

연구논문

A Longitudinal Study of Sex Homophily and its Changes in a Public Organization

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〈 Abstract 〉

Homophily is “the principle that a contact between similar people occurs at a higher rate than among dissimilar people” (McPherson et al. 2001, p. 416). Using a social network perspective, this study examines the differences in sex homophily, the tendency to form their interpersonal network with those from the same sex (men to men, women to women), and their longitudinal changes in an organization. Using social network data collected longitudinally in an organization with a large infusion of newcomers, this study found that polarization of sex homophily occurs over time as men’s homophily increases while that of women’s decreases. Homophilous ties generally last longer in both men’s and women’s networks. In women’s network, their ties with other women were more likely to survive in women’s informal network, whereas they were more likely to perish in women’s formal network. The results imply that women’s patterns of interaction may change as they seek the resources and support they need during their organizational entry, while homophily among men begins soon after their organizational entry. The findings also suggest that the patterns of sex homophily in a network may be greatly determined by who controls resources in the network. Therefore, the

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changes that occur in women's sex homophily patterns may raise another barrier to women's career development and success.

[Keywords: homophily, social network analysis, career development, longitudinal network change, gender inequality]

I . Introduction

Homophily is “the principle that a contact between similar people occurs at a higher rate than among dissimilar people” (McPherson et al. 2001, p. 416). People are more attracted to others when they share the same “status” such as sex, race, and economic status, and/or “values” such as beliefs, perspectives, and norms (Lazarsfeld and Merton 1954). Status and value homophily do not necessarily overlap, but they are closely related to one another in many social settings. Individuals often believe that people of the same sex or race share similar values as well (Ibarra 1993b) and they organize their social relationships based on these ascribed similarities. For that reason, making connections with similar others benefits individuals in that such relationships often increase trust and communication between individuals and enable them to anticipate others' responses to an action or an event (Bechky 2003; Lincoln and Miller 1979).

Homophilous relationships often provide social comfort to underrepresented group members, who are often marginalized and feel intimidated in social settings dominated by disparate others (McPherson et al. 2001; Mehra et al. 1998; Mollica et al. 2003). When members of underrepresented groups cannot find similar others in their own organizational units, they often cross structural boundaries to do so, rather than associate with dissimilar others in the same unit (Ibarra 1993b). On the other hand, such relationships can limit people's social experience and further marginalize minority groups in an organization (McPherson et al. 2001; Mehra et al. 1998; Mollica et al. 2003). In an organization, organizational members—often newcomers—learn organizational values and social norms through their informal

relationships, in particular, with central actors (Choi and Yang, 2008). Such social relationships also may shape social capital for individuals and often result in critical organizational consequence including job satisfaction (Lee and Cha, 2015). Therefore, by choosing specific mentors and friends based on their gender, race, and values (i.e., those who are similarly marginalized in the organization), individuals can lose the opportunity to learn about different perspectives and benefit from social integration with dissimilar others (Bers and Smith 1991) and result in greater disadvantages in a network (Mollica et al. 2003). Their closed and reflexive network can also result in delays in obtaining important information and access to resources. Therefore, underrepresented groups' homophilous networks can exacerbate the systemic inequality of a particular group by further excluding them from the core of the network.

Women, while often not a numerical minority in an organization, may find that they cannot be part of the “old boys’ network” in a male-dominated organization, with the result that they do not receive adequate support in their career advancement to ensure success (Brass 1985; Ibarra 1992, 1993a, b, 1997; Mehra et al. 1998). For example, although women may have “official” authority equivalent to that of their male colleagues, women managers may be considered less influential than male managers are (Brass 1985).

Although gender-biased practices have substantially diminished over the last few decades, sex differences in patterns of social networks still have a differential impact on one’s career success and on the quality of their organizational life. The previous studies have generally focused on the consequences of sex homophily, but the goal of this study is to explore sex homophily with respect to when it begins and how it changes over time in an organization.

Thus, this study contributes to the study of gender and social network in several ways. First, it explores longitudinal changes in networks, a topic that has received little attention in previous network studies. Previous studies provide great insights into our understanding of homophily. They identify the existence of differential patterns of homophily among underrepresented groups in an organization and offers

possible explanations. However, they have been often criticized, since the use of cross-sectional data does not clarify causes behind the differential structure of the networks—e.g., are people attracted to similar others because they seek social comfort or they are marginalized in the network? This study aims to seek insights into the question by examining homophily patterns over time. Second, using a sample that includes a large proportion of newcomers as well as existing members, this study observes how individuals initiate relationships with strangers upon entering an organization and how the existing structure influences newcomers' formation of ties. Prior studies have used samples of existing organizational members, and this approach makes it difficult to determine how the networks actually develop (Mollica et al. 2003).

II. Literature Review

1. Sex Homophily in Organizations

A number of studies have argued that sex homophily is mainly caused by the ways society defines gender roles (Bielby and Baron 1986; Ridgeway and Smith-Lovin 1999). To be more specific, men and women learn their gender roles as they internalize them via ongoing interactions with others, and sex homophily often plays a role in reinforcing the existing gender system by providing the stereotypes of how women or men should behave in a society.

