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Theorizing gender in social network research: What we do and what we can do differently

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ABSTRACT

We review the ways in which gender is theorized in social network research and propose an alternative approach for future research to consider. To assess "what we do," we undertake an evaluative review. In that review, we first examine how gender is typically theorized in structural approaches to social network research. Then, in greater detail, we review social network research that affords more diversity into such theorizing. We organize this more detailed review around a framework that is based on the level of analysis at which the implications of gender are invoked (cognitive, behavioral) and the focus of relational mechanisms that are used (ego-based, alter-based). Following this review of "what we do," we consider "what we can do" by reflecting on the state of the literature and proposing a broad agenda, which we see as an alternative to many of the current approaches. We illustrate the implications of this alternative using four research topics and approaches.

Keywords: Gender, Social networks, Cognition, Organization theory

Wherever social networks are found, humans use gender to organize their relationships, allocate tasks, and assign people to roles (Eagly & Steffen, 1984; Gneezy, Leonard, & List, 2009; Ridgeway & Correll, 2004). Even in the workplace, where roles and reporting lines are often formally defined, women and men often form different informal social networks, behave differently in these social networks, and may utilize their relationships differently – with consequences both for their careers, as well as for the teams and organizations of which they are members (Fang, Zhang, & Shaw, 2020; Ibarra, 1992, 1993; Khattab, van Knippenberg, Pieterse, & Hernandez, 2020). Given the importance of gender to the form and function of social networks, it is not surprising that considerable research has sought to examine gender inequality through a social network lens. The broad consensus in this research is that gender inequality is reproduced and reinforced in the social interactions that constitute social networks. As shown across different streams of research (e.g., gender stereotype theory: Fiske, Cuddy, Glick, & Xu, 2002; Glick & Fiske, 2001; status characteristics theory: Wagner & Berger, 1997; Ridgeway, 1991), all else equal, women are assumed to be (and often are) lower status than men. The argument is that women's lower status, compared to men, limits the degree to which women can build and mobilize social networks, as well as their opportunities to do so. This contributes to gender inequality in the workplace by curtailing women's performance and advancement, which further reinforces their lower status.

Despite this broad consensus about the structural origins of gender inequality, there is little consensus about the mechanisms that produce it. This is illustrated in a recent review of the research on the influence of gender and social networks on career outcomes (Woehler, Cullen-Lester, Porter, & Frear, 2021), which documented largely mixed evidence for mechanisms relating to why women often have different social networks to men and why they usually extract unequal returns from those networks. Our own reading of this literature suggests that these inconsistent results come about largely due to the different ways in which the

constructs of social networks and, especially, gender are theorized across studies, but just as importantly, also as a result of how gender and social networks are theorized *in relation to each other*. Accordingly, the first goal of our review is to describe "what we do" by providing an organized and evaluative overview of how gender and social networks *are* theorized in relation to each other across different streams of research. In conducting that overview, we adopt a lens that departs from the usual treatment of gender in social networks research, which typically conceptualizes both gender and social networks as socio-cultural-structural features in organizations. Instead, in our review we emphasize that the socio-cultural-structural dynamics of both gender and social networks in organizations are constituted in, and by, the behaviors that are enacted by individuals interacting with each other, as well as their cognitions. Thus, gender and social networks can be theorized not only through the lens of structure (e.g., Singh, Hansen, & Podolny, 2010), but also through the lens of behavior (e.g., Mehra, Kilduff, & Brass, 1998) and the lens of cognition (e.g., Brands & Mehra, 2019). This conceptual insight allows us to document the multiplicity of interrelated behaviors and interrelated cognitions that underlie gender differences in social networks, and gender differences in returns to social networks. Our second goal is to show "what we can do differently" by providing a discussion about, and agenda for, how gender and social networks *could* be theorized in relation to each other. Our lead idea in this discussion is that gender and social networks are mutually constitutive, the implication being that any complete theory of social networks requires scholars to actively consider gender in their theorizing. We provide a roadmap for scholars to take up this challenge by elaborating on topics and approaches for future research to consider.

We achieve these two goals over the three main sections that follow. First, we define the two constructs of interest – gender and social networks. In the next section, the core of our review, we provide an evaluative review of how gender has been conceptualized and theorized in the literature to date, i.e. what we do. We do this by first summarizing the key ideas in social

network research that theorizes gender inequality through a decidedly structural lens. That summary serves as a point of comparison with the social network research that we subsequently review in further detail, i.e., research that is not avowedly structural and that allows greater scope for different conceptualizations of gender and alternative approaches to theorizing it. In the third section, on what we can do differently, we discuss the implications of our review and our assessment with respect to theorizing gender and social networks, proposing that they be re-conceptualized as mutually-constitutive constructs, which we encourage researchers to pursue by setting out an agenda of approaches and topics for future research.

THE CONSTRUCTS: GENDER AND SOCIAL NETWORKS

We begin by providing a brief overview of the constructs that are central to our review: gender and social networks.

Gender

The most basic definition of gender is that it is the meanings that humans attach to the biological differentiation between the female sex and the male sex.[1] We assign meaning to sex because the ability to recognize and differentiate between the sexes is fundamental to our survival as a species (Buss, 2015; Martin & Slepian, 2020). Human beings create new human beings through sexual reproduction and the female and male of the species each provide unique cells to accomplish this. As a species, we developed cognitive adaptions to assist in the tasks necessary for sexual reproduction, such as differentiating between female and male humans by identifying dimorphic sex characteristics (Buss, 1991). Thus, human beings are cognitively primed to imbue sex with meaning (Martin & Slepian, 2020). The meaning that individuals attach to biological sex is encoded in cognitions, or gender schemas, defined as a set of interrelated ideas, expectations, and associations for women and men that are imposed on the

[1] We acknowledge that there is debate about whether sex is binary or bimodal. We do not intend to take a position on that debate here. Rather we focus on the sex binary as the basis of the gender binary that is observed in Western cultures, where much of the research we review in this article is conducted.

biological categories of female and male, respectively (Bem, 1981b; Taylor, 1981). Gender schemas are shared between individuals, meaning gender is a social identity (see Hogg, 2020; Tajfel, 1974) that we use to categorize ourselves and others, thereby organizing our understanding of the social world, whether that understanding is about one's self in relation to others, about others in relation to others, or about women in relation to men. We expand upon these points below, unpacking each of these three levels of gender: the self, others, and society.

Gender is a primary aspect of our individual identity. Gender is often the first social category that infants learn and apply (Martin & Ruble, 2004). However, the sex binary is not necessarily reproduced in a gender binary. Individuals can vary in the extent to which they identify with their anagraphic gender (i.e., the extent to which their membership in a gender group is felt as important to their sense of self) (Cameron & Lalonde, 2001), the extent to which they identify with the social category of woman or man (Hyde, Bigler, Joel, Tate, & van Anders, 2019), and the extent to which they see themselves as possessing stereotypically feminine or masculine traits (Bem, 1981a). The de-coupling of gender and sex has led to an increasing recognition in both scholarship and society that an individual might identify with a different gender than the one they were assigned at birth (i.e., is transgender), might identify with both genders (i.e., is nonbinary), neither gender (i.e., is agender), or may fluctuate between genders (i.e., is gender fluid) (Montañez, 2017).

Gender is also primary in our perception of other people. We automatically categorize others as women or men, and this categorization happens before we notice other features about them (Ito & Urland, 2003; Stangor, Lynch, Duan, & Glas, 1992). When individuals categorize other people as women or men, they often view them through the lens of gender stereotypes. Gender stereotypes are shared beliefs about behaviors and characteristics that are assumed or taken to be typical of, and appropriate for, women versus men (Ellemers, 2018). Gender stereotypes differentiate between women and men along two dimensions: agency and

communality (Bakan, 1966). Women are seen as, and expected to be, *communal* (i.e., relationship-oriented) and therefore kind, helpful, altruistic, cooperative, and sympathetic to others' needs. Conversely, men are seen as, and expected to be, *agentic* (i.e., achievement oriented) and therefore instrumental, competent, aggressive, independent, decisive, and forceful (Abele & Wojciszke, 2007; Fiske & Stevens, 1993). Gender stereotypes are descriptive, in the sense that they detail how women and men *will* be in terms of behaviors, traits, roles, etc., and also prescriptive (detailing how women and men *should* be) as well as proscriptive (detailing how women and men *should not* be) (Heilman & Eagly, 2008).

Finally, gender is also a primary means by which human beings organize society. At this level, gender can be defined as a system of cultural practices that determines how individuals will behave in relation to one another (Ridgeway & Correll, 2004). Researchers have conjectured that gender stereotypes that portray women as communal and men as agentic likely arose from the distribution of women and men in social roles (Eagly & Steffen, 1984; Martin & Slepian, 2020). With a few notable exceptions (Gneezy et al., 2009), across different societies women are more likely to occupy caregiving roles in both unpaid (i.e., primary caregiving to children) and paid (e.g., nursing) domains, and men are more likely to occupy roles with power and influence (e.g., leadership, politics) (Glick, Wilk, & Perreault, 1995). That is, across different societies, men tend to dominate over women (however this dominance was achieved). The psychology of power operates in predictable ways (e.g., Gruenfeld, Inesi, Magee, & Galinsky, 2008), producing reliable gender differences in behavior that, over time, tend to be attributed to sex differences rather than to differences in power (Stewart & McDermott, 2004). As such, gender has become a diffuse status characteristic, i.e., a cue for observers across different contexts about the likely competence, power, authority, and status of an individual (Stewart & McDermott, 2004; Wagner & Berger, 1997). In the absence of other cues, men are afforded more deference than women, suggesting that they are more likely

to attain positions of power and influence, further reinforcing not only gender steroetypes, but also gender inequality in organizations and society (Ridgeway, 1991; Ridgeway & Correll, 2004; Stewart & McDermott, 2004).

Social Networks

Social networks, in their basic definition, are sets of "nodes" and "ties" (Borgatti, Mehra, Brass, & Labianca, 2009). Nodes are actors, or interacting subjects, and ties are relationships, or social interactions, between actors. The network logic in organizational research assumes that structured patterns of interaction between people can partly explain their outcomes in organizations (Kilduff & Brass, 2010). Within this broad logic, there is an inherent tension between studies that investigate networks from a structural perspective and those that do so from an individual perspective. From a structural perspective, the "static position of the actor in the network has been assumed to explain his or her actions in social settings" (Stevenson & Greenberg, 2000: 652). From an individual perspective, the focus is on whether individual characteristics explain the occupation of specific positions in social structure (Tasselli, Kilduff, & Menges, 2015), and on agency, defined as the maneuvering of social connections in search of network-related advantage (Tasselli & Kilduff, 2021). Thus, the tension is that even though networks *can* facilitate or inhibit action, people are the ultimate acting agents (Burt, Kilduff, & Tasselli, 2013). Furthermore, within the individual perspective, another tension exists between studies that conceptualize and measure social networks as cognitions, i.e., how people perceive and recall social relationships (Ibarra & Andrews, 1993; Kilduff & Krackhardt, 1994; Smith, Menon, & Thompson, 2012) and those that conceptualize and measures social networks as behaviors, i.e., interactions among network members (Bensaou, Galunic, & Jonczyk-Sédès, 2014; Burt, 1992; Tortoriello, Reagans, & McEvily, 2012).

Rather than adjudicating between the structural and individual perspectives, and in turn,

between the cognitive and behavioral perspectives, we take these differing conceptualizations of social networks to reflect lenses through which gender is theorized. Accordingly, we begin by reviewing studies on gender that are conducted through a decidedly structural lens, focusing on research that provides insights into the structural mechanisms of gender inequality. Following this, we move on to reviewing work on gender that is conducted mostly through an individual lens, providing insights into the cognitive and behavioral underpinnings of gender inequality. In Appendix 1, we provide information about the scope of our review and the search steps we undertook to assemble the studies in our review sample.

