Do Connections Always Help?
Network Brokerage's Negative Impact on the Emergence of Status

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ABSTRACT

This paper explores the contingent role that social ties play in the emergence of status hierarchies. We argue that, while status is formed based on actors' perception and understanding of social cues, network structure and position influence this process by influencing the attention and legitimacy given to the focal actor in accordance with social cues that signal an actor's identity. Using a large data set from an open-source software development community, we find that a broker linking diverse network members is less likely to receive status ratings from others and that the rating is more likely to be low when a broker receives a rating. Furthermore, we find evidence that the effects of brokerage are contingent upon certain factors that may affect the attention and legitimacy given to actors in the process of status evaluation, such as the actor's prior status. An actor's prior status was found to weaken the negative effect of brokerage. The importance of this study for theories of status, social networks, and attention is discussed.

Key Words: Status; Emergence; Attention; Network Brokerage; Identity.

Status can be understood as the prestige which accrues to an actor due to the actor's position in a hierarchical social order (Gould, 2002; Podolny, 2005). Status can be independent of, or only loosely linked to an actor's true quality or observed performance (Benjamin & Podolny, 1999; Gould, 2002; Podolny, 2005). One important feature of status in that status can be transferred "…through association and through relations that involve either exchange or deference" (Podolny 2005, p14). According to the literature on status dynamics, individuals and organizations can gain status through associations with high status actors, or lose their status if they are associated with low status others (Podolny, 1993; Podolny & Phillips, 1996). The importance of status in individual and organizational behavior and performance has been very well documented in organizational studies. High status has been found to be beneficial to a firm's performance in terms of profitability and revenue (Benjamin & Podolny, 1999; Podolny, 1993; Shapiro, 1983; Sullivan, 1998).

Given the primary importance of status, social scientists have often investigated which factors affect the emergence of status hierarchies. While economists often suggest that the emergence of social rankings, such as reputation (Fombrun, 1996; Washington & Zajac, 2005), serves the purpose of achieving efficiency and increasing returns (Klein & Leffler, 1981; Williamson, 1985), sociologists view status as a system of social construction. Status can be derived from others' subjective evaluation of an actor (Blau, 1964), or a result of legitimization (Rao, 1994). The emergence of status has an institutional logic (Zhou, 2005) which assumes that there are fundamental institutional norms that both differentiate and legitimize different groups with different levels of status. Using a network approach, other scholars have suggested that the emergence of status is a reflection of individual or organizational connections (Bonacich, 1972; Podolny, 1993, 1994).

There are at least two gaps in the current studies of status emergence in organizations. First, from a social constructive perspective, the manner by which actors perceive and evaluate each other has often been left in a black box. Examinations of dyadic inter-subjective evaluations of actor's status are extremely rare (see Stewart, 2005 as an exception). Without such investigations, specific inter-actor dynamics of status emergence are not clearly revealed. Second, while scholars using a network approach

have suggested that status can be reflected in the nature of how individuals or organizations connect to each other (Bonacich, 1972; Podolny, 1993, 1994), the direct link between the role of network brokerage and status emergence is less clear.

An actor is in a brokerage position if that actor links two actors who otherwise are not connected (Burt, 1980, 1992; Galaskiewicz, 1979; Marsden, 1982; Gould & Fernandez, 1989). Most studies of brokers have emphasized how brokers act as mediators that facilitate different kinds of transactions, thus enabling those actors to gain financial or other performance benefits (Burt, 1992; Burt, 2004; Marsden, 1982; Podolny, 2001). Although the positive performance consequences of an actor's brokerage position are evident, the status consequences of brokerage remain unclear. On one hand, studies (e.g. Burt, 2002) reveal that with more structural holes, an employee may generate more positive feedback from colleagues; on the other hand, research has shown that closed networks, or cohesive networks, are more conducive to status building because of the social control mechanisms linking cohesive network ties (Coleman, 1988, 1990). This argument suggests that performance benefits generated from brokerage positions do not necessarily transfer into status gains.

Not only are there inconsistent arguments about the relationship between brokerage roles and status, there is also a lack of direct empirical investigation of the impact of brokerage on status. In this study, we seek to explain the role of social networks in the process of status emergence by exploring inter-actor status evaluation and status building. We argue that, while the emergence of status is socially constructed, network structures and positions can influence this process by influencing the attention and legitimacy given to actors through the perception and interpretation of social cues that signal an actor's identity.

