends with each other. This is called a closed network." For details on the use of visual network scales in network research, including evidence of reliability and validity, see Mehra et al. (2014).

Following the method set out by Dasgupta et al. (2015) which established the presence of an explicit gender stereotype about men's and women's relative ability in engineering, individuals were asked to indicate (1) their own personal beliefs about whether men or women would perform better in broker networks and (2) other people's beliefs about whether men or women would perform better in broker networks, on a five-point scale (1 = women

will perform much more highly than men; 2 = women will perform slightly more highly than men; 3 = women and men will perform equally well; 4 = men will perform slightly more highly than women; 5 = men will perform much more highly than women). We asked about personal as well as shared beliefs because even though individuals may not endorse a stereotype personally, they are still likely to be aware of its existence. Indeed, individuals are vulnerable to stereotype threat even if they do not personally endorse negative stereotypes about their group's performance in the domain (Steele et al., 2002).

A *t*-test against the midpoint of the scale revealed that the respondents did not individually endorse the view that men would perform better than women in broker networks ($M = 3.06$, $SD = .98$, $t_{(206)} = .85$, $p = .39$). However, respondents tended to believe that there was a widely-shared view that men would perform better than women in broker networks ($M = 3.21$, $SD = .99$, $t_{(206)} = 3.1$, $p = .002$). There was no difference in the extent to which US vs UK participants endorsed the stereotype, $F_{(1, 206)} = .02$, $p = .89$. Likewise, men and women were equally likely to endorse the stereotype, $F_{(1, 206)} = 1.16$, $p = .28$. Thus, the results of the pretest confirm that a negative stereotype exists about women's ability to perform as well as men in broker networks. (In a similar study, not reported here but available from the authors, we found that there was no gender stereotype about men's and women's relative performance in closed networks.)

The mean score for endorsing the shared stereotype was close to the midpoint of the scale, suggesting that the stereotype about gender differences in performance in broker roles is not strong. However, it should be noted that it is the presence vs. absence of a stereotype that produces threat, not its strength, because people are highly sensitive to the possibility that they may be devalued on the basis of their social identities (Purdie-Vaughns, Steele, Davies, Ditlmann, & Crosby, 2008). Indeed, stereotype threat effects can be produced by even

ambiguous cues in an environment that suggest the potential to being judged through the lens of a negative group stereotype (McGlone, Aronson, & Kobrynowicz, 2006).

APPENDIX B

Study 3

Manipulation checks. We conducted several manipulation checks related to Study 3. First, we examined whether individuals' interpretation of the network diagrams corresponded with their mental representation of their own workplace friendship networks. We recruited, on Amazon's Mechanical Turk, 118 US or Canadian residents (57 women, 61 men) who were employed either full or part time. Participants completed a cognitive network assessment, in which they were asked to nominate up to ten friends in their workplace and indicate the friendship ties between those friends. Participants were also presented with the two network diagrams used previously (with the names of the friends removed), accompanied by a written description of both (see Appendix A). Next, participants were asked to indicate on a five point Likert scale the extent to which their friendship network at work was more like a closed network or more like a broker network (1 = like a closed network to 5 = more like a broker network). The order of the two network assessment tasks was randomly counterbalanced across participants. We calculated the density of respondents' self-reported friendship networks as a proxy for perceived structural holes and correlated it with their response to the network diagram scale. The correlation between the two measures was $r = -.40, p < .001$, indicating that to the extent that individuals reported having dense friendship networks, they were less likely to indicate that they had a broker network.

Having established that the network diagram corresponded to individuals' 'in-use' schemas, we checked whether the experimental task effectively primed individuals with a broker network. We recruited, via Amazon's Mechanical Turk, 194 US or Canadian residents (94 women, 100 men) who were employed either full or part time. Participants were randomly assigned to either the broker or closed network condition and were asked to imagine what it would be like to be in that friendship network and to write a few sentences

describing those feelings and the typical interactions they imagined they would have in the network. Next, they completed a cognitive network assessment, in which they were asked to nominate up to ten friends in their workplace and indicate the friendship ties between those friends. The correlation between the network dummy and the density measure confirmed that participants assigned to the broker network condition generated marginally less dense networks than participants assigned to the closed network condition, $r = -.13$, $p = .08$. Based on these two manipulation checks, we concluded that the network diagrams corresponded to individuals' 'in-use' network schemas and that our manipulation effectively primed these 'in-use' schemas in the expected direction.

It is possible that the absence of a friendship tie in broker networks could be perceived as indicative of conflict between the brokered parties. We therefore examined whether the network diagrams used in Study 3 elicited gender differences in perceptions of conflict. We recruited 105 men and 96 women to undergo the experimental manipulation in Study 3, randomly assigning them to either the broker or constrained network condition, and subsequently asked them to respond to Jehn's (1995) task and relational conflict scale. We found that although individuals perceived the same amount of task conflict in the broker and closed network conditions ($F = .87$, $p = .35$), they did perceive more relational conflict in the broker network than in the closed network ($F = 17.94$, $p = .00$). However, when we examined the means we found that perceptions of relational conflict were below the midpoint of the 5-point scale in both the closed ($M = 1.94$, $SE = .1$) and broker prime conditions ($M = 2.54$, $SE = .1$). Indeed, a t-test of the overall mean for relational conflict, collapsing across conditions, was significantly different from 3 (the midpoint of the scale), $M = 2.21$, $SD = 1$, $t_{(182)} = -10.18$, $p < .0001$ and below the overall mean for task conflict (2.96), $t_{(182)} = -9.75$, $p < .0001$. Given this pattern of results, an accurate characterization of the difference between the two network diagrams elicit is that the broker prime elicits *less cohesion* than the closed prime