WHAT WE DO: HOW GENDER IS CONCEPTUALIZED AND THEORIZED IN SOCIAL NETWORK RESEARCH

To review how gender is conceptualized and theorized in social network research, we start by providing an overview of research that examines this topic through a decidedly structural lens. This overview provides a useful point for comparison and contrast both with the social network research that we survey and review in greater detail in the next section, as well as with the approach we propose for future research.

The study of social networks builds from the structuralist tradition, which places a primary emphasis on social structure as a locus of behavior and outcomes, and in doing so deemphasizes or even eschews the study of individuals. On the topic of gender, the predominant focus of research that falls into this structuralist tradition has been how gender inequality is reproduced in the social interactions that constitute social networks (Belliveau, 2005; Castilla, 2011; Ding, Murray, & Stuart, 2013; Grugulis & Stoyanova, 2012; Kirchmeyer, 1998; Smith, 2000; Son & Lin, 2012; Straits, 1996; Whittington, 2018). Given its structural emphasis, studies in this domain have theorized gender through a similarly socio-cultural lens, in which gender is a system of cultural practices that human beings use to organize society (Ridgeway & Correll, 2004). Our reading of the literature indicates to us that there are several key ideas that dominate theorizing in this approach to the study of gender and social networks,

which we describe and illustrate below.

The first idea is that gender inequality – whether in network position or outcomes – has a structural origin (e.g., Burt, 2000; Castilla, 2011; Grugulis & Stoyanova, 2012; Lin, 2000; Son & Lin, 2012). For example, research has shown a link between gender and network decay, defined as the likelihood for ties to weaken and disappear over time. The general finding is that relationships decay more slowly the longer they have existed. However, this dynamic is true only for ties extended by men (to other men or women) (Burt, 2000). In contrast, ties extended by women are almost certain to decay by three years, the implication being that women lose social capital at a greater rate than men (Burt, 2000). This effect was attributed to the fact that women's relationships tended to be less embedded in the surrounding network of relationships, i.e., the social structure, meaning that relative to men, women tended to have fewer relationships with people with whom they share mutual acquaintances.

A second, related idea is that structural forces intersect with gender differences in status to produce gender inequality (e.g., Singh, Hansen, & Podolny, 2010; Belliveau, 2005; Burt, 1998; Kirchmeyer, 1998). One example of this dynamic comes from research showing that women's peripheral role in organizational networks may combine with the dynamics of gender homophily to produce gender disadvantages for women when they search for information in their organization (Singh, Hansen, & Podolny, 2010). This research found that both women and men were likely to reach out to same gender (i.e., gender homophilous) ties when they search for information in their organization. However, women were more likely to be on the periphery of organizations, and peripheral individuals are less effective in guiding knowledge searches than individuals in the center or core of the network. In contrast, when men reached out to other men in their information searches, they were more likely to connect to an individual in the core of the network, who could effectively guide their search. Thus, although the network dynamic of homophily governed both women's and men's information searches, because

women were in lower status network positions (i.e., at the network periphery) than men, they ended up spending more time and resources than men searching for information in the organization.

A third central idea in this approach is that the social network dynamics of gender inequality are self-reinforcing. That is, network dynamics act on gender differences in status to produce gender inequality, and this inequality further reinforces gender differences in status. This idea has received less direct empirical support, as it requires longitudinal data, but it is nonetheless explicitly theorized or implied in much of the research that takes a structural approach to gender inequality (e.g., Ding, Murray, & Stuart, 2013; Son & Lin, 2012). One paper that did explicitly illustrate this dynamic focused on the organized crime network in Chicago between 1900 and 1933 illustrates this dynamic (Smith, 2020). Prior to the U.S. prohibition of alcohol, women were low status in the network: they were underrepresented (18% of the network) and socially distant from network elite members. After the U.S. prohibition of alcohol, the organized crime network rapidly expanded in size and increased in centralization, shifting from a small decentralized network with a greater proportion of elites to a large network in which power was consolidated around a few key elites (Smith, 2020). This restructuring served to further marginalize women, such that their representation in the network fell to less than 5% and their social distance to the elite members of the network compounded.

In summarizing the lead ideas (as we see them) in literature that examines gender inequality through a decidedly structural lens, we do not mean to imply that research has not uncovered exceptions to these self-reinforcing dynamics (e.g., Ody-Brasier & Fernandez-Mateo, 2017), that individual women and men cannot (or do not) exercise agency in the relational dynamics we describe (e.g., Ibarra, 1997), or that these ideas are otherwise unchallenged in the literature (e.g., Shih, 2006). Rather, by articulating them we wish to

highlight that although the structural approach to studying gender and social networks has yielded valuable insights, it is limited in two respects. First, by largely reducing gender to status, this approach under-theorizes gender. Status is multidimensional (Magee & Galinsky, 2008), intersectional (Fiske, Dupree, Nicolas, & Swencionis, 2016; Hall, Hall, Galinsky, & Phillips, 2019), and depends on organizational factors such as the representation of women (Duguid, Loyd, & Tolbert, 2012; Kanter, 1977); all of which suggest that in reality, there is likely to be much variation in the presumed status difference between women and men (e.g., white women are often seen to be higher status than Black men). Moreover, gender is not *only* status. For the women and men whose interactions make up social networks, gender is experienced as more than status alone. The result of these considerations is that relational approaches to gender in social networks research fail to provide a coherent account of gender in social networks.

We provide one example to illustrate this point, that of the role of network closure or openness on women's careers. Burt (1998) found that open networks (in which an individual's contacts tend not to have relationships with one another) accelerated men's careers, but hindered women's.[2] In contrast, another study found that network closure (those in which an individual's contacts tend to have relationships with one another) hindered women's careers at a greater rate than men's (Lutter, 2015). Of course, there are empirical differences between these two studies and meta-analytic evidence could adjudicate between conflicting findings (e.g., Fang et al., 2020). Our point in highlighting these opposite findings, however, is that in both studies, gender is conceptualized, contextualized, and theorized in a remarkably similar manner. In both studies, women were conceptualized as lower status and therefore at a disadvantage, relative to men, and in both studies women were in the numerical minority in the

[2] Further analyses by the author suggest that women benefit from interconnected networks that included a career sponsor.

context in which the study was conducted. Yet, Burt (1998) theorized that these disadvantages would mean that women would be *unable* to capitalize on the information benefits of open networks, whereas Lutter (2015) theorized that these disadvantages would render the information benefits of open networks *particularly beneficial* to them – and both found empirical support for their conjectures.

This example also illustrates a second limitation of theorizing gender through a relational lens, namely – it provides us with very little insight into the mechanisms of gender inequality. For example, women's ability to capitalize on the information benefits of open networks could be limited by active hindrance from their interaction partners due to antipathy, others' presumptions about their (lack of) competence, their lack of legitimacy in the domain, or a lack of the type or amount of social capital (whether perceived or actual) that would make them an attractive exchange partner, i.e., due to processes that relate to their alters. Moreover, women's returns to brokerage could also be affected by egocentric processes, such as their motivation and comfort in open networks.

It is these micro-processes that underlie gender differences in social networks that we illuminate next. To do so, we leverage an important similarity between the constructs of gender and social networks. Namely, that although research on gender and social networks has traditionally conceptualized both constructs at the socio-cultural-structural level, they are, in fact, both constituted in and by individual-level dynamics. To wit: With respect to networks, the patterning of ties around an individual serves to facilitate or constrain their actions. Yet, this patterning of ties is also the result of individuals initiating, maintaining, and severing relationships with others. In the same manner, cultural ideas about gender (e.g., gender norms) serve to facilitate or constrain the actions of individual women and men. Yet those ideas are shaped – whether by reinforcement or challenge – by the actions of women and men interacting with others. It is this insight, i.e., the conceptual similarity between gender and social networks

as being constituted in and by individual interactions, that provides the conceptual foundation for the remainder of our review. In doing so, we do not do away with the structural perspective entirely – it remains an important perspective in the research we review. Rather, we move it to the background in order to put micro-processes in the foreground.

Organizing Framework

Having provided a brief overview of how gender is conceptualized and theorized in social network research that is decidedly structural, we now move on to consider research in which the cognitions and behaviors of individuals are prominent (which we will survey and review in greater detail). We see this body of research as affording greater diversity with respect to the conceptualization and theorization of gender, as compared to an approach that is strictly structural. To organize this effort, we propose an integrative framework built on the two focal dimensions of social networks and gender – see Figure 1. For social networks – represented in the vertical axis – our framework highlights two key relational perspectives that constitute the locus of analysis: the focal individual (i.e., ego) and the individuals with whom ego interacts (i.e., alters). For gender, we distinguish between the cognitive (i.e., gender schemas) and behavioral levels of analysis, as represented by the horizontal axis. Thus, our framework incorporates four categories of research that emerge from the intersection of the two relational mechanisms of social networks (ego and alters) and the two levels of analysis of gender (cognitive and behavioral).

----- Insert Figure 1 about here -----

Gender & Network Cognition

We begin by examining the interplay of gender and social networks at the cognitive level of analysis. This research stream builds on a long tradition of work examining how cognitive networks of relationships (the "network in the mind") systematically differ from actual patterns of social interactions (the "network in the world;" e.g., Burt et al., 2013), i.e.,

examining network biases and schema (see Brands, 2013 for a review). These mental representations, known as cognitive social structures (Krackhardt, 1987), are assumed to be a primary determinant of social perceptions and behaviors, i.e., people do not respond to the world how it is, but how they see it.

Cell 1: Ego's Cognition

This first cell in Figure 1 refers to research that investigates how ego's gender affects ego's network cognition. Understanding gender differences in network cognition has the potential to provide powerful insights into gender differences in social network structures, i.e., gender differences in network roles, positions, and configurations. Women's and men's social networks differ (for excellent summaries of this literature, see Brashears et al., 2016 and Woehler et al., 2021). Two broad categories of explanations for these gender differences have been forwarded. The first, preference-based argument posits that women and men have different relational preferences (e.g., for type of alter, relationship, or network configuration) which leads them to build different social networks (e.g., Fang et al., 2020). The second, constraint-based argument suggests that women and men have differential access to potential contacts, meaning that even if they exhibit the same preferences and behaviors, women and men will nevertheless end up with different social networks (e.g., Ibarra, 1993). Both of these arguments suffer from conceptual limitations (the preference argument tends to assume equal opportunity and the constraint argument tends to assume equal preferences) and neither explanation provides a full empirical account of gender differences in social networks (Brashears, Hoagland, & Quintane, 2016). Importantly, both arguments neglect cognition as the origin of both preferences and constraints: if women and men perceive social networks differently, they could develop different networks even if they have the same preferences and are subject to the same constraints.

Despite the potential power of gender differences in network cognition to explain gender

differences in social networks, empirical investigations that set out to explicitly examine this topic are scant. One notable exception is the work of Brashears and colleagues (2016), who found that women were substantially better and more efficient than men at recalling social network information. Their work is exceptional in that they interrogate multiple explanations for gender differences that are grounded in different conceptualizations of gender: biological sex differences in the brain as well as gender differences in how women are socialized to pay greater attention to relational information than men. The authors find no evidence that priming individuals with their gender accentuates gender differences in network recall, meaning that they are unable to definitively attribute their findings to gender socialization. They tentatively (and somewhat reluctantly) conclude that neurological sex differences could account for their findings, but suggest that it is more likely that the intense gendered socialization that individuals are exposed to produces chronic differences in women's and men's relative ability to encode and recall social networks. Indeed, failure to detect an effect in one study using one method is not evidence that there is *no effect* of gender socialization on network cognition, but rather that in this study the authors found *no evidence* of such an effect.

Another study that investigated gender differences in network cognition did so in relation to the network role of brokerage, i.e., when an individual acts as the only point of contact between otherwise disconnected alters (Brands & Mehra, 2019). The authors cast gender as a social identity, documenting the existence of a gender stereotype that men will perform better than women as brokers. The authors theorize that when women recognize themselves as occupying brokerage roles in their surrounding network of friends, they become concerned about the possibility of fulfilling this negative performance stereotype about women brokers in the eyes of others – a well-documented phenomenon known as social identity threat (for a review of this literature, see Spencer, Logel, & Davies, 2016). This concern, which is experienced by women as anxiety, ultimately undermined their performance in brokerage roles.