We concur that the effect of brokerage on an actor's status emergence is likely to be context specific. Since prior studies have mostly focused on well-structured and relatively small organizations where performance-based evaluations are often hard to distinguish from socially-constructed status evaluations, the full role of brokerage in status formation can be hard to determine. In this study, we contend that the allocation of attention plays an important role in the process of status evaluation and thus

the emergence of status. We suggest that in a large organizational setting where uncertainty is high: 1) whether actors evaluate others is affected by where the evaluating actor's attention resides, 2) social cues and signals are important attention stimuli for actors to evaluate others, and 3) a focal actor's received status rating reflects how others' perceive the nature of the focal actor's identity, as signaled by ego's brokerage position. These dynamics are driven by the possibility that a larger, loosely connected organization is likely to be filled with actors who may not be familiar with each other's real quality.

In terms of defining one's identity, there is an emerging consensus in recent literature that identity involves not only a focal actor's self-definition, but also an audience's expectations of what the focal actor's identity should be (Stone 1981; Zuckerman & Kim 2003). In a broad sense, identity can be understood as a set of default social codes, rules or features that an audience expects the focal actor to have (Pólos et al., 2002; Hsu and Hannan, 2005; Hannan, et al. 2007). Studies have suggested organizational forms (Pólos et al., 2002; Hsu & Hannan, 2005), employment relationships (Baron, 2004), and loose sets of skills or expertise (Zuckerman et al., 2003) as representing specific kinds of identity. Consistent with prior research on identity, in our study, we refer to identity as the default perceptions, beliefs and expectations that the audience has for an actor based on their judgment about the group and competency categories to which the actor should belong. We argue that an actor's brokerage position sends signals regarding an actor's identity. To carefully examine the role of brokerage position in the process of status emergence, we specifically ask the following questions: (1) How does brokerage affect the attention of alters as they issue evaluations to ego? (2) How does brokerage influence the level of an ego's received status evaluations? To further support our main hypothesis, we examine whether this brokerage effect is contingent on other factors that may affect alters' attention allocation.

By examining the effects of an actor's network position on received status evaluations, we contribute to the literature on status emergence and networks in at least two respects. First, while the importance of attention allocation in decision-making is well documented in prior organization studies (Simon, 1957; March & Simon, 1958; Cyert & March, 1963; Ocasio, 1997; Weick & Sutcliffe, 2006), there has not been a sufficient examination of the role of attention in the status emergence process. By

linking attention allocation to identity and status evaluation, we reveal an important yet overlooked aspect in the emergence of status. Building on prior statements that identity affects audience attention in market and employment settings (Zuckerman, 1999, 2000), we suggest that identity also influences status emergence by influencing the attention allocation process inherent in inter-actor ratings.

Second, in the existing literature on social networks, status is often measured by determining an actor's centrality within a network of connections (i.e. Bonacich centrality) with the implicit assumption that central players in a network can gain a higher degree of status among peers (Jensen, 2003; Podolny, 1996, 2001). Few studies have directly examined how specific network positions lead to advantage or disadvantage for status evaluation. By using a social network setting to directly analyze the mechanisms underlying the dynamics of status evaluations, this study furthers our understanding of how relational structures can be transformed into public perception of an actor's quality.

Third, few studies have paid enough attention to the idea that the effect of an actor's network on his status can be contingent on factors that are linked with the actor's identity. For instance, while it is well noted in the literature that an actor's status is an effective signal for that actor's unobserved quality (Podolny, 1993) and that status itself signals certain dimensions of an actor's identity, few have examined the relationship between an actor's status and the threat of identity dilution. By doing so, this study contributes directly to the emerging areas of identity and status in the field of organization studies (Zuckerman et al., 2003; Polos et al., 2002; Hsu & Hannan, 2005).

This paper is structured as follows. We first review the literature on status as a socially constructed process. We then examine the role of networks in the emergence of an actor's status and develop hypotheses about the effects of brokerage on an actor's status and the moderation of this effect by contingent factors. Finally, we present an empirical study of status emergence in a large open-source software development community. We conclude by considering the implications of those results on existing theories of status and networks.

THEORIES AND HYPOTHESES

The establishment of status implies placement within a differential and hierarchical social order

(Berger, Conner & Fisek, 1974; Zhou, 2005). Therefore, the perception of an actor's quality on a salient trait is essential in the emergence of an actor's status. There are also institutional forces that legitimize the status ordering, in a sense that there is a general acceptance of which traits lead certain groups to have a high status (Zhou, 2005). The selected status-bearing traits can be organization-specific and are maintained by group boundaries (Bianchi, King, and Stewart, 2012). The effect is that, over time, a stabilized status ordering can emerge.