Another approach has suggested that sex homophily in an organizational setting is determined by unequal power and resource distribution between men and women in the hierarchy structure, since men are generally the dominant group and occupy higher positions and have authority to distribute resources than women do in most organizations (Bielby and Baron 1986; Brass 1985; Ibarra 1992, 1993b), and the dearth of women in positions of power and influence presents a barrier for female employees who need support for their career success in the organization as well as

the resources and information needed for their career development (Ragins and Scandura 1994).

Empirical studies conducted in organizational settings have supported the notion that sex homophily is caused by the unequal power structure (e.g., Ibarra 1992, 1993b; Kay and Hagan 1998; Louch 2000), which determines who has control over resources. This control over resources is a fundamental motive for organizational members to establish interpersonal networks with other organizational members, in particular, existing organizations members who may have better access to resources in the organization. Since men can obtain resources and social support through same-sex ties, they tend to have more homophilous relationships than women do; women build relationships with other women only for social support and friendship but must find cross-sex relationships for instrumental purposes such as getting information, resources, and advice (Ibarra 1992, 1993b). Ibarra (1992, 1993b) explains that women are often unable to obtain both friendship and task-oriented resources from a single network in an organization where men control most of the resources. As a result, women, unlike men, must develop differentiated network strategies to gain access to the resource network.

Previous literature does not clearly address how such distinctive patterns of homophily between men and women change over time. However, given that interpersonal relationships in an organization provide organizational members with various benefits such as information, social support, and resources, it is expected that both men and women would maintain or establish relationships that may provide such benefits—arguably, relationships with men who have control over resources in the organization more often than women do. Therefore, based on this notion, we can hypothesize that men will strengthen their homophilous tendency, while women will show the opposite tendency. The hypotheses are as follows:

H1-1: Men's homophily tendency increases over time.

H1-2: Women's homophily tendency decreases over time.

2. Tie Decay: Sex Homophily and Its Change Over Time

Social networks change over time (Louch 2000). In general, strong ties persist over time (Burt 1992, 2000; Granovetter 1973; Ibarra 1992, 1997); reciprocal social relationships last longer (Bala and Goyal 2000; Feri 2007), and homophilous ties persist (Burt 2000; Burt 2001; Burt 2002; Ingram and Morris 2007; Mollica et al. 2003). In addition, ties persist when they are emotionally attached (Burt 2001), and when they are socially embedded (Burt 2000; Stuart 1998). The persistence of a tie is particularly important since the duration of a tie often helps people develop trust and collaborate (Burt 2000).

A number of studies addressed that women tend to lose their social ties over time. Morgan, Carder, and Neal (1997) found that only 54% of ties among 234 recent widows in a social support organization remained after a year. Suitor and Keeton (1997) studied 42 women's social networks, but only 36.6% of previously strong ties still existed after one year, and 23.2% existed ten years later. However, these studies did not examine whether the decay rate among women was higher than that among men. Burt (2000) found that men's relationships initially perish faster than those of women, but their decay rates decrease dramatically after a certain amount of time. On the other hand, women's relationships are more stable than men's at first, but their decay rates increase quickly after a while. In particular, ties between women die faster and more frequently than do women-to-men and men-to-men ties. The strong persistence of men-to-men ties suggests that there may be a stronger homophily tendency among men. Alternatively, it could also suggest that women try on more relationships than men do and, accordingly, the decay rate is higher among women. Men, on the other hand, try on fewer relationships with other men or women but are more likely to maintain these ties in a longer term. However, the results cannot clearly clarify which one better explains the persistence of men's tie.

Theoretical arguments and empirical evidence regarding gender differences in social networks suggest that time and longitudinal change in networks may provide fruitful avenues for research in order to enhance our understanding of men's and

women's social networks in an organization. The changes in homophily patterns seem to be complex and connected to factors such as structural configuration, functional roles, sex composition, and availability of resources in an organization. Accordingly, an understanding of homophily necessitates understanding the underlying relationships between homophily and structural variables. Based on this notion, following hypotheses were proposed:

H2: Homophilous ties are more likely to survive in men's network.

H3: Homophilous ties are more likely to perish in women's network.

III. Data and Methods

1. Sample and Procedure

This study took place in the context of a cohort-wide required course for the Master of Public Administration (MPA) program of one of New York State University Campuses, United States, during the 2007–2008 academic year. The study population comprises 26 professors in the department, 4 department staff who have frequent interactions with MPA students, 1 teaching assistant (TA), and 89 students who enrolled in the course. Of the 89 students, 80 percent were in their first year of study, and the rest entered the program in 2006 or earlier.

Data were collected longitudinally through three waves. The first survey was distributed in September 2007, two weeks after the beginning of the fall semester (Wave 1). Two additional surveys were administrated in late October 2007 (Wave 2) and in May 2008 (Wave 3). Since there was an infusion of a large number of newcomers a few weeks before the first survey, it was expected that, initially, there would be active interactions among newcomers and between newcomers and extant organizational members and, as a result, a large amount of rapid formation and decay of ties during the early period. With this assumption, two surveys were administered during the first semester to capture these early changes, while only one

survey was conducted during the following spring semester. The survey was completed by 115, 108, and 90 respondents, in the first, second and third waves, respectively, and 83 participants responded to all three waves. The average age of the 83 participants was 52.5 for faculty and 26.2 for students. Possible reasons for the relatively lower response rate at the third wave include the turnover of 3 faculty members and status changes in 9 students (i.e., 1 dropout, 8 graduations) after January 2008.