Men, in contrast, did not experience anxiety when they perceived themselves to be brokers, or when they perceived themselves to be surrounded by a more interconnected network.

The two aforementioned studies explicitly set out to examine gender differences in network cognition. In contrast to this approach is a study that examines the effect of gender homophily on network cognition, without explicitly examining women's and men's network cognition separately. This study examined the effect of gender homophily on the value which individuals perceived in their relationships, finding that both women and men perceive relationships with contacts who provide them with resource multiplexity, i.e., multiple kinds of resources, as more valuable than those who do not, and that, for both women and men, gender similarity with a contact serves as an amplifier of the effect of resource multiplexity on perceived value (Grossman, Yli-Renko, & Janakiraman, 2012). The authors theorize that women and men are socialized towards different values, beliefs, and communication patterns, which accounts for their findings that gender similarity is an amplifier of the perceived value of a tie. Empirically, the authors treat women pairs and men pairs as equivalent, i.e., they do not examine potential differences between women pairs and men pairs. Implicit in this treatment is the assumption that the dynamics of homophily on network cognition are the same for two women interacting as they are for two men. However, other research shows that the dynamics of homophily for women and men dyads differ (e.g., Kleinbaum, Stuart, & Tushman, 2013). Again, we note that although this research finds no evidence that gender homophily differentially affects women's and men's network cognitions, this should not be interpreted as evidence of no effect, especially as the authors did not interrogate this question directly.

Cell 2: Alter's Cognition

Whereas the first cell represents how gender affects individuals' network cognition, the second cell represents how an individual's gender affects others' perceptions of them in their social network.

Just as gender stereotypes shape individuals' cognitions about their own networks, so too do stereotypes shape individuals' cognitions about the networks of others. Gender stereotypes that cast women as communal and men as agentic create expectations about the structure of the social networks surrounding women versus men. Men – more so than women – are expected to inhabit networks that provide them with the opportunity to exercise agency and control, i.e., men are expected to initiate relationships and broker relations between their network members. In contrast, women – more so than men – are expected to inhabit interconnected networks that demonstrate their interdependence and desire for cohesion with others.

These gender stereotypes about social networks shape individuals' perceptions of their social worlds in two ways. First, stereotypes describe how the world will be, meaning that individuals tend to impose stereotyped expectations on to the networks surrounding them, biasing their perceptions of these networks (i.e., stereotypes filter individuals' perceptions of their social networks). Individuals overestimate the degree to which men extend ties to others and broker between network members, and underestimate the extent to which women do so (Brands & Kilduff, 2014). Second, stereotypes prescribe how the world should be, meaning that when women are seen to violate a gender stereotype, others react negatively. To the extent that individuals perceive a woman's brokerage, they tend to rate her as less warm than when she is seen to occupy a more interconnected network (Brands & Kilduff, 2014). This phenomenon is known as the implied communality deficit (Heilman & Okimoto, 2007), and is incurred by women who succeed in male-typed roles, such as brokerage.

The theoretical lens utilized in this work casts gender as a social identity and seeks to understand how gender stereotypes shape expectations for the structure of the relationships that a focal woman or man is involved in, i.e., the pattern of direct connections around them. However, social networks are not an individual-level phenomenon, they exist, by definition, at the interpersonal, structural level. An implication of this point is that gender stereotypes might

also affect individuals' expectations about the structure of the whole network, and not just those that a focal woman or man is directly involved in. Research suggests that this is the case. The expectation that women will be communal and men will be agentic shapes expectations about the kind of social networks that will suit women versus men. Specifically, in the domain of charismatic leadership, men are seen as better suited for centralized networks (i.e., those in which one or a few individuals dominate the network) whereas women are seen as a better match for cohesive networks (i.e., those in which the overall network is more interconnected) (Brands, Menges, & Kilduff, 2015). Importantly, it does not matter whether the focal woman herself has an interconnected network, or whether the focal man himself is at the center of the network; rather, the *overall* structure of the network gives rise to a perceived match or mismatch between the network and the leader.

Summary of Gender and Network Cognition

Much more research is needed on the topic of gender and network cognition. In our review, we identified just six papers – all of them published from 2012 onward – in which the research question was definitively cognitive in nature (i.e., whether there are gender differences in network cognition, or differences in the way women's and men's networks are perceived). When we widened the definition to include any papers in which the theory invoked cognition in some manner (about gender or networks), regardless of the research question, we identified a further 15 papers.[3]

With respect to current body of work, the research reviewed in the first two cells demonstrates three different approaches to theorizing this topic. One approach recognizes gender as social identity, but assumes that women's and men's network cognition will be similar, and will be similarly shaped by situational dynamics, such as the gender of the person they are observing or interacting with (Brands & Kilduff, 2014; Grossman et al., 2012). The

[3] These papers are marked in a separate column in Appendix 4.

second approach also recognizes gender as a social identity, but assumes that the meaning attached to, and the experience of being in, the category 'woman' is different from the meaning attached to, and the experience of being in, the category 'man,' and that the processes of gender socialization are so robust that they produce chronic gender differences in network cognition (e.g., Brashears et al., 2016). The third approach also assumes that women's and men's network cognitions differ, but posits that these differences are best theorized as socially situated cognition (see Semin & Garrido, 2015; Smith & Semin, 2004), i.e., an emergent product of individuals' perceptions of their social network, the context in which that network occurs, and their gender (as well as other mental states that might be salient at the time) (e.g., Brands & Mehra, 2019).

We cannot adjudicate between the accuracy of these three theoretical lenses given the paucity of the evidence base. However, we do posit that the third approach – theorizing gendered network cognition in context – is likely to be the most generative in terms of theory building and testing. Research about gender differences in other domains shows that gender is fundamental to social cognition (Martin & Slepian, 2018), but also that even highly robust gender differences that appear to transcend organizational and national contexts do, in fact, exhibit contextual variation (e.g., gender differences in risk taking and preference for competition; Charness & Gneezy, 2012; Gneezy et al., 2009). Thus, an approach to theorizing that explicates both robust gender differences and variations in these is on solid empirical footing.

Gender & Network Behavior

Next, we turn to research that examines social networks through a behavioral lens. We review work that – explicitly or implicitly – focuses on ego's or alter's behavior in social networks. Although we disaggregate this research into these two sides of the relational equation, we recognize the theoretical and empirical complexity of, and the challenges linked

to, determining the source of networking behavior. Individuals' network agency is facilitated or constrained not just by their individual choices and preferences, but also by their alters' perceptions of, and reactions to, their relational behavior (Kleinbaum, Jordan, & Audia, 2015). These negotiated patterns of interactions between egos and their alters ultimately contribute the structural features of networks (e.g., cohesion, centralization), which themselves then also affect individuals' abilities to build and mobilize social ties (e.g., Burt et al., 2013).

Cell 3: Ego's Behavior

The third cell in Figure 1 refers to research that focuses on ego's behavior in the network. As highlighted in preceding sections, even though the structural perspective influences this research, our review emphasizes theorizing in relation to individuals' behaviors. Two predominant topics of enquiry emerged from our review: homophily as a specific topic of interest, and instrumental networking more broadly. We explore each of these in turn.

Homophily. A core topic in research that examines the effect of gender on ego's networking behavior is gender homophily, defined as the tendency of individuals to have relationships with people of the same gender. On the one hand, individuals prefer to initiate ties with people whom they perceive to be similar to themselves, a phenomenon that is referred to as choice homophily (Ertug, Brennecke, Kovacs, & Zou, 2021; Lawrence & Shah, 2020). On the other hand, such preferences are circumscribed by the availability of similar interaction partners to ego. If there are few dissimilar contacts available to ego relative to similar ones, homophily may be accentuated and likewise, if there are many dissimilar contacts available to ego relative to similar ones, homophily may be attenuated. This tendency to form homophilous ties due to the availability of similar interaction partners, as different from preference-based choice homophily, is known as induced homophily. Therefore, the overall level of homophily that is observed is generally a result of some combination of these two conceptually distinct types of homophily.

Induced homophily has been used to explain why women often display less gender homophily in their networks than men. For example, in organizations, women's ability to network with other women is circumscribed by the lack of availability of women at higher ranks. This means that women at managerial ranks tend to have networks that are less homophilous than men's (holding constant factors that explain future career advancement, such as managers' advancement potential), i.e., they have induced gender heterophily (Ibarra, 1997). Likewise, since men tend to be resource-rich nodes in organizations, which makes them attractive interaction partners, women develop more gender heterophilous instrumental networks than men (Ibarra, 1992). Moreover, low numerical representation of women can foment interpersonal dynamics that discourage women from forming ties with other women (Ely, 1994; Merluzzi, 2017). However, a lack of available women has also been shown to induce *more* homophily for women than men. For example, women in entrepreneurship (a domain in which women are underrepresented) display more gender homophily in their networks than men (Burt, 2019). Similarly, in an organizational setting in which women were in the numerical minority, women were found to have larger and more gender homophilous networks than men (Kleinbaum et al., 2013).

These conflicting findings[4] suggest that homophily theory – especially that part of it which primarily conceptualizes the formation of ties to similar others as being conditioned on availability – may not apply straightforwardly to the case of gender. That is, gender cannot be reduced to, and treated the same as, some of the simpler dimensions that are studied in homophily research (e.g., same team, Kleinbaum et al., 2013). This is because such a straightforward application fails to take into account the broader societal and organizational structural power inequalities faced by women, gender norms and stereotypes, as well as the

[4] Differences between these studies and others might also be due to how homophily is measured and the degree to which choice (rather than induced) homophily can be isolated, rather than assumed, in studies (for further discussion of this point see Lawrence & Shah, 2020; Ertug et al., 2021)

interplay between these cultural/structural factors and individual behavior (Greenberg & Mollick, 2017; van den Brink & Benschop, 2014). Stated differently, the experiences that drive women to form gender homophilous ties in settings that are dominated by men are different from the experiences that drive men to form gender homophilous ties in those same settings. Moreover, these different experiences cannot be explained solely by numerical representation, i.e., women's experiences in women-dominated settings would also differ from men's experiences in men-dominated settings. The complexity and depth of considerations that are linked to gender and which are relevant for individuals' relational choices (and, thus, of interest to homophily research) therefore suggest caution in the straightforward extension of homophily reasoning to the study of gender.

One implication of this insight is that the dynamics of homophily may be different for women than they are for men. Indeed, there is suggestive evidence for this idea. For example, women's preferences for same-gender ties are insensitive to formal organizational structures and other social foci (e.g., business units) which usually constrain individuals' social networks. In contrast, men's networks exhibit greater homophily within, rather than between, such formal structures (Kleinbaum et al., 2013). In a similar manner, gender homophily accentuates the effect of the social influence of peers on men's decisions to become entrepreneurs more than it does for women (Kacperczyk, 2013). To provide an example from a different topic, women are more likely to name a difficult work tie to a woman, than men are to name a difficult work tie to a man. But this effect was attenuated when women had a more gender homophilous social support network (Merluzzi, 2017; see also Saparito, Elam, & Brush, 2013).

Research that takes a micro-perspective on women's networks by investigating their networking behaviors and motivations provides some insight into these dynamics. Women often have larger networks than men, which could be because they are specifically seeking ties to other women (Kleinbaum et al., 2013; Obukhova & Kleinbaum, 2020; Yang, Chawla, &

Uzzi, 2019), often to compensate for some gender-based disadvantage. For instance, women job-seekers tend to network at a similar rate and intensity as men when connecting to other men, but with greater frequency and intensity to women in their job search, with the aim to find employers and career options that support women's careers (via, for example, flexible work practices and a gender-inclusive climate) (Obukhova & Kleinbaum, 2020). By the same token, women in the Champagne grape growing community compensated for their isolation and exclusion from the men, who were in the numerical majority, by sharing information with each other about prices and, as a result, were able to charge higher prices than men (Ody-Brasier & Fernandez-Mateo, 2017).