Social ordering may also be closely tied to firm performance (Fombrun, 1996; Washington & Zajac, 2005). To explain the emergence of social order, economists emphasize the merits or quality of an actor. In this approach, an actor's reputation is established because of the actor's actual actions and quality and because of the actor's expectations of positive returns from having a good reputation. For instance, a borrower from a bank obtains a good reputation if it has a good history of keeping the contract terms with a bank (Dinc, 2000). Or, a bank with credit history obtains a higher reputation than those without such a history (Gorton, 1996). In other words, a good standing within the domain of valued qualities leads to the attainment of better reputation. This approach suggests that status, or any social ordering, is indicative of real quality and performance. As such, it is the dispositional characteristics of actors and their individual efforts which help them to gain high ranking in the social order (Bromberg & Fine, 2002; Ducharme & Fine, 1995).

Departing from this rational view of status emergence, many sociologists and organization scholars emphasize social constructive processes that shape an actor's status. Status is understood to be a positional construct that can be independent of a firm's real quality or only loosely linked to an actor's merits or quality (Gould, 2001; Podolny, 2005; Washington & Zajac, 2005). Nonetheless, it is often used as a signal for others to infer an actor's potential quality, which is often difficult to observe directly in a complex environment (Podolny, 1993).

In the sociology literature, there are at least two related, yet different, perspectives addressing the emergence of status. The first perspective focuses on the social and institutional forces that generate a socially constructed status ranking. This perspective holds that the formation of status is fundamentally

based on how actors perceive social and institutional cues regarding an actor's quality. Rao (1994) argued that status is a product of legitimization. Zhou (2005) further argued that prestige building is a dual process of differentiation and incorporation (legitimization). Status orders emerge first because of differentiated behavior and performance by actors, but also because they are interpreted in such a way that the perception of performance becomes shared by members of the same community. An actor's status becomes increasingly stable as the actor establishes a set of institutionalized expectations regarding his performance. It is possible, then, that this social construction process can lead to a decoupling between perceived and actual quality.

A second sociological perspective on the emergence of status emphasizes structural forces that shape an actor's status. While this approach also stresses that an actor's true quality is often difficult to observe, thus making the role of audience interpretation paramount to status judgments, the structural approach differs from an institutional perspective by suggesting the information inferred from the patterns and outcomes that emerge from positional and social relations between actors becomes essential in determining the status ordering among the actors (Leifer & White, 1987; White, 1981). An actor with the right connections (connections that help the actor to attain high recognition within the group) will be perceived as one who is able to produce high quality products and that actor will be rewarded correspondingly (Lin, 1982; Podolny, 1993; 2001). Social connections and personal characteristics of those from whom an actor receives status ratings become salient determinants of consensus regarding an actor's future status (Sullivan and Stewart, 2011).

Building on the social constructivist perspective, in this paper we argue that, while the emergence of status is based on inter-actor subjective evaluations, social networks provide cues to an evaluator about multiple dimensions of a judged actor, while also influencing the attention focus of the evaluator. Our theoretical propositions will be examined with inter-actor status evaluations at a dyadic level to capture the person-to-person status evaluations. This approach not only gives us the ability to control for certain social processes that are linked to characteristics of the actors involved in the ranking process, it also gives us a chance to control for the quality of the focal actor in order to reveal the social constructive

nature of status formation. In the following section, we begin by describing the context in which we will be examining our research questions.

Research Context: Advogato.org

Advogato.org is an online organization of individuals who are involved in developing open-source software. The goal of the open source software community is to preserve the freedom to run, copy, distribute, study, change, and improve software (Stallman, 1999; Axelrod & Cohen, 1999). Founded in 1999, the website Advogato.org serves as a virtual meeting place for developers of open source software. Developers join the community voluntarily and create online user accounts that they can use to post publicly viewable blogs, share source code, and participate in public forums related to open source software development and other areas of general interest. There is no special requirement to create an Advogato account. Anyone interested in participating or observing the activity within the community is welcome to join simply by filling out an online form to create a unique user identity.

For this study, an essential aspect of Advogato is its use of a system of peer certifications whereby any member of the community can provide a publicly displayed evaluation