2. Measures

1) Network Ties

(1) Social ties (Evermet and Everate ties)

Since a large part of the sample consists of new students, actors may not have had time to develop substantial relationships such as friendship or mentor-protégé relationships at the first wave, a few weeks after their entry. Arguably, students who have prior experience with the department for their undergraduate study would have limited chances to establish substantial relationships with new students and faculty, since the nature of faculty-student relationships is somewhat different in an undergraduate program and a professional development program. Thus, the study setting may not be proper to observe established relationships, although students can certainly find their friends and mentors by the third wave, at the end of an academic year. However, the setting offers a good opportunity to understand how initial interaction begins among strangers and when homophily begins, before individuals establish more mature relationships such as friendship (c.f. Ingram and Morris 2007). Thus, to observe the development of homophily, the study focuses on the participants' informal interactions.

This study captures two early steps in social interactions: meeting and eating together. These two activities are the most common social conventions to initiate new contacts in a social setting. More specifically, the meaning of “meeting together” may

vary, but it may represent “formal” ties. On the other hand, “eating together” may imply informal relationships. Participants were given a list of people and instructed to indicate whether they had ever met the people listed before the survey distribution date (“Evermet” hereafter). To clarify the meaning of “meeting,” the survey questionnaire provided the following definition: *“By ‘met,’ we mean have you at least been introduced to one another and had some minimal interaction. Just seeing the other person across a room would not count as ‘meeting’ unless you also had some interaction.”* The participants were also asked whether they had ever eaten lunch or dinner or had drinks with anyone on the list before the survey distribution date (“Everate” hereafter).

(2) Homophily

The proportion of homophilous ties with people of the same sex or same race to heterophilous ties with people of a different sex is greatly affected by the availability of contacts in the particular social setting (Ibarra 1992; Krackhardt 1990; Leonard et al. 2008a; McPherson et al. 2001; Mehra et al. 1998; Mollica et al. 2003). Mollica et al. (2003) suggest that racial minorities show homophily only when they can form a subgroup of reasonable size. Similarly, Ibarra (1992) reports that women in a male-dominant organization tend to have less homophilous networks partly because of the lack of opportunity. Thus, the study uses the formula described in previous studies to control for the demography of potential contacts in the network (Ibarra 1992; Krackhardt 1990; Leonard et al. 2008a; Mollica et al. 2003):

$$\frac{ad - bc}{\sqrt{(a+c)(b+d)(a+b)(c+d)}}$$

where “*a*” is the number of same-sex ties a person cited; “*b*” is the number of cross-sex ties a person cited; “*c*” is the number of same-sex ties a person could have cited but did not; and “*d*” is the number of cross-sex ties a person could have cited but did not. This index can range from -1 (perfect heterophily) to 1 (perfect homophily). Homophily scores were computed based on status (i.e., faculty vs. student) and sex.

Since sex homophily has been found to be closely related with the power structure and control over resources, it is expected that in-depth differential patterns of homophily in the network can be better understood when the homophily indices for same-status and different statuses are included.

2) Network Effects

Dynamics of network changes are complex, since the creation and decay of dyads are substantially influenced by endogenous network effects such as reciprocity and transitivity (Robins et al. 2007; Robins et al. 2006; Snijders 2001, 2002, 2005; Snijders and Duijn 2002; Van De Bunt et al. 1999). For example, reciprocity is a fundamental foundation of interpersonal—especially informal—relationships in any social setting (Wasserman and Faust 1994). Similarly, the concept of transitivity suggests that having a mutual friend increases the probability of establishing a dyad. That is, when “A” knows “B” and “B” knows “C,” “A” and “C” are more likely to know each other. Taking reciprocity and transitivity into account will lead to a deeper understanding of social relationships in a network; thus, this study includes reciprocity, mutual friends, indirect ties, distance, and degree centrality .

(1) Reciprocity

Reciprocity measures the existence of a reciprocated tie between A and B. A “1” value of reciprocity indicates that both A and B reported a tie between them, while a “0” value indicates that either A or B or neither of them reported a tie between them. *Mutual friends* measures the number of mutual friends between A and B when there is a tie between A and B (Wasserman and Faust 1994). That is, if A knows B, B knows C, and A knows C, then C is counted as one mutual friend between A and B. The reciprocity between pairs of actors is not considered in this measure. If neither A nor B reported a tie between them but they both reported a tie with C, then C is counted as an *indirect tie* between A and B (Wasserman and Faust 1994).

(2) Distance

Distance is defined as degrees of separation or, more specifically, the number of actors required for A to reach B when there is no direct tie between A and B (degrees of separation) (Ingram and Morris 2007).

(3) Degree centrality

The number of ties each actor has in the network, is a frequently used variable in studies of homophily (e.g., Ibarra 1992, 1993a, b, 1995, 1997; McPherson et al. 2001; Mehra et al. 1998; Mollica et al. 2003), since homophily is closely related with control over resources in an organization. *Tie duration* is calculated as the number of weeks the tie existed.

2) Other Variables

Structural similarities in status or experience connect people (McPherson et al. 2001); for instance, students who are enrolled in the same courses are more likely to have opportunities to interact with one another. Thus, to examine sex homophily in a social setting, it is necessary to control the impact of these structural similarities. For this reason, the first wave survey contained questions regarding demographic information such as *sex*, *age*, *status (faculty vs. student)*, *the assigned work group for the course*, and *the number of required courses the students enrolled in during the fall and spring semesters*. The survey also asked the participants to identify the *program* in which they were enrolled and whether they had been *previously affiliated with the university or the department* before they entered the graduate program.