Instrumental networking. A related topic concerns gender differences in instrumental networking, defined as proactive and purposeful initiation of relationships with a specific goal of obtaining benefits, such as career advancement (Casciaro, Gino, & Kouchaki, 2014: 706). Fang et al. (2020) investigated why women are less likely than men to have networks rich in structural holes. They found that women were less likely than men to report that they engaged in proactive networking behaviors (e.g., interacting and socializing with people from other departments) and that this reduced their brokerage in their social networks. The authors did not find support for the other two explanations they tested, namely discrimination and job-based opportunities. However, we caution that the self-report measures used in this study may not be suitable for examining discrimination and job-based opportunities, or even for accurately measuring individuals' social networks (see Brands, 2013). Moreover, although the authors attribute gender differences in proactive networking to differences in women's and men's socialized preferences, it may also be the case that proactive networking is not well-received when it comes from women (e.g., Rudman & Phelan, 2008), or that women are unable to engage in this kind of networking due to caregiving responsibilities at home (Bozeman & Corley, 2004), even if women's and men's preferences were no different.

The implication is that gender differences in networking behavior could be driven by women's rational reactions to the structural and interpersonal constraints that they face in the domain of paid work, rather than preferences for abstaining from instrumental networking. For example, a qualitative study of high-level women leaders in large German corporations found that women expressed moral concern about instrumental networking and self-doubt about their abilities to make valuable contributions to people in their network, which contributed to their reluctance to engage in instrumental, proactive networking (Greguletz, Diehl, & Kreutzer, 2019). However, structural factors partly contributed to these expressions of personal hesitation. The women interviewed felt informally excluded by men (who preferred to network with other men over masculine interests) and precluded from networking by the fact that networking events often conflicted with their family responsibilities.

Cell 4: Alter's Behavior

The fourth cell in Figure 1 represents research that focuses on the behavior of other actors in a network, i.e., alters. We focus on two predominant themes in this literature: the structural exclusion of women and discrimination received by women from their network members.

Exclusion. An important topic of work concerns women's exclusion by alters in social networks. Empirically, exclusion is often operationalized as the extent to which women occupy peripheral (versus central) positions in social networks. Women are frequently at the periphery of social networks (Elliott & Smith, 2004; Mehra, Kilduff, & Brass, 1998; Smith, 2020; Whittington, 2018), particularly those networks that are rich in social capital (Brass, 1985; Elliott & Smith, 2004). Such marginal positions are experienced by women as a "chilly climate," defined as a sense that they are not regarded as full members of their organization (Maranto & Griffin, 2011).

The dynamics of exclusion are closely related to the dynamics of homophily, i.e.,

exclusion occurs when men prefer ties to other men rather than women. Men's preference for ties with other men means that women are excluded from participating in many of the interactions at the core of the network. By the same token, women's preferences for ties with other women mean that women would choose not to participate in the core of the network (for a discussion of this interplay, see Singh et al., 2010). One study that adjudicated between these perspectives showed that women were structurally marginal in friendship networks, not because they avoided friendships with men, but because men avoided friendships with them (Mehra et al., 1998), also noting that such exclusion is most likely to occur in contexts in which women are numerically rare. In contexts in which numerical representation of women and men is more balanced, even if women and men still interact in gender-segregated networks this would not result in women being at the periphery of the network (Brass, 1985).

What is unclear in existing research is *why* men prefer gender homophilous ties. We do not have a clear picture of the extent to which men actively seek to relegate women to the periphery and therefore lock them out of beneficial exchanges (i.e., explicit gender bias), versus the extent to which men's homophily is the result of non-conscious or implicit preferences.[5] One study that sheds light on this topic conceptualizes gender not as a social category, but rather as a set of *practices*, defined as things that people do and say in their social interactions in order to distinguish between women and men, and femininity and masculinity (van den Brink & Benschop, 2014: 465). Studying gatekeepers in the context of academic recruitment, the authors find that men's preference for other men often arises from taken-for-granted organizational routines and practices, which contribute to the formation of explicit preferences for relationships with other men. For example, the men in their research tended to habitually

[5] There is evidence from research focusing on women (e.g., Duguid, 2011; Ely, 1994; Greenberg & Mollick, 2017) that speaks to the interplay of personal preferences and contextual factors, such as organisational culture, in influencing women's gender homophilous preferences. However, as noted, the mechanisms of men's homophily might differ from the mechanisms of women's, meaning that this literature is not necessarily directly relevant.

organize late meetings, dinners, or conferences, which men were more able to attend than women who often had caregiving duties, meaning men formed a greater number of, and deeper, social bonds with other men. An important insight that arises from this characterization of gender as a set of practices is that women can both participate in (and reproduce) but also challenge the practices that reinforce women's exclusion (see also Shih, 2006). For example, the authors highlight that women recognized that men's gender homophily tended to reinforce women's exclusion from professorial roles, and so attempted to use their own networks to recruit women. However, like men, women also tended to favor men candidates who exemplified the masculine qualities associated with success in academia.

Discrimination. Discrimination occurs when women receive less favorable treatment from their network members because they are women. There is a vast literature on interpersonal bias (e.g., microaggressions; Basford, Offermann, & Behrend, 2014; identity abrasions; Ely, Meyerson, & Davidson, 2006) that is beyond the scope of our review. Instead, we focus on research that is directly related to social networks. An intriguing theme emerges from this work: whether individuals discriminate against women in their networks partly depends on the gender norms in the context in which a given relationship is embedded.

For example, research on instrumental networking among entrepreneurs found that when individuals (both women and men) engaged in dyadic resource exchanges, they did not discriminate against women. However, when the resource exchange involved referring a person to a third-party, individuals did discriminate against women, particularly when their business was in a male-typed industry or occupation (Abraham, 2020). This negatively affected women entrepreneurs' revenue, in the order of thousands of dollars each year. The author theorizes that even if individuals do not personally endorse gender stereotypes about women's lower status and competence, they assume that others will. As a result, when individuals consider whether to make a referral, they tend to favor men as the high-status candidates, assuming that third

parties will prefer this. These assumptions are magnified in male-type industries or domains, where the incongruity of a woman entrepreneur makes gender-based status beliefs even more salient.

Similarly, research using multi-year data on women entrepreneurial activity in rural India found that their ties to men in power (in this case, those who are involved in local government) negatively affect women's likelihood of becoming an entrepreneur and their profits from entrepreneurial activities (Venkatesh, Shaw, Sykes, Wamba, & Macharia, 2017). In contrast, ties to family members – some of whom were men – were positively related to entrepreneurial activity and profit. The authors reason that whereas men in power are motivated to uphold cultural traditions that demand women stay at home, family members who were men often provide material and emotional resources that buffer women from social norms that demand they stay at home. The implication is that whether women receive support or discrimination from their contacts who are men depends not on those men's personal biases, but on the institutional context of the tie (a point further underscored by the authors' decisions to empirically treat power and family networks as mutually exclusive, i.e., family members were excluded from government networks).

Examining the context of social networks also helps reconcile some seemingly inconsistent findings. For example, research shows that women entrepreneurs enjoy higher success rate in crowdfunding their ventures than men (Greenberg & Mollick, 2017), a finding that is inconsistent with work that demonstrates that women attract venture funding at a lower rate than men (e.g., Harrison & Mason, 2007). The finding in the more recent study arises because women entrepreneurs benefit in crowdfunding contexts from women investors' perceptions that they themselves also face similar challenges and discrimination as women entrepreneurs, which results in women investors preferentially investing in women's entrepreneurial ventures. In this view gender is not simply a social identity or category which

individuals use to organize relations, rather it is a cultural institution that individuals actively seek to shape (see also Bozeman & Corley, 2004)

Summary of Gender & Network Behavior

The research reviewed in cells three and four highlights that even though women's decisions to engage in certain types of networking behaviors and relationships with certain actors in networks may be an immediate consequence of their individual choice or preferences, those preferences and choices are also socialized in interactions with their network members, who provide women with feedback about the kinds of behaviors that will be positively received. Importantly, prevailing cultural norms about gender (whether these are at the organizational or societal level) shape this process. Thus, negotiated agency is bounded not only by network structure (as has been the typical focus of social networks research), but also by gender as a shared, cultural frame for interpersonal behavior.

WHAT WE CAN DO DIFFERENTLY: A PROPOSED WAY FORWARD

Having covered the four cells in our review, we move on to provide high level reflections on the manner in which gender and social networks are theorized in relation to each other and sketch the contours of a suggested agenda for future research.

We noted that there has been a long-standing tension in social network research about whether we should understand social networks as behavioral interactions or as individuals' cognitions (Brands, 2013; Burt et al., 2013). In line with our aim to provide a useful and analytical way to map the research in this area, our framework reflects the current state of the literature by explicitly distinguishing between network cognitions and network behaviors. However, this distinction might well be immaterial to the empirical development of the literature on gender and social networks, because recent research shows that gender cognition and social cognition are interdependent. Gendered cognition (i.e., the tendency to see entities as either feminine or masculine) is thought to underlie social cognition, such that the manner

in which people perceive, process, and understand the social world falls along two dimensions that have been found to broadly correspond to femininity and masculinity (Martin & Slepian, 2018). Across a range of domains, researchers have identified that two dimensions underlie perceptions, the so-called "Big 2." For example, studies of person perception have highlighted that warmth and competence underlie all social judgements (Abele, Cuddy, Judd, & Yzerbyt, 2008; Fiske et al., 2002) and studies of personality have differentiated between approach and avoidance (Elliot & Thrash, 2002).

There is suggestive evidence of these "Big 2" dimensions in cognitions about social networks as well. For example, network interconnectedness is stereotypically associated with women/femininity (cohesion, interdependence, communality) and centralization is stereotypically associated with men/masculinity (power, dominance, control) (Brands et al., 2015). Relatedly, researchers have also theorized about gender differences in how individuals construe their relationships in connection to their identity, with women being assumed to tend towards a relational-interdependent self-construal (where the self is defined by one's close relationships) and men being assumed to tend towards a relational-independent self-construal (where the self is seen as distinct from close others) (Cross, Bacon, & Morris, 2000; Cross & Madson, 1997; Cross, Morris, & Gore, 2002). Moreover, individuals' perceptions of their position in their surrounding networks invoke their gender identity (Brands & Mehra, 2019) and likewise, individuals' gender causes them to attend to certain features of their social networks over others (Brashears et al., 2016).

Gendered cognition is therefore inextricably intertwined with the way individuals perceive, interpret, and recall social structure. These social network cognitions underlie individuals' decisions about with whom to interact and how (e.g. Ody-Brasier & Fernandez-Mateo, 2017) and others' social responses to the women and men they encounter in daily life (e.g., Ibarra, 1992). Indeed, the behavioral interactions that form the relationships of social

networks cannot take place absent of cognition – individuals' behaviors in social interactions are determined by their interpretations of that interaction (and vice versa) (Brands & Mehra, 2019; Semin & Garrido, 2015). The implication for social network research is that social networks are not gender neutral. Therefore, any fully articulated theory of social networks requires scholars to actively consider and include gender in their theorizing.

This idea represents a significant departure from the current body of work that we reviewed: with few exceptions, researchers treat gender and social networks as orthogonal to each other, with social networks typically in the foreground and gender being given a background role, mostly examined as a moderating factor. In contrast to this predominant in-use conceptualization of gender and social networks as orthogonal constructs, we suggest that gender and social networks are best conceptualized as interdependent and mutually constitutive, meaning that gender is both a cause and a consequence of social networks, and vice versa. Incorporating this insight into future research requires a substantial change in how scholars approach research in this domain. Accordingly, below, we provide an agenda for future work on gender and social networks, comprising approaches and topics.