(rather than that the broker prime elicits more relational conflict than the closed prime). Moreover, men and women did not differ in their perceptions of task ($F = .48, p = .44$) and relational conflict ($F = 2.17, p = .14$) and likewise there was no *gender x network role* effect for either task ($F = .22, p = .64$) or relational ($F = .37, p = .54$) conflict. These findings indicate that gender differences in perceptions of conflict in relation to the prime do not account for our findings.

It may be that, even though men and women perceive a similar (and low) degree of conflict in brokerage networks, women are more likely to involve themselves in resolving perceived conflict between members of their friendship network, which distracts them from task-related work. To test this, we checked whether the prime prompted different conflict management responses in men and women. We recruited 102 men and 100 women to undergo the experimental prime used in Study 3. After completing the prime, respondents indicated how likely they would be to engage in integrative ($\alpha = .93$) and compromising ($\alpha = .88$) conflict resolution behaviors in their network (Rahim, 1983). We found that although individuals were equally likely to engage in compromising behaviors across network conditions ($F = 1.64, p = .20$) individuals in the closed network condition were more likely to engage in integrative conflict resolution behaviors in the closed ($M = 4.12, SE = .08$) network condition than the broker ($M = 3.89, SE = .08$) network condition, $F = 7.02, p = .009$. Critically, however, there was no main effect of gender on either integrative ($F = 1.09, p = .3$) or compromising ($F = .97, p = .33$) behavior, and there was no *gender x network role* effect on proclivity to engage in either integrative ($F = 2.11, p = .15$) or compromising ($F = .55, p = .46$) conflict management behavior. This pattern of results indicates that the network context does affect individuals' choice of conflict resolution style – individuals in broker networks feel less pressure to find an integrative solution, presumably because such networks

afford them more freedom. However, because this does not vary by gender, it suggests that gender differences in response to conflict do not account for our findings.

Validation of State Self Esteem Scale as a measure of anxiety. Prior to choosing this measure, we reviewed the stereotype threat research with the view to finding an established measure. We based our review on the work of Pennington, Heim, Levy, and Larkin (2016), updating our search to include articles published subsequently. Of 44 articles that empirically examined a mediator, 19 examined anxiety. There was no standard measure employed in this literature; with few exceptions most of the papers used a different measure of anxiety. These measures broadly fell into one of two categories, namely, test anxiety (e.g., Brodish & Devine, 2009; Chung, Ehrhart, Holcombe Ehrhart, Hattrup, & Solamon, 2010; Gerstenberg, Imhoff, & Schmitt, 2012) and generalized state anxiety (e.g., Bosson, Haymovitz, & Pinel, 2004; Johns et al., 2008; Mayer & Hanges, 2003).

In order to establish that our chosen measure of anxiety – state self-esteem (Heatherton & Polivy, 1991) – was comparable to other measures of anxiety used in the literature, we conducted an empirical study. We recruited 498 individuals (247 women) from Amazon's Mechanical Turk and asked them to undertake a short verbal and numerical reasoning battery. We used this instead of our experimental manipulation because some of the items on our comparison measures explicitly refer to 'the test'. Subsequently, individuals completed a measure of test anxiety - the revised worry and emotionality scale (used in Brodish & Devine, 2009; by Morris, Davis, & Hutchings, 1981), a generalized state anxiety measure (used in Johns et al., 2008) and the state self-esteem measure (Heatherton & Polivy, 1991). All items for all measures appear in Table B1.

We examined the correlation between the measures to establish the convergent validity of our scale. The correlation between state self-esteem and the revised worry and

emotionality scale was $r = .8$, the correlation between the state self-esteem measure and the generalized state anxiety measure was $r = .7$. This indicates that our measure of state anxiety is a valid measure of anxiety, and is thus comparable to existing research on stereotype threat.

TABLE B1**Anxiety Measures**

Revised worry and emotionality scale

I feel my heart beating fast

I feel regretful

I am so tense that my stomach is upset

I am afraid that I should have studied more for this test

I have an uneasy, upset feeling

I feel that others will be disappointed in me

I am nervous

I feel that I may not do as well on this test as I could

I feel panicky

I do not feel very confident about my performance on this test

Generalized state anxiety measure

To what extent do you feel the following emotions right now in relation to the test you have just taken?

Agitated

Anxious

Nervous

Uneasy

Worried

State self-esteem (reversed)

I feel confident about my abilities (R);

I feel frustrated or rattled about my performance;

I feel that I am having trouble understanding things that I read;

I feel as smart as others (R);

I feel confident that I understand things (R);

I feel that I have less scholastic ability right now than others;

I feel like I am not doing well.

I am worried about whether I am regarded as a success or failure;

I feel self-conscious;

I feel displeased with myself;

I am worried about what other people think of me;

I feel inferior to others at the moment;

I feel concerned about the impression I am making;

I am worried about looking foolish.