2. Analysis

UCINET 6.1 (Borgatti et al. 2002), software specifically designed for social network analysis, was used to generate network measures such as centrality,

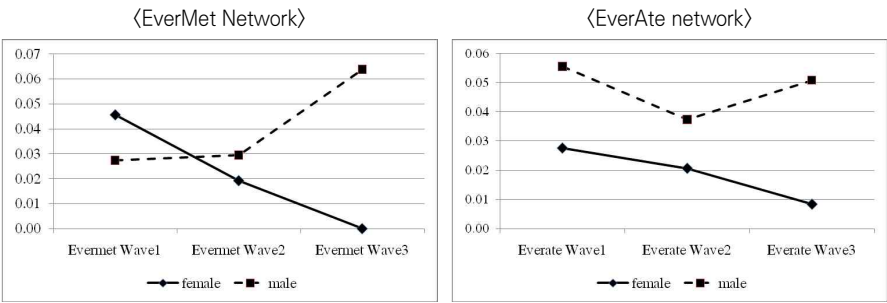
distance, and structural similarity based on sociometric data collected through the three waves. Then, STATA 12 were used to produce the dyadic and triadic data necessary to calculate a number of network measures such as *homophily* indices, *reciprocity*, *mutual friends*, *indirect ties* in triads, and *tie duration*.

The datasets were analyzed in three steps. First, a series of t-tests were conducted to determine any differences in patterns between men and women and whether sex homophily indices ($n=115$, 108 , and 90 at times 1, 2, and 3, respectively) change over time. Second, with the data from the 46 males and 37 females who responded to all three waves of surveys, a number of survival analyses were conducted to examine factors that affect tie decay in men's and women's networks. Borrowing from Burt's(2000) and Ingram and Morris's (2007) analytic framework, this study assumes that the decay rate of ties follows a hazard rate. The survival analysis estimates $r(t)$, the instantaneous risk that a tie between A and B will disappear. The unit of analysis is a dyad, a pair of individuals. The final analysis includes 6,806 observations, or 83×82 dyads from the respondents who responded to all three surveys. In deciding which model to use for the analysis, a number of different survival models (e.g., Weibull, Gompertz, and Log-nominal) and their estimates were compared with the results of cross-sectional logistic regression analyses (Blossfeld et al. 2007). The process identified a Weibull model as best for explaining the data.

IV. Results

1. Changes in Sex Homophily over Time

〈Figure 1〉 Overall Pattern of Gender Homophily in EverMet Network



From the results of t-tests, as previous studies have suggested, show that men generally have more homophilous relationships than women do (see Figure 1 and Table 1). In general, men’s homophily is higher than women’s at the second and third Waves in the Evermet network and at the first and third waves in the Everate network (Table 1). Tables 2 and 3 show the longitudinal comparisons between men and women in the EverMet network, demonstrating that men’s homophily increases at a higher rate at the second and third Waves than at the first Wave. This tendency is clearer in the EverMet than in the EverAte Network. Longitudinally, as shown in Table 2, the degree of men’s homophily does not differ ($t = -0.18, d.f.=59$) from Time 1 [$mean(M \text{ hereafter})=0.03, s.d.=0.11$] to Time 2 ($M=0.03, s.d.=0.11$), but it increases significantly ($t = -2.65, d.f.=46$) from Time 2 ($M=0.03, s.d.=0.11$) to Time 3 ($M=0.06, s.d.=0.11$). On the other hand, in overall, the decrease in women’s homophily occurs during the very early period of their organizational entry ($M=0.05, s.d.=0.09$ at Time 1; $M=0.02, s.d.=0.09$ at Time 2; $t = 2.76, d.f.=44$) but neither increases nor decreases statistically from Wave 2 to Wave 3 in their EverMet network. However, female students’ homophily continuously decreases over time ($t=2.42, d.f.=30$ from Time 1 to Time 2; $t=2.50, d.f.=26$ from Time 2 to Time 3 in Table 2).

〈Table 1〉 Cross-sectional Comparison between Male and Female Students in Homophily

Sex Homophily Indices Overall Homophily	Evermet1	Evermet2	Evermet3	Everate1	Everate2	Everate3
Women	0.03	-0.00	-0.04	0.03	0.02	-0.01
Men	0.06	0.05	0.10	0.08	0.05	0.07
<i>t</i>	-1.26	-2.65***	-5.96****	-1.67**	-1.06	-3.18****
<i>d.f.</i>	84	78	67	51	69	62

* $p < .10$; ** $p < .05$; *** $p < .01$; **** $p \leq .001$

This study explores the interaction between statuses and that interaction’s impact on homophily. Tables 2 and 3 provide comparisons between men’s and women’s homophily with people of their own status and between statuses. Men’s homophily tendency increases significantly both within and between statuses ($t=-2.29$, $d.f.=46$ within the same status; $t=-2.54$, $d.f.=46$ with different statuses) between Times2 and 3 (Table 2). The decrease in female students’ homophily tendency with faculty members appears only at Wave 3 ($t=2.50$, $d.f.=26$ in Table 2), while the decrease in their relationships with other female students is observed during earlier periods ($t=1.82$, $d.f.=24$).