Agenda for Future Research

Decoupling the gender binary. Scholarship on gender and networks tends to take men (their experiences, their psychology, their outcomes) as the baseline or default when theorizing, and women (their experiences, their psychology, their outcomes) as the exception. That is, gender is theorized as a "moderator" whereby women's experiences are conceptualized as being exceptions to the general rules of how social networks operate. This partly arises from the fact that organizations and paid work are predominantly masculine domains, such that prototypes of ideal workers, leaders, and even organizational structures are male-typed and reinforce assumptions about male-dominance (Acker, 1990; Schein, 1973). These assumptions (whether scholars articulate them at all or, indeed, are even aware of it) are reflected in the

gender and social network research that we review, which tends to portray men as the prototypical person who agentically builds social networks and on whom social structure operates. Thus, women are theorized through the lens of masculinity (which implies that women and men are at opposite ends of a gender spectrum), where the baseline/default masculinity-based lens is used as a starting point that is then adjusted to accommodate women vis-à-vis men.

This treatment of gender has not kept pace with psychological theory, which increasingly treats gender as two separate dimensions of femininity and masculinity (Bem, 1981a, b; Hyde et al., 2019), rather than as being at either end of a spectrum or as discrete, binary categories.[6] This recent turn in psychology away from the gender binary provides insights about how social network research could similarly decouple the gender binary when theorizing about gender. The predominant approach in the current literature is to measure gender as a stable individual difference, classifying individuals as belonging to the binary social categories of "woman" or "man" and applying the average effect of these identity groups (e.g., stereotypes, identification) to all individuals in the corresponding category. An alternative approach, suggested by psychological theory, would be to examine the extent to which individuals identify with, or see themselves as possessing, masculinity and femininity and, likewise, the extent to which they see others as masculine or feminine (Bem, 1981a). This approach suggests that researchers could examine femininity and masculinity within individuals who identify as the same gender (e.g., Merluzzi & Burt, 2020), as well as the more normative approach of cross-gender comparisons.

Such an approach also brings to the fore the suggestion that researchers examine not only the effect of gender on social networks, but also the effect of social networks on gender.

[6] Recall our earlier point that the de-coupling of gender and sex has led to an increasing recognition in both scholarship and society that the sex binary is not necessarily reproduced in a gender binary, such that individuals may identify with neither gender exclusively, and, likewise, see themselves as possessing a combination of (stereotypically) feminine and masculine traits.

Almost all of the research that we reviewed theorizes in one causal direction: from the individual to the network, i.e., gender as a cause/antecedent (e.g., homophily research) or as a moderator (e.g., gender moderates consequences of social networks), but not from the network to the individual. However, the definition of gender that we use in this review – that gender is the *meaning* assigned to the biological categories of female and male – suggests that the causal arrow can run the other way as well, i.e., that gender can be an *outcome* of social networks. It may be unusual for individuals to change whether they categorize themselves or others as women or men. However, the use of gender as a demographic category that we assign to the self and others is just one manifestation of gender as meaning.

In particular, gender as meaning is also manifest in, for example, the stereotypes associated with the social identity groups of women and men. Notably, there is considerable variation within individuals over time, between individuals, and between societies regarding the content and strength of these stereotypes (Breda, Jouini, Napp, & Thebault, 2020; Cuddy et al., 2015; Eagly, Nater, Miller, Kaufmann, & Sczesny, 2020) – variation that necessarily arises out of social interactions. We know that some of the core defining aspects of our individual identities are dependent on network connections, positions, and structures (Tasselli et al., 2015). Social networks are sources of social identity to the extent that they define the segmentation of social space into clusters of mechanisms and structures that tend to be populated by actors who share social or demographic characteristics (White, 2012), such that individual identities themselves are constructed from social resources (e.g., Shipilov, Gulati, Kilduff, Li, & Tsai, 2014). Thus, research could examine how social networks affect individuals' self-concept, not as women or men, but rather as possessing masculine or feminine traits (see Bem, 1981a, 1981b). For example, women whose networks afford them with opportunities to exercise power over others might, over time, update their self-concept, coming to view themselves as possessing more stereotypically masculine characteristics than before.

Switching the focus from ego to alter, research could examine how social networks affect the activation, suppression, and strength of stereotypes, both in the moment at which they are applied to other people as well as over time (e.g., stereotype change). For example, the amplification of opinions and social judgments inherent in Simmelian cliques (i.e., triadic or extra-triadic groups in which members are all strongly tied to each other; Krackhardt, 1998) could serve as an incubator for within-group stereotypes, which could then spread to other cohesive groups of which those Simmelian brokers are members. Furthermore, research can also investigate the extent to which social networks, by shaping people's perceptions of gender stereotypes, might affect the extent to which they categorize a specific individual's behaviors as either masculine or feminine, which in turn might condition how they react to such behaviors.

Examining gender in relational dynamics. In our framework, we followed the literature and disaggregated the ego and alter driven processes that constitute the underlying processes of gender differences in social networks. Although this approach is theoretically and empirically easier to grapple with than the messy reality of social relations, ego's and alter's relational decisions are not independent from each other. Networks are a result of patterns of negotiated agency, in which egos enact behaviors that are necessarily affected by their alters, and which behaviors both constitute, and are constituted in, social networks (Tasselli et al., 2015). For example, it is likely that gender stereotypes lead women and men to enact different relational behaviors. These behaviors elicit responses from alters, the type and content of which are likely to depend on whether alter is a woman or a man. These responses, in turn, provide feedback to egos about their own behaviors, which not only affects egos' cognitions about their own gender identities, but also set norms for expressing their gender in future interactions with others. Importantly, this process may unfold differently in different dyads, as based on contextual factors (e.g., gender-type of the job. See also, Joshi & Knight, 2015).

Therefore, instead of seeking to attribute gender differences in social networks to either ego-centric or alter-centric effects exclusively through a node-level analysis, we suggest that research theorize gender at network structures, below the level of the entire network, i.e., with respect to dyads, triad, and cliques. This approach requires researchers to theorize not just about how gender influences relational perceptions and behaviors, but also about how relational dynamics unfold within structures that vary in terms of the number of actors involved and the gender of those actors. For example, a woman's concerns about being negatively stereotyped for behaving agentically when she brokers between two network members (Brands & Mehra, 2019) may be alleviated if those two network members are women who – perceiving the focal woman's behavior as agentic – reciprocate by behaving agentically towards her. In this case, the focal woman's concerns about violating gender stereotypes may be alleviated by the emergent agentic behavioral norm that has emerged within this triad of women, i.e., the shared agreement that women behave agentically. Since the logic of this approach highlights the recursive interplay of gender and relationships, it necessarily requires research methods that can capture relational dynamics.

Examining exceptional cases. Even though we looked for regular patterns of theorizing and empirical findings in our review of the literature, we see the value of research that examines unusual or exceptional cases. Exceptional cases can provide critical insight for theory building by highlighting the boundary conditions of models that researchers use to understand and test reality (Gibbert, Nair, Weiss, & Hoegl, 2021). Given our comments about the current state of the literature and the paths forward that we propose, this is especially relevant for theorizing about gender and networks. We make two specific suggestions to illustrate this point. First, research can be conducted in organizations or in contexts (whether these be careers or industries) in which women are both the numerical majority and that are female-typed (e.g., childcare, nursery, and preschool teachers). If gender is simply a proxy for legitimacy or power

(Burt, 1998), one might expect to see the network dynamics of gender inequality reversed in these settings. However, evidence outside of the domain of social networks suggests that even in female-typed and women majority settings men may continue to experience advantages (Williams, 1992). If such a finding were to be replicated in the domain of social networks, it could provide useful insights for the development of separate theories of networks and networking for women and men, for example in terms of the meaning of gender that is used as a starting point in such theorizing.

Our second suggestion for researchers is to explore contexts in which women do not experience network disadvantage. This would include organizations in which women and men either have broadly equivalent social networks and/or experience broadly equivalent returns to their social networks. In these contexts, researchers could examine whether certain network structures or configurations, or other relational or contextual factors, act to suppress the cognitive processes and behaviors that are typically gender-specific, such as women's tendency to build stronger support networks or men's tendency to be more risk-takers (Byrnes, Miller, & Schaefer, 1999), or the cognitive activation of stereotypes that underlie gender bias (Wheeler & Petty, 2001). This research could subsequently be used to develop interventions that seek to reduce or reverse the network disadvantages women usually experience in organizations.

Re-coupling gender and race. Similar to gender, race is a source of social identity that entails schemas for members of different racial groups and that affects how networks get structured (Dreher & Cox Jr, 1996; Miller, Lincoln, & Olson, 1981). Gender and race are visible social categories, meaning that individuals automatically categorize others into them (accurately or not) (Ito & Urland, 2003), with consequences for how they behave towards them (Tajfel, 1974). Gender and race are frequently treated as separate topics in social network research, with studies theorizing about or empirically examining gender and race in isolation, or side-by-side, but as independent of each other. For example, research leveraging network

data from the 2002 General Social Survey of adult Americans found that women were more likely than men to have weak ties in their networks, while white people were more likely than Black people to have weak ties (Lizardo, 2006). Even though the likelihood of having weak ties for Black women could be calculated from a combination of the two corresponding coefficients (see also Merluzzi & Sterling, 2017), the opposite effects of gender and race suggest that an investigation that considers the possible intersection, or interplay, between these two categories, via an interaction effect or sub-sample analyses at a minimum, might provide greater insights about their joint implications.

Recent psychological research has demonstrated that gender and race stereotypes intersect, meaning that gender stereotypes are differentially activated and applied to individuals of different racial groups (Hall et al., 2019; Purdie-Vaughns & Eibach, 2008). An important insight extending from this research is that the prototypes for "men" and "women" are white, meaning that theories about gender in social network research implicitly invoke white stereotypes. The implication is that many of the findings in research on gender and social networks may not necessarily apply to individuals who are not white. Therefore, future social network research should explicitly theorize about and empirically investigate gender for racial groups that are not white and also examine social networks in contexts and organizations that are not majority white. Future research might also consider other social identities in conjunction with gender (e.g., religion, sexual orientation). However, as these are less visible categories, they might not be invoked in social behavior to the same extent, meaning that unlike race and gender, their influence on the social interactions that constitute social networks might be less direct.

Conclusion

Every organization, and more generally every society, has informal social networks. The patterning, structure, and consequences of these networks are affected by the gender of the

people interacting in them. In our review, we sought to organize the research being conducted on this topic, illuminating “what we do” by elucidating the levels and mechanisms by which gender and social networks affect each other. More importantly, we outlined “what we can do differently” with observations about blind spots in current approaches and suggestions for future research directions. We hope to invigorate a paradigm shift in gender and social networks research, one in which we will see gender and social networks explored as the mutually constitutive constructs that they are.