These results indicate that both male and female newcomers are more likely to add new male contacts to their networks over time, which reinforces men’s homophily but weakens that of women. The slow decrease in women’s homophily relationships with other women at a higher rank might be due to women’s initially seeking to obtain both resources and social supports through their ties with other women of the higher status. Arguably, this may suggest that female students’ ties with female faculty start decaying only when the students realize that those faculty members have less control over resources in the organization. Therefore, hypotheses 1-1 and 1-2 were supported.

〈Table 2〉 Longitudinal Comparison between Men and Women

Sex Homophily Indices Overall homophily	Evermet1	Evermet2	t	d.f.	Evermet2	Evermet3	t	d.f.
Women	0.05 (0.09)	0.02 (0.10)	2.76***	44	0.02 (0.10)	0.00 (0.10)	1.54	37
Men	0.03 (0.11)	0.03 (0.11)	-0.18	59	0.03 (0.11)	0.06 (0.11)	-2.65**	46
Homophily within same status								
Women	0.06 (0.08)	0.03 (0.07)	1.92*	38	0.02 (0.07)	0.01 (0.08)	1.13	37
Men	0.02 (0.10)	0.01 (0.10)	0.93	55	0.01 (0.09)	0.03 (0.10)	-2.29**	46
Homophily with different status								
Women	0.03 (0.09)	0.01 (0.10)	1.40	43	0.00 (0.09)	-0.02 (0.09)	1.62*	36
Men	0.02 (0.08)	0.03 (0.09)	-0.96	55	0.03 (0.09)	0.06 (0.09)	-2.54**	46

* $p < .10$; ** $p < .05$; *** $p < .01$; **** $p \leq .001$

〈Table 3〉 Longitudinal Comparison between Male and Female Students

Sex Homophily Indices Overall Homophily	EverMet1	EverMet2	t	d.f.	EverMet2	EverMet3	t	d.f.
Women	0.04 (0.09)	0.00 (0.10)	2.42**	30	0.00 (0.10)	-0.04 (0.09)	2.50**	26
Men	0.06 (0.10)	0.06 (0.09)	0.30	46	0.05 (0.09)	0.09 (0.09)	-3.16***	37
Homophilous relationship with other students								
Women	0.05 (0.10)	0.01 (0.08)	1.82*	24	0.01 (0.08)	-0.02 (0.08)	2.29**	26
Men	0.05 (0.09)	0.04 (0.09)	0.81	42	0.03 (0.09)	0.06 (0.08)	-2.28**	37
Homophilous relationship with faculty								
Women	0.01 (0.07)	0.00 (0.09)	0.89	29	-0.01 (0.09)	-0.04 (0.08)	2.52**	26
Men	0.03 (0.09)	0.04 (0.09)	-0.74	42	0.03 (0.09)	0.07 (0.09)	-3.52***	37

* $p < .10$; ** $p < .05$; *** $p < .01$; **** $p \leq .001$

2. Decay of Ties

To explore factors that affect the tie decay rate over time, 6,806 dyads, pairs of individuals who responded to all three surveys, were analyzed. All dyads fall into two types of ties: *early developed or pre-existing tie* (EDT) at the time of initial measurement (Wave 1) and *slowly developed tie* (SDT) observed for the first time at Time 2. Thus, an EDT is defined as the presence of tie between an actor A and an alter B at Wave 1, i.e., when A indicates that A had prior interaction with B at Wave 1, the dyad is considered an EDT. By contrast, an SDT is defined as the absence of a tie between an actor A and an alter B at Wave 1 and the presence of a tie at Wave 2, i.e., when A states that A did not interact with B at Wave 1 but did at Wave 2, the dyad is considered an SDT.

In generating the dataset for survival analysis, one must distinguish between EDTs and SDTs to minimize errors in estimation. The persistence of homophilous ties might be influenced by transitive ties. By controlling such factors as mutual friends and indirect ties, the analysis can yield more accurate results to understand a longitudinal pattern of homophilous ties in an evolving network. Since they indicate the presence or absence of an initial relationship, the observations identified as EDTs and SDTs are mutually exclusive sets of ties; EDTs have values of “0” for *distance* and *mutual indirect ties* and SDTs have values of “0” for *the number of mutual friends* at Wave 1. For instance, while each pair of individuals identified as an SDT dyad did not know one other at Wave 1, they might share mutual indirect ties even though they are not mutual friends. In this case, if these mutually exclusive variables are analyzed in the same model, the effect of these variables will be underestimated. For this purpose, In Tables 4 and 5, models 1 and 2 report the results of EDTs, and models 3 and 4 report those of SDTs.

<Table 4> Determinants of Tie Decay in EverMet Network

Variable	Early Developed/Pre-existing Ties		Slowly Developed Ties	
	Model1	Model2	Model3	Model4
Initial EverMet balance, A and B	-1.81* (1.86)	-2.18** (2.24)	0.59* (1.90)	0.64** (2.00)
Balance, A and B at EverMet2	0.29 (0.52)	0.15 (0.26)	-0.02 (0.10)	0.01 (0.03)
Initial EverMet out-degrees A+B	-0.001 (0.04)	-0.01 (0.42)	0.02**** (7.41)	0.03**** (6.91)
Initial EverMet mutual friends, A and B	0.09*** (3.06)	0.11**** (3.18)		
Mutual friends A and B at EverMet2	-0.20**** (10.56)	-0.20**** (10.21)	-0.43**** (27.53)	-0.44**** (27.04)
Initial EverAte mutual friends, A and B	-0.04 (1.04)	-0.05 (0.98)		
Mutual friends A and B at EverAte2	-0.03 (0.70)	-0.02 (0.41)	-0.10 (1.01)	-0.12 (1.12)
Initial EverMet reciprocity, A and B	-0.22 (0.82)	-0.43 (1.51)		
Reciprocity A and B at EverMet2	-1.27**** (3.67)	-1.28**** (3.57)	-1.11**** (7.48)	-1.12**** (7.50)
Initial EverMet indirect ties, A and B			-0.002 (0.20)	-0.001 (0.11)
Initial EverAte indirect ties, A and B			-0.15** (2.04)	-0.15* (1.91)
Initial EverMet distance between A and B			-0.06 (0.85)	-0.10 (1.36)
Initial EverAte distance between A and B			0.01 (0.33)	0.01 (0.50)
A student's tie with faculty		-0.89*** (3.05)		-0.18 (1.26)
Two students		-0.82** (2.46)		-0.03 (0.23)
A faculty member's tie with student		-0.42 (0.72)		-0.20 (0.26)
Previous UA affiliation, A and B		-0.36 (1.13)		-0.04 (0.48)
Previous UA affiliation, neither A nor B		-0.02 (0.03)		-0.23 (1.52)
Previous UA affiliation, only A		-0.58 (1.31)		-0.08 (0.64)
Previous PA affiliation, A and B				0.11 (1.07)
Previous PA affiliation, neither A nor B				0.13 (1.22)
Previous PA affiliation, only A				0.10 (0.84)
Previous work experience, A and B		-0.04 (0.16)		0.17** (1.97)
Previous work experience, neither A nor B		-0.09 (0.24)		0.02 (0.20)
Previous work experience, only A		-0.26 (0.81)		0.10 (1.03)
Two women		-0.57* (1.80)		-0.15 (1.42)
Two men		-0.18 (0.68)		-0.08 (0.95)
A woman's tie with a man		-0.41 (1.40)		-0.13 (1.46)
Constant	-5.64**** (7.55)	-4.28**** (4.54)	-11.57**** (33.18)	-11.66**** (27.87)
Shape parameter (ρ)	1.73**** (6.23)	1.77**** (6.62)	3.99**** (57.10)	4.05**** (56.47)
Log likelihood	-250.06	-242.69	-651.79	-642.96

* $p < .10$; ** $p < .05$; *** $p < .01$; **** $p \leq .001$

Note: The absolute values of the z statistics are in parentheses.

〈Table 5〉 Determinants of Tie Decay in EverAte Network

	Early Developed/Preexisting Ties		Slowly Developed Ties	
	Model1	Model2	Model3	Model4
Initial EverAte balance, A and B	-0.37 (0.39)	-0.33 (0.29)	0.06 (0.21)	-0.07 (0.27)
Balance, A and B at EverAte2	1.10 (1.43)	0.61 (0.68)	-0.03 (0.08)	-0.36 (0.79)
Initial EverAte out-degree A +B	0.01 (0.75)	-0.002 (0.21)	0.02**** (4.63)	0.01* (1.89)
Initial EverAte reciprocity	-0.73*** (2.68)	-0.42 (1.45)		
Reciprocity at EverAte2	-0.55 (1.51)	-0.94** (2.43)	-1.44**** (5.63)	-1.54**** (5.81)
Initial EverAte mutual friends	0.06*** (2.92)	0.04 (1.52)		
Mutual friends at EverAte2	-0.30**** (5.65)	-0.33**** (5.12)	-0.52**** (8.56)	-0.56**** (9.04)
Initial EverMet indirect ties			-0.06**** (3.30)	-0.04** (2.44)
Initial EverAte indirect ties			0.04* (1.74)	0.03 (1.29)
Initial EverMet distance between A and B			0.59**** (5.01)	0.66**** (5.48)
Initial EverAte distance between A and B			0.05* (1.65)	0.03 (0.86)
A student's tie with a faculty member		-0.61 (0.86)		-0.29 (1.10)
Two students		-0.79 (1.42)		-0.45* (1.84)
A faculty member's tie with a student		0.27 (0.55)		0.29 (0.91)
Previous UA affiliation, A and B		-1.56*** (2.61)		-0.01 (0.06)
Previous UA affiliation, neither A nor B		-0.45 (0.38)		-0.29 (1.04)
Previous UA affiliation, only A		-1.06 (1.36)		0.02 (0.10)
Previous PA affiliation, A and B		0.92 (1.12)		-0.22 (1.27)
Previous PA affiliation, neither A nor B		1.28 (1.62)		-0.33* (1.92)
Previous PA affiliation, only A		1.41 (1.55)		-0.40** (2.20)
Previous work experience, A and B		1.27** (2.51)		0.10 (0.69)
Previous work experience, neither A nor B		1.23** (2.07)		0.41** (2.45)
Previous work experience, only A		1.26** (2.38)		0.48*** (3.13)
Two women		0.81** (2.17)		0.49*** (3.04)
Two men		0.64 (1.53)		0.50*** (3.14)
A woman's tie with a man		0.80** (2.17)		0.62**** (3.62)
Constant	-4.85**** (7.70)	-5.76**** (5.11)	-10.06**** (20.16)	-10.59**** (16.17)
Shape parameter (p)	1.27** (2.49)	1.42**** (3.66)	3.03**** (29.57)	3.34**** (30.44)
Log likelihood	-191.66	-175.36	-267.42	-242.54

* $p < .10$; ** $p < .05$; *** $p < .01$; **** $p \leq .001$

Note: The absolute values of the z statistics are in parentheses.