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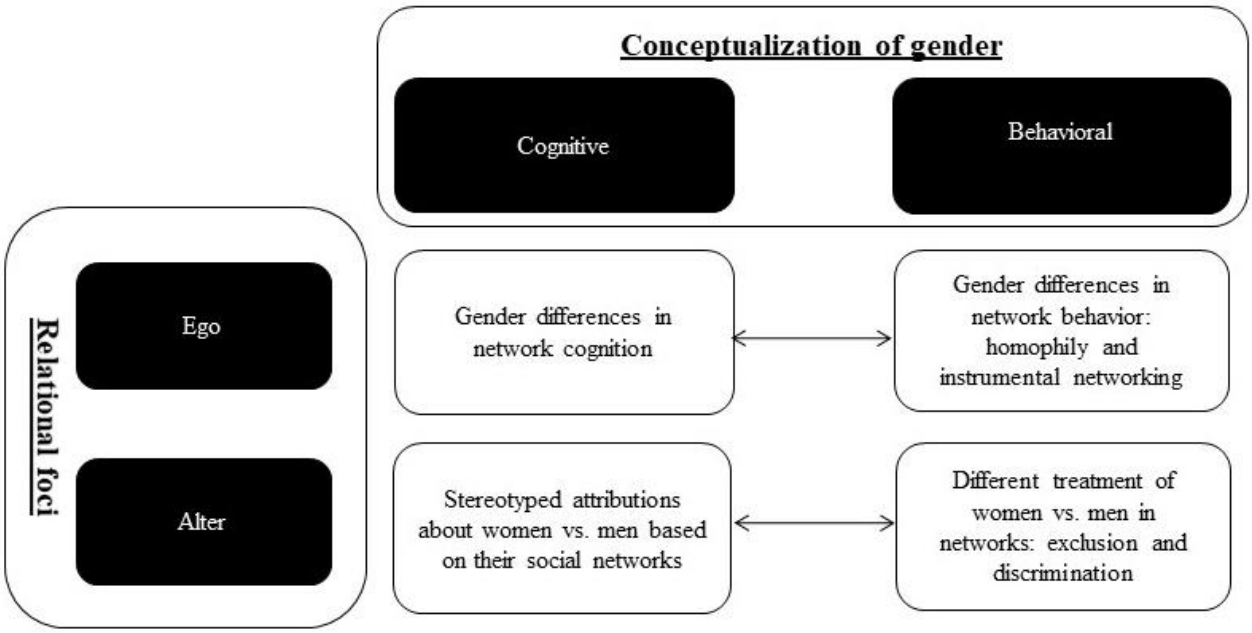
Figure 1: Organizing Framework



Appendix 1: Review Scope and Literature Search Procedure

Review scope and selection of articles. Our focus is on social network research in management and organization studies in which theorizing about gender plays a significant role. We recognize the subjectivity in decisions about whether an article is a social network study (e.g., if one were to use a very broad understanding, any study that investigates some aspect of inter-personal relationships might be deemed pertinent), whether an article qualifies as research in management and organizations (for articles in the journals that we selected from the Financial Times list this was an easier call to make, however, for articles that are identified in some of the other journals in Step 1 or for those articles identified in Steps 2-4, the decision is more subjective), or whether gender plays a *significant* role in an article's theorizing. For all three criteria, we erred on the side of including those articles that were more directly relevant (at the risk of not including in our sample some articles that others researchers would include), rather than on the side of inclusion broadly (which would have made our review list more comprehensive in one sense, but, in our opinion, would not add significantly to our characterization of the literature and would not enable us to point to additional significant insights). Our interest in deciding on the search steps below and in making a call on the identified articles for their inclusion in our review sample was to yield a body of work that provided a good sense and fair coverage of the literature on the topics of our interest.

Literature search procedure. We implemented a four-step process. First, we searched Web of Science (WOS) for articles that include any term among "gender," "women," or "female" *and* any term among "network," "networks," "networking," or "social capital." This search was performed on the title, abstract, or keywords in articles in management journals that are included in the Financial Times (FT) list and in a selected list of journals from adjacent disciplines. This

search yielded 308 matches. We went through these matches to assess whether to include them, based on the relevance of their arguments and findings for the intersection of gender and networks in the context of management research. After resolving coding differences, this exercise yielded 99 articles. Second, using the same combination of terms as above, we searched the WOS database for the categories of "Psychology Multidisciplinary," "Psychology," "Psychology Social," "Psychology Applied," "Sociology," "Business," and "Management." This search yielded 4,190 matches. Our goal in this step was to pick up work published in other management journals or in related disciplines that fell within the scope for our review. We sorted these matches by descending citations and examined papers that had at least 100 citations (263 matches). All but seven of the relevant articles we identified were already in the list after step 1. We added those seven articles to our review sample. In a third step, we searched the in-press pages of the journals included in our first step (WOS provides incomplete coverage for articles that have not yet been assigned a specific volume/issue) for the same criteria. This yielded three articles, which we added to our list. Fourth, we undertook additional searches in Google Scholar (using different combinations of the search terms we used in WOS searches), to pick up other directly relevant work the above steps might have missed, which yielded three more articles. After these four steps, we ended up with 112 articles. Appendix 2 discusses how our review is different from other reviews in the broad area of gender and networks. Appendix 3 lists these 112 articles, and Appendix 4 provides basic information about the setting and methods of these studies.

The journals and categories included in each step are listed below.

<u>Step 1: Journals (n = 22) included</u>

Relevant journals from the Financial Times (FT) list (n = 17)

Academy of Management Journal

Academy of Management Review

Administrative Science Quarterly

Entrepreneurship Theory and Practice

Human Relations

Human Resource Management

Journal of Applied Psychology

Journal of Business Venturing

Journal of International Business Studies

Journal of Management

Journal of Management Studies

Management Science

Organization Science

Organization Studies

Organizational Behavior and Human Decision Processes

Research Policy

Strategic Entrepreneurship Journal

Other management journals, and journals from other disciplines (n = 5)

Journal of Organizational Behavior

Journal of Personality and Social Psychology

Social Networks

American Journal of Sociology

American Sociological Review

Step 2: Web of Science (WOS) categories included

Psychology

Psychology Social

Psychology Applied

Psychology Multidisciplinary

Sociology

Business

Management

Step 3: Going over in-press articles for the 22 journals in Step 1, using the same criteria

Step 4: Google Scholar search, using similar search terms as those in used in our WOS searches, to identify other articles

Appendix 2: Related Reviews

We identified four articles and one edited book focusing on gender and social networks. Two articles date from 2006 or earlier, the one from 2017 has a decidedly narrow focus on "formal women-only business networks," whereas the one from 2021 reviews how social networks influence men's and women's career success. Of the 112 articles in our review sample, fewer than 29% percent are mentioned in the review list of any of these other pieces (the focus of the book is different, and therefore we did not conduct this exercise for it). Accordingly, our study is informed by literature that is substantially different from that in these other reviews. More importantly, the central concern and contribution of our study are distinct from those of the other studies. We elaborate below, focusing in particular on the most recent review, i.e., Woehler et al. (2021).

Timberlake (2005) is a brief, essayistic piece. Neergaard and colleagues (Neergard, Shaw, & Carter, 2005) focus on women business owners, entrepreneurship, and what they term "small firm networks." The authors take issue with the prevalence of quantitative research in this area and develop a conceptual framework to inform network studies of owner-managers, especially focusing on women-owners. We include this conceptual piece, rather than a review here, since it mentions "a research agenda." Villesèche and Josserand review "the emerging literature on formal women-only business networks and outline propositions to develop this under-theorized area" (2017: 1104). They focus entirely on women-only and formal (rather than informal) networks, with the implication that our scope and focus differ from theirs, as does the corresponding literature we review. The book edited by Gidengil and O'Neill (2006) focuses on political science and sociology. The foci of this book's chapters and our work are clearly different and the overlap in the articles we review is minimal.

Woehler and colleagues (Woehler et al., 2021) present a framework to elucidate how and why gender and networks may explain career inequality. In undertaking this work, the authors review evidence on unequal network characteristics and unequal network returns that relate to career success. Our review is distinct in both its focus and its intended contribution from that by Woehler et al. (2021). First, whereas Woehler et al. (2021) emphasize the underpinnings of, and the evidence for, different career outcomes for women vs. men, as driven by social networks, i.e., the outcome variables, our focus is on the theoretical links (e.g., theorizing, mechanisms, arguments, assumptions) that have been made in social network studies that have a gender aspect/component/concern. Therefore, we do not have a systematic and explicit focus on outcomes. Rather, we emphasize the conceptual and analytical links between gender and networks in the studies we review, i.e., how is gender theorized in social network studies in reseach on management and organizations. Second, whereas Woehler et al. (2021) broadly distinguish between two manifestations of gender differences in organizations (unequal network characteristics and unequal network returns), in the course of our review and discussion we delve further into the conceptualizations of gender, the level (cognitive, behavioral) at which gender differences are discussed, and the relational perspectives (whether ego- or alter-focused) to characterize the different approaches to theorizing gender in social network research. These differences are reflected in the studies that are included in the review samples. Of the 112 studies in our review list and the 115 studies in the review list in Woehler et al. (2021), only 29 are in common, which provides another indication of the differences in the focus and approach of the two reviews.

Appendix 3: 112 Articles in our Review

Abraham, M. 2020. Gender-role incongruity and audience-based gender bias: An examination of networking among entrepreneurs. ***Administrative Science Quarterly***, 65(1): 151–180.

Balkundi, P., Kilduff, M., Barsness, Z. I., & Michael, J. H. 2007. Demographic antecedents and performance consequences of structural holes in work teams. ***Journal of Organizational Behavior***, 28(2): 241–260.

Barsness, Z. I., Diekmann, K. A., & Seidel, M.-D. L. 2005. Motivation and opportunity: The role of remote work, demographic dissimilarity, and social network centrality in impression management. ***Academy of Management Journal***, 48(3): 401–419.

Becker-Blease, J. R., & Sohl, J. E. 2007. Do women-owned businesses have equal access to angel capital? ***Journal of Business Venturing***, 22(4): 503–521.

Belliveau, M. A. 2005. Blind ambition? The effects of social networks and institutional sex composition on the job search outcomes of elite coeducational and women's college graduates. ***Organization Science***, 16(2): 134–150.

Bozeman, B., & Corley, E. 2004. Scientists' collaboration strategies: Implications for scientific and technical human capital. ***Research Policy***, 33(4): 599–616.

Brands, R. A., & Kilduff, M. 2014. Just like a woman? Effects of gender-biased perceptions of friendship network brokerage on attributions and performance. ***Organization Science***, 25(5): 1530–1548.

Brands, R. A., & Mehra, A. 2019. Gender, brokerage, and performance: A construal approach. ***Academy of Management Journal***, 62(1): 196–219.

Brands, R. A., Menges, J. I., & Kilduff, M. 2015. The leader-in-social-network schema: Perceptions of network structure affect gendered attributions of charisma. ***Organization Science***, 26(4): 1210–1225.

Brashears, M. E., Hoagland, E., & Quintane, E. 2016. Sex and network recall accuracy. ***Social Networks***, 44: 74–84.

Brass, D. J. 1985. Men's and women's networks: A study of interaction patterns and influence in an organization. ***Academy of Management Journal***, 28(2): 327–343.

Bridwell-Mitchell, E. N., & Lant, T. K. 2014. Be careful what you wish for: The effects of issue interpretation on social choices in professional networks. ***Organization Science***, 25(2): 401–419.

Burt, R. S. 1998. The gender of social capital. ***Rationality and Society***, 10(1): 5–46.

Burt, R. S. 2000. Decay functions. ***Social Networks***, 22(1): 1–28.

Burt, R. S. 2001. Attachment, decay, and social network. ***Journal of Organizational Behavior***, 22(6): 619–643.

Burt, R. S. 2019. The networks and success of female entrepreneurs in China. ***Social Networks***, 58: 37–49.

Campbell, K. E. 1988. Gender differences in job-related networks. ***Work and Occupations***, 15(2): 179–200.

Castilla, E. J. 2011. Bringing managers back in: Managerial influences on workplace inequality. ***American Sociological Review***, 76(5): 667–694.

Chanland, D. E., & Murphy, W. M. 2018. Propelling diverse leaders to the top: A developmental network approach. ***Human Resource Management***, 57(1): 111–126.

Chow, I. H.-S., & Ng, I. 2004. The characteristics of Chinese personal ties (guanxi): Evidence from Hong Kong. ***Organization Studies***, 25(7): 1075–1093.

Chua, V., Mathews, M., & Loh, Y. C. 2016. Social capital in Singapore: Gender differences, ethnic hierarchies, and their intersection. ***Social Networks***, 47: 138–150.

Cromie, S., & Birley, S. 1992. Networking by female business owners in Northern Ireland. ***Journal of Business Venturing***, 7(237–251): 15.

Dennissen, M., Benschop, Y., & van den Brink, M. 2020. Rethinking diversity management: An intersectional analysis of diversity networks. ***Organization Studies***, 41(2): 219–240.

Di Tommaso, G., Gatti, M., Iannotta, M., Mehra, A., Stilo, G., & Velardi, P. 2020. Gender, rank, and social networks on an enterprise social media platform. ***Social Networks***, 62: 58–67.

Ding, W., & Choi, E. 2011. Divergent paths to commercial science: A comparison of scientists' founding and advising activities. ***Research Policy***, 40(1): 69–80.