Broadly speaking, reciprocated ties are more likely to last longer in all networks. Independent variables in the Weibull model have a multiplicative effect, which means that the magnitude of a coefficient can be understood in terms of a multiplier

of the decay rate determined by other variables due to a change in the level of the focal variable. The coefficient in model 2 in the EverMet network indicates that reciprocated dyads are about 72 percent ($1-e^{-1.28}$) more likely to last longer than non-reciprocated ties. This is not surprising, since reciprocity is normally a fundamental condition for two people in a relationship.

The results suggest that homophilous ties are more likely to survive in both men's (Hypothesis 2 was supported) and women's network over time (Hypothesis 3 was not supported). Regarding hypothesis 3, the results show a mixed findings. In the EverMet network, women's homophilous ties developed in the first few weeks (i.e., EDTs) are the most likely to survive; for example, they are 43 percent ($1-e^{-0.57}$; see *two women* in model 2, Table 4) more likely to survive than a man's tie with a woman is. In the EverAte network, when actors develop their EverAte ties slowly (i.e., SDTs), homophilous ties—*two women* and *two men*—are more likely to survive than are women's ties with men. (See *coefficients* in Table 6, 0.49 or 0.50 versus 0.62 in model 4, EverAte). However, women's homophilous ties developed after the first measurement (i.e., SDTs) did not show this persistence in the EverMet network, and their EDTs with other women and men are 125 percent ($1-e^{0.81}$) and 123 percent ($1-e^{0.80}$), respectively, more likely to decay than the ties in the base group (i.e., a man's tie with a woman). Therefore, homophilous ties are more likely to survive in women's informal network (i.e., EverAte network), while they are less likely to survive in women's formal network (i.e., EverMet network).

These mixed results offer interesting insights. First, women might have different development curves in the EverMet and EverAte networks: for example, women might develop persistent relationships with other women more easily and quickly during the first few weeks in a more informational and formal network (e.g., the EverMet network), whereas they need more time to build such relationships in a more informal network (e.g., EverAte network). That is, they maintain informal and persistent relationships more effectively when they spend more time selecting ties, especially ties with other women. Perhaps women might go through more careful filtering to choose their informal and close friends among other women and seek to

maintain informal and long-term relationships with other women only when they confirm their identity.

Second, this pattern might be due partly to women's EDTs resulting in less rewarding and lower utility than those of men. If so, this cause could define the critical difference. Newcomers' EDTs lay the foundation of their network expansion and are the core of their network. The fact that women's early ties decay more quickly than men's may mean that women face a barrier in building their own social capital, while both men and women pick up these early ties based on distinct characteristics(e.g., sex) during the first few weeks. In men's cases, they maintain these patterns, but women cannot because such relationship patterns do not bring the resources they need to be successful in the organization. As a result, women drop many of their early ties within a few weeks of their organizational entry.

V. Discussion

The findings suggest that homophily among men begins very early after their entry into an organization, and the ties developed during the first few weeks become the basis of their network expansion and so are more likely to survive than other ties. Moreover, sex homophily tends to polarize over time; that of men increases, while that of women decreases. Women's homophily with people of higher status diminishes more slowly than it does with women of the same status, since females of higher rank can provide resources as well as social support. The results suggest that professional networks can be strongly motivated by the resources transferred through these ties. This finding confirms Ibarra's(1992, 1993b, 1997) argument that women seek instrumental ties with men in order not to be excluded from the access to resources.

1. Theoretical Implications

This study contributes to an understanding of the factors affecting pattern of sex homophily in an organization. One's interpersonal relationships are formed by various factors such as social needs and structural factors. Cross-sectional studies on this topic are often criticized because of the ambiguity in causality. The findings of this study demonstrate that the decay in female students' homophilous relationships with female faculty members occurs more slowly than the decay in their ties with other female students. This finding supports that polarization of sex homophily is reinforced by one's resource-seeking behavior than by the type of gender role system, which further suggests that gender inequality in an organization goes far beyond gender composition of an organization and is closely associated with control over resources.

Second, the homophily patterns that emerged in the study add insights into the controversy over the persistence of homophily over time. Ibarra (1995) and Mollica et al. (2003) presented conflicting findings in this area, but the current study found that homophily patterns were generally stabilized between the first two waves, and then changed dramatically at Wave 3. In that sense, both Ibarra's (1995) and Mollica et al.'s (2003) arguments might be right, and the persistence pattern might simply depend on the timing of measurements. A number of previous studies were conducted within very short-term intervals (e.g., from three weeks to six months), suggesting that the different results might be caused by the lengths of the intervals.

Third, this study highlights the critical role of ties developed at a very early stage after newcomers' entry into an organizational. EDTs are the foundation of individuals' network expansion; the mutual ties are developed via these initial ties. Since the role of EDTs has not been tested in social network studies, this finding is a unique contribution to social network studies. In particular, an examination of the role of EDTs may explain why the different patterns in homophily create an entry barrier for women and racial minorities. In forming their networks, men are less likely to experience an internal conflict in their selection, assimilation or

socialization(Popp et al. 2008), and getting resources(e.g., Ibarra, 1992, 1993b, 1997), since their network may be multiplex and confirm their identities and bring them resources at the same time; as a result, men can expand their networks through EDTs without substantial modification of their identities. On the other hand, women and racial minority groups, who need to diversify their network into instrumental and social support networks, might face substantial conflict with their identities since instrumental ties might involve an assimilation process that implies changes in their identities. At the same time, changes in women's identities can create obstacles to their ability to maintain their social support ties. For these reasons, they might need to change their pattern of relationships in their networks, and these changes might explain the changes in women's sex homophily pattern we saw after the first Wave in this study.

2. Practical Implications

From a managerial perspective, the results suggest that organizations should recognize the different patterns of social networks that might lead to differences in opportunities for men vs. women in the organization. To prevent sex segregation, organizations need to provide focused activities for new organizational members in which both men and women can share. The patterns of social ties are organized in a focused organization(e.g., school, work) where actors spend a great portion of their time and share their activities(Feld 1981). In this study, cross-sex ties were actively formed in required courses or work groups. Considering how critical the first few weeks following arrival are for newcomers' formation of ties, an organization should provide focused social activities to integrate new organizational members during the early period of their socialization (e.g., orientation activities, a short-term training program, welcoming parties).

More importantly, structural configuration could play an important role in creating opportunities for each sex; therefore, organizations should consider this factor when they design work teams, assign team members to tasks, and plan career

development for their employees. In addition, organizations might consider providing appropriate mentors to women to help them overcome their specific challenges and concerns as women in a male-dominant work environment.

3. Limitations and Future Research

This study has several limitations. First, the measures for network ties are based on respondents' indications of whether they have met or eaten with other individuals on the list. Due to the nature of the measures, the estimates for tie decay rates might be underestimated. That is, A might have indicated B as an alter, even if there was no substantial interaction between A and B since the last measurement. Although the review of data shows a substantial reduction in ties between the measurements such that most participants in this study indicated alters only when they had substantial interactions, this does not guarantee the robustness of estimates and might not capture possible changes in the nature of a tie (e.g., from friends to enemies). The issue could be an issue if there is systematic gender bias in remembering ties such that a female actor A might remember having an interaction with male actor B, but B might not remember it the interaction—or vice versa. However, this bias might exist in all gender-related studies.

Second, since the study took place in an academic setting, the results might not be generalizable to work settings. Nevertheless, because this study examined fundamental principles in human behavior in an organizational setting, its findings of this study should not be bounded in a specific setting, such as an academic setting. In fact, the nature of the network studied here is very similar to work settings in that students, as the newcomers in a work setting, also need to find mentors, information, resources, and social supports during their socialization period in order to adjust to an unfamiliar environment and eventually to be more successful in the organization. In addition, the students in a professional development program are trained to seek out information and resources, such as information about job postings, other organizations where they might apply for a job, recommendation

letters, grants for student internships, and so forth. In that regard, the content that the student network conveys is very similar to those of a work network.

Third, this study examines the initial interaction patterns during a socialization period. While the interactions capture the actual activities done by the participants, they do not precisely indicate what contents are delivered through these activities and whether there are gender differences in the content. For instance, it is generally known that social ties provide privileged information, promotion opportunities, and job mobility (Burt 1992; Granovetter 1973; Ibarra 1992; Morrison 1993, 2002; Podolny and Baron 1997) and that social ties can be used as source of learning through role models (Ibarra et al. 2005; Morrison 2002). However, this study does not clarify the nature of EverMet and EverAte interactions, as some actors might use the interaction as a useful opportunity to learn about the organization or job market, while others might pursue social support from a tie. In that regard, this study does not explain how more mature relationships, such as friendship or mentorship in an organization, are related to these interaction patterns. It is fair to assume that interactions such as meeting and eating together and relationships such as friendship might be on a continuum of the same dimension. It is also possible, however, that those relationships do not share any commonality, so future research might examine the relationship between initial interactions and mature relationships over time.

The findings of this study also provide other suggestions for future research. First, the findings raise an interesting question with respect to why a homophily tendency is stabilized during the early period during newcomers' organizational entry. This study cannot answer the question with its current data, so future research could investigate the unique pattern of homophily during this period. Second, future research might further investigate the relationship between EDTs and mutual ties in maintaining and expanding a social network.

4. Conclusion

The findings of this study allow us to connect different approaches to sex homophily in an organization; sex homophily may be strongly motivated by resources transferred by social ties and at the same time, it is a complex process involving individuals' social needs and identities, and the structural factors of a particular social setting. Homophily patterns that emerged in the study suggest that the initial selections of homophilous ties constitute the core of individuals' interpersonal relationships, which is the foundation of a transitive and multiplex network. In that regard, sex homophily is deeply related to both resource dependence and to individual identity; women might face challenges in maintaining two different networks without modifying their identities, and doing so might lead to a pattern shift (i.e., from women to men) in women's selection of partners when they are unsuccessful at maintaining both networks. The shift in choice might also be a reason for women's dissatisfaction with their ability to meet their social needs as well as their career goals. Thus, this study highlights the important role of an organization's proactive intervention in improving both men's and women's organizational lives according to their differential needs and suggests the importance of an organization's configuring its structure to integrate men and women into the organization more effectively.

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