Ding, W. W., Levin, S. G., Stephan, P. E., & Winkler, A. E. 2010. The impact of information technology on academic scientists' productivity and collaboration patterns. ***Management Science***, 56(9): 1439–1461.

Ding, W. W., Murray, F., & Stuart, T. E. 2013. From bench to board: Gender differences in university scientists' participation in corporate scientific advisory boards. ***Academy of Management Journal***, 56(5): 1443–1464.

Elliott, J. R., & Smith, R. A. 2004. Race, gender, and workplace power. ***American Sociological Review***, 69(3): 365–386.

Elsesser, K., & Peplau, L. A. 2006. The glass partition: Obstacles to cross-sex friendships at work. ***Human Relations***, 59(8): 1077–1100.

Feeney, M. K., & Bozeman, B. 2008. Mentoring and network ties. ***Human Relations***, 61(12): 1651–1676.

Fernandez, R. M., & Sosa, M. L. 2005. Gendering the job: Networks and recruitment at a call center. ***American Journal of Sociology***, 111(3): 859–904.

Forret, M. L., & Dougherty, T. W. 2001. Correlates of networking behavior for managerial and professional employees. ***Group & Organization Management***, 26(3): 283–311.

Forret, M. L., & Dougherty, T. W. 2004. Networking behaviors and career outcomes: Differences for men and women? ***Journal of Organizational Behavior***, 25(3): 419–437.

Friedman, R., Kane, M., & Cornfield, D. B. 1998. Social support and career optimism: Examining the effectiveness of network groups among black managers. ***Human Relations***, 51(9): 1155–1177.

Godwin, L. N., Stevens, C. E., & Brenner, N. L. 2006. Forced to play by the rules? Theorizing how mixed-sex founding teams benefit women entrepreneurs in male-dominated contexts. ***Entrepreneurship Theory and Practice***, 30(5): 623–642.

Greenberg, J., & Mollick, E. 2017. Activist choice homophily and the crowdfunding of female founders. ***Administrative Science Quarterly***, 62(2): 341–374.

Greguletz, E., Diehl, M.-R., & Kreutzer, K. 2019. Why women build less effective networks than men: The role of structural exclusion and personal hesitation. ***Human Relations***, 72(7): 1234–1261.

Greve, A., & Salaff, J. W. 2003. Social networks and entrepreneurship. ***Entrepreneurship Theory and Practice***, 28(1): 1–22.

Grossman, E. B., Yli-Renko, H., & Janakiraman, R. 2012. Resource search, interpersonal similarity, and network tie valuation in nascent entrepreneurs' emerging networks. ***Journal of Management***, 38(6): 1760–1787.

Grugulis, I., & Stoyanova, D. 2012. Social capital and networks in film and TV: Jobs for the boys? ***Organization Studies***, 33(10): 1311–1331.

Hagan, J. M. 1998. Social networks, gender, and immigrant incorporation: Resources and constraints. ***American Sociological Review***, 63(1): 55–67.

Han, J., Shipilov, A. V., & Greve, H. R. 2017. Unequal bedfellows: Gender role-based deference in multiplex ties between Korean business groups. ***Academy of Management Journal***, 60(4): 1531–1553.

Handy, J., & Rowlands, L. 2017. The systems psychodynamics of gendered hiring: Personal anxieties and defensive organizational practices within the New Zealand film industry. ***Human Relations***, 70(3): 312–338.

Harrison, R. T., & Mason, C. M. 2007. Does gender matter? Women business angels and the supply of entrepreneurial finance. ***Entrepreneurship Theory and Practice***, 31(3): 445–472.

Hultin, M., & Szulkin, R. 1999. Wages and unequal access to organizational power: An empirical test of gender discrimination. ***Administrative Science Quarterly***, 44(3): 453–472.

Ibarra, H. 1992. Homophily and differential returns: Sex differences in network structure and access in an advertising firm. ***Administrative Science Quarterly***, 37(3): 422–447.

Ibarra, H. 1993. Personal networks of women and minorities in management: A conceptual framework. ***Academy of Management Review***, 18(1): 56–87.

Ibarra, H. 1997. Paving an alternative route: Gender differences in managerial networks. ***Social Psychology Quarterly***, 60(1): 91–102.

Jha, Y., & Welch, E. W. 2010. Relational mechanisms governing multifaceted collaborative behavior of academic scientists in six fields of science and engineering. ***Research Policy***, 39(9): 1174–1184.

Johnson, R., Kovács, B., & Vicsek, A. 2012. A comparison of email networks and off-line social networks: A study of a medium-sized bank. ***Social Networks***, 34(4): 462–469.

Kacperczyk, A. J. 2013. Social influence and entrepreneurship: The effect of university peers on entrepreneurial entry. ***Organization Science***, 24(3): 664–683.

Kay, F. M., & Hagan, J. 1998. Raising the bar: The gender stratification of law-firm capital. ***American Sociological Review***, 63(5): 728–743.

Khattab, J., van Knippenberg, D., Pieterse, A. N., & Hernandez, M. 2020. A network utilization perspective on the leadership advancement of minorities. ***Academy of Management Review***, 45(1): 109–129.

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Kleinbaum, A. M., Stuart, T. E., & Tushman, M. L. 2013. Discretion within constraint: Homophily and structure in a formal organization. ***Organization Science***, 24(5): 1316–1336.

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Petersen, T., Saporta, I., & Seidel, M. L. 2000. Offering a job: Meritocracy and social networks. ***American Journal of Sociology***, 106(3): 763–816.

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Seierstad, C., & Opsahl, T. 2011. For the few not the many? The effects of affirmative action on presence, prominence, and social capital of women directors in Norway. ***Scandinavian Journal of Management***, 27(1): 44–54.

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Sorenson, R. L., Folker, C. A., & Brigham, K. H. 2008. The collaborative network orientation: Achieving business success through collaborative relationships. ***Entrepreneurship Theory and Practice***, 32(4): 615–634.

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Stuart, T. E., & Sorenson, O. 2007. Strategic networks and entrepreneurial ventures. ***Strategic Entrepreneurship Journal***, 1(3–4): 211–227.

Suitor, J., & Keeton, S. 1997. Once a friend, always a friend? Effects of homophily on women's support networks across a decade. ***Social Networks***, 19(1): 51–62.

Takács, K., Bravo, G., & Squazzoni, F. 2018. Referrals and information flow in networks increase discrimination: A laboratory experiment. ***Social Networks***, 54: 254–265.

Tian, F. F., & Liu, X. 2018. Gendered double embeddedness: Finding jobs through networks in the Chinese labor market. ***Social Networks***, 52: 28–36.

Trimble O'Connor, L. 2013. Ask and you shall receive: Social network contacts' provision of help during the job search. ***Social Networks***, 35(4): 593–603.

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van Emmerik, IJ. H. 2006. Gender differences in the creation of different types of social capital: A multilevel study. ***Social Networks***, 28(1): 24–37.

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Vial, A. C., Brescoll, V. L., Napier, J. L., Dovidio, J. F., & Tyler, T. R. 2018. Differential support for female supervisors among men and women. ***Journal of Applied Psychology***, 103(2): 215–227.

Westphal, J. D., & Milton, L. P. 2000. How experience and network ties affect the influence of demographic minorities on corporate boards. ***Administrative Science Quarterly***, 45(2): 366-398.

Whittington, K. B. 2018. A tie is a tie? Gender and network positioning in life science inventor collaboration. ***Research Policy***, 47(2): 511–526.

Wu, L., & Kane, G. C. 2021. Network-Biased Technical Change: How Modern Digital Collaboration Tools Overcome Some Biases but Exacerbate Others. ***Organization Science***, 32(2), 273-292.

Ynalvez, M. A., & Shrum, W. M. 2011. Professional networks, scientific collaboration, and publication productivity in resource-constrained research institutions in a developing country. ***Research Policy***, 40(2): 204–216.

Appendix 4 / Online Appendix: Basic Information for the 112 Articles[7]

#	Author/s	Setting/Sample	Methods	Cognition	DV/Outcomes
1	Abraham (2020)	Entrepreneurial networking clubs	Empirical (archival, interviews)	C2	Gender difference in connections to third-party resource providers received from contacts.
2	Balkundi et al. (2007)	Fortune-100 manufacturer of paper and wood-based building products	Empirical (questionnaires)		Team structural holes and performance
3	Barsness et al. (2005)	Internet commerce firm in the southwestern U.S.	Empirical (questionnaires)	C2	Use and effectiveness of impression management
4	Becker-Blease & Sohl (2007)	Angel portals	Empirical (questionnaires)		Differences in seeking and receiving angel financing
5	Belliveau (2005)	Elite liberal arts colleges in the Northeast	Empirical (questionnaires)		Salary offers, number of offers
6	Bozeman & Corley (2004)	Scientific researchers at U.S. academic research centers	Empirical (questionnaires)		Collaboration choices and strategies
7	Brands & Kilduff (2014)	Study 1: regional distributor of electronic components; study 2: leading MBA program	Empirical (questionnaires)	C1	Study1: perceived brokerage; study2: perceived warmth and competence, individual performance, team performance
8	Brands & Mehra (2019)	Studies 1 & 2: business school in England; study 3: online subjects in North-America	Empirical (questionnaires, experiment)	C1	Individual performance
9	Brands et al. (2015)	Study 1: online subjects in the U.S.; study 2: individuals working in teams in U.S. organizations; study 3: individuals working in U.S. organizations (20 different industries)	Empirical (experiment, questionnaires)	C1	Perception of charismatic leadership
10	Brashears et al. (2016)	Mid-sized university in the Northeastern U.S.	Empirical (experiment)	C1	The quality of social network memory/recall
11	Brass (1985)	Newspaper publishing company	Empirical (questionnaires)		Perceptions of influence and promotions to supervisory positions

[7] In reference to Footnote 4 in the main text, under the *Cognition* column, papers in which the research question was definitely cognitive in nature are marked as C1 and papers in which the theory invoked cognition in some manner are marked as C2.

12	Bridwell-Mitchell & Lant (2014)	Educational organizations	Empirical (questionnaires, experiment)	C2	Social choices and access to social capital (advice/seeking choices)
13	Burt (1998)	U.S. firm of electronic components and computing equipment	Empirical (archival)		Social capital returns/promotion
14	Burt (2000)	Financial organization	Empirical (archival)		Rate of network decay
15	Burt (2001)	University of Chicago's Graduate School of Business	Empirical (questionnaires)		Decay in attachment to an organization
16	Burt (2019)	Private enterprises in five manufacturing industries within three provinces around the Yangtze River Delta, China	Empirical (questionnaires)		Network advantage and business success
17	Campbell (1988)	Labor market in the Research Triangle area of North Carolina	Empirical (questionnaires)		Network characteristics
18	Castilla (2011)	Urban labor market in North America	Empirical (archival)		Performance evaluations
19	Chanland & Murphy (2018)	-	Conceptual		-
20	Chow & Ng (2004)	Full-time employees pursuing MBA/EMBA in Hong Kong	Empirical (questionnaires)		Development of close relationships
21	Chua et al. (2016)	Singaporean households	Empirical (questionnaires)		Different types and amounts of social capital (extensity, upper reachability, and resource heterogeneity)
22	Cromie & Birley (1992)	Northern Ireland entrepreneurs	Empirical (questionnaires)		Composition of personal contact networks
23	Dennissen et al. (2020)	Two Dutch organizations	Empirical (qualitative, case study)		Diversity management practices (multiple identity categories in relation to diversity networks)
24	Di Tommaso et al. (2020)	Enterprise Social Media (ESM) platform	Empirical (archival)		Homophily and network centrality
25	Ding & Choi (2011)	University life scientists	Empirical (archival)		Scientists' propensity to become academic entrepreneurs or scientific advisors
26	Ding et al. (2010)	Life scientists in the U.S.	Empirical (archival)		Research productivity, authorship gain

27	Ding et al. (2013)	Life scientists in the U.S.	Empirical (archival)	C2	The likelihood that academic scientists will join corporate scientific advisory boards (SABs)
28	Elliott & Smith (2004)	White and minority respondents in Atlanta, Boston, and Los Angeles	Empirical (archival)		Workplace power and its outcomes
29	Elsesser & Peplau (2006)	30 different organizations with at least 50 employees	Empirical (qualitative, interviews)	C2	Obstacles to cross-sex friendships at work
30	Feeney & Bozeman (2008)	Managers in Illinois and Georgia	Empirical (archival)		Formation of network ties inside and outside the protégé's organization
31	Fernandez & Sosa (2005)	Applicants as customer service representative (CSR) at a call center of a large, globally diversified financial service institution	Empirical (archival)		Job gender segregation
32	Forret & Dougherty (2001)	Business school graduates from a large Midwestern state university	Empirical (questionnaires)		Involvement in networking behaviors
33	Forret & Dougherty (2004)	Business school graduates from a large Midwestern state university	Empirical (questionnaires)		Career outcomes
34	Friedman et al. (1998)	Members of the NBMBA Association (African-American employed adults)	Empirical (questionnaires)		Career chances and career optimism
35	Godwin et al. (2006)	-	Conceptual		-
36	Greenberg & Mollick (2017)	Study1: students at universities in the Northeastern U.S.; study 2: projects from Kickstarter (reward-based crowdfunding site)	Empirical (experiment, archival)	C2	Choice of reciprocal support among members of underrepresented groups (funding via crowdfunding)
37	Greguletz et al. (2019)	High-profile female leaders in large German corporations	Empirical (qualitative, interviews)		Two dimensions of structural exclusion, relating primarily to access to networks and to personal hesitation, directly influencing networking behavior, and corresponding to four themes of work–family conflict, homophily, relational morality and gendered modesty

38	Greve & Salaff (2003)	Entrepreneurs (nascent and business-owners) in Italy, Norway, Sweden, and the U.S.	Empirical (questionnaires)		Entrepreneurs' social capital (network size)
39	Grossman et al. (2012)	Early-stage entrepreneurs	Empirical (questionnaires)	C1	New ventures' initial network ties formation (perceived value of network contact)
40	Grugulis & Stoyanova (2012)	U.K. film and TV industry	Empirical (qualitative, interviews)		Exploration of advantages of social capital and exclusionary mechanisms in social networks
41	Hagan (1998)	Maya communities in Houston and Guatemala	Empirical (qualitative, ethnography)		Role of network for settlement outcomes (opportunities to become legal)
42	Han et al. (2017)	Composition of owner families of Korean chaebols	Empirical (archival, interviews)		Behaviors on the business domain of a multiplex relationship (business group market entries or exits)
43	Handy & Rowlands (2017)	New Zealand film industry	Empirical (qualitative, interviews)	C2	How team leaders experience role in relation to team building; potential team members' trustworthiness, including role of gender stereotypes in framing women as less trustworthy; how risk averse hiring strategies perpetuate discrimination
44	Harrison & Mason (2007)	U.K. business angels	Empirical (questionnaires)		Business angels' number of ventures supported and total capital flows
45	Hultin & Szulkin (1999)	Swedish citizens	Empirical (archival)		Gender wage inequality
46	Ibarra (1992)	New England advertising and public relations agency	Empirical (questionnaires)		Network structures and network returns
47	Ibarra (1993)	-	Conceptual		-
48	Ibarra (1997)	Managers in Fortune 500 firms	Empirical (interviews)		Gender differences in formation and career support networks
49	Jha & Welch (2010)	Academic scientists and engineers in research universities in the U.S.	Empirical (archival)		Multifaceted collaboration
50	Johnson et al. (2012)	Employees at a Central European bank	Empirical (archival, questionnaires)		Determinants of online and off-line social networks structures

51	Kacperczyk (2013)	Hedge fund foundings	Empirical (archival)		Transition to entrepreneurship
52	Kay & Hagan (1998)	Lawyers called to the bar in Ontario, Canada	Empirical (questionnaires)		Advancement to partnership
53	Khattab et al. (2020)	-	Conceptual		-
54	Kirchmeyer (1998)	MBA graduates of an urban university in mid-west U.S.	Empirical (questionnaires)		Career progression and success
55	Kleinbaum et al. (2013)	Large IT and electronics company	Empirical (archival)		Rate of homophilous interaction
56	Leicht & Marx (1997)	Headquarters of a top-50 U.S. bank	Empirical (questionnaires)		Gender and job referrals
57	Lerner et al. (1997)	Women entrepreneurs in Israel	Empirical (archival)		Business performance
58	Levy et al. (2015)	Publicly traded MNCs	Empirical (questionnaires)	C2	Perceived senior leadership opportunities
59	Lizardo (2006)	American adults	Empirical (archival)		Strong and weak ties network density and network size
60	Lutter (2015)	Actors in the film industry	Empirical (archival)		Gender differences in career survival
61	Lyness & Thompson (2000)	Executives at multinational financial services firm	Empirical (archival)		Gender differences in career advancement
62	Macintosh & Krush (2014)	Licensed real estate salespeople	Empirical (questionnaires)		Job satisfaction and organizational commitment
63	Manolova et al. (2007)	New venture owners in Bulgaria	Empirical (questionnaires)		Entrepreneurs' growth expectancies
64	Maranto & Griffin (2011)	Tenure track faculty at a private Midwestern U.S. university	Empirical (questionnaires)	C2	Perceptions of exclusion ('chilly climate')
65	McDonald (2011)	U.S. adults	Empirical (questionnaires)		Labor market inequality (job information, job finding assistance, number of higher status contacts)
66	McGuire (2002)	Employees at a large financial services firm	Empirical (questionnaires)		Gender inequality and employees' informal networks (receiving work-related help)

67	Mehra et al. (1998)	Second-year MBA class in the U.S. (residents only)	Empirical (questionnaires)		The tendency to choose friends similar to self in terms of race and sex, centrality in the friendship network
68	Meng (2016)	Academic scientists at U.S. research universities	Empirical (archival)		Role of boundary-spanning collaboration ties for patenting performance (involvement and productivity)
69	Merluzzi (2017)	A global management consulting and technology services company (Consult) and the Midwest region of a facilities services contractor (Midwest)	Empirical (questionnaires)	C2	The odds of citing a negative tie, the odds of citing a negative tie with a woman
70	Metz & Tharenou (2001)	Australian banks	Empirical (questionnaires)		Managerial advancement (comprises: managerial level, salary, number of subordinate staff, and total number of managerial promotions)
71	Milanov et al. (2015)	Microcredit entrepreneurs in Kenya	Empirical (questionnaires)		Gender differences in the network size-business performance relationship
72	Miller et al. (1981)	Employees at six multiagency social service delivery systems	Empirical (questionnaires)		Access to networks of inter-organizational exchange
73	Moore (1990)	U.S. adults	Empirical (archival)		Gender differences in network size and composition
74	Munch et al. (1997)	U.S. adults	Empirical (archival)		Childrearing and gender differential in personal social networks
75	Neal et al. (2022)	Legislators in the U.S. House of Representatives	Empirical (archival)		Co-sponsorship of bills (collaboration)
76	Ody-Brasier & Fernandez-Mateo (2017)	Grape growers and other players in the Champagne industry	Empirical (qualitative, interviews, archival)		Gender differences in grape price charging
77	Petersen et al. (2000)	Applicants to a U.S. high-technology company	Empirical (archival)		Role of sex, race and networks on the hiring process
78	Pezzoni et al. (2012)	French and Italian academic physicists	Empirical (archival)		Social capital and academic careers
79	Plickert et al. (2007)	Toronto (Canada) residents	Empirical (questionnaires)		Nature of reciprocal relationships
80	Reagans (2005)	R&D firm	Empirical (questionnaires)		Tie strength

81	Renzulli et al. (2000)	Entrepreneurs in the Research Triangle area of North Carolina	Empirical (questionnaires)		Social capital and likelihood of starting a business
82	Reskin & McBrier (2000)	U.S. work establishments	Empirical (archival)		Gender differential in managerial jobs
83	Roscigno et al. (2018)	German employed adults	Empirical (questionnaires)		Networks and worker outcomes (satisfaction, fairness, commitment, and effort)
84	Rubineau & Fernandez (2013)	Simulated organization	Empirical (simulation)		Job segregation by sex
85	Rubineau & Fernandez (2015)	Simulated organization	Empirical (simulation)		Job segregation by sex
86	Sanyal (2009)	Microfinance groups in India	Empirical (qualitative, interviews)		Role of economic ties for social relations and behaviors
87	Saparito et al. (2013)	Small-firm owners and their bank managers	Empirical (questionnaires)	C1	Gender and perception of banking relationships
88	Seierstad & Opsahl (2011)	Boards of Norwegian firms	Empirical (archival)		Legislation and gender equality in boards
89	Singh et al. (2010)	Global management consulting firm	Empirical (archival, interviews, questionnaires)		Information search in organizations (network distance to expert)
90	Smith (2000)	Adults in U.S. metropolitan areas	Empirical (archival)		Race, ethnic, and gender wage inequalities
91	Smith (2020)	Organized crime in Chicago	Empirical (archival)		Exogenous shocks and restructuring of power and inequality in illicit markets
92	Solano & Rooks (2018)	Ugandan entrepreneurs	Empirical (questionnaires)		Social capital and access to/request for financial resources
93	Son & Lin (2012)	Employed U.S. adults	Empirical (questionnaires)		Reaching out to high status contacts and status attainment outcomes
94	Sorenson et al. (2008)	Small family business owners	Empirical (questionnaires)		Collaborative network orientation and business performance

95	Spalter (2010)	Israeli adults over 60	Empirical (qualitative, interviews, questionnaires)	C2	New partnership and social capital
96	Steffensmeier et al. (2013)	Corporate fraud cases	Empirical (archival)		Female involvement in corporate criminal networks
97	Stoloff et al. (1999)	Households and employers in large U.S. cities	Empirical (archival)		Women network structure and employment status
98	Straits (1996)	U.S. adults	Empirical (archival)		Gender differences and workplace interaction
99	Stuart & Sorenson (2007)	-	Conceptual		-
100	Suitor & Keeton (1997)	Women students at a U.S. university and their networks	Empirical (questionnaires)		Persistence of support over time
101	Takács et al. (2018)	College students	Empirical (experiment)		Micro level discrimination in the labor market
102	Tian & Liu (2018)	Chinese adults	Empirical (archival)		Gender gap in network-based job searching
103	Trimble O'Connor (2013)	U.S. households	Empirical (questionnaires)	C2	Ability and willingness to help with a job search
104	Uzuegbunam & Uzuegbunam (2018)	Nigerian firms	Empirical (archival)		Gender differences in entrepreneurs' relational orientation in interactions with customers
105	van den Brink & Benschop (2014)	Dutch universities	Empirical (archival, qualitative, interviews)		(A theoretical framework to understand) how networking activities bring about or counter gender inequalities
106	van Emmerik (2006)	Faculty members in the Netherlands	Empirical (questionnaires)		Gender differences in creation of hard and soft social capital
107	Venkatesh et al. (2017)	Villages in rural India	Empirical (field quasi-experiment)		Initiation and success of women's entrepreneurial ventures

108	Vial et al. (2018)	Online participants, employees and their supervisors	Empirical (experiment, questionnaires)	C2	Gender differences in perception of women supervisors in the workplace
109	Westphal & Milton (2000)	U.S. companies (in the Forbes 500 index of industrial and service firms)	Empirical (archival, interviews)	C2	Director influence on strategic decision making by the board
110	Whittington (2018)	Biotech firms and their partner organizations	Empirical (archival)		Scientists' collaborative positioning, collaborator characteristics, and future productivity
111	Wu & Kane (2021)	1004 consultants in a large professional services firm	Empirical (archival)	C2	New connections, information diversity, and communication volume – as leading to increases in billable revenues
112	Ynalvez & Shrum (2011)	Agricultural scientists in the Philippines	Empirical (questionnaires)		Social capital and publication productivity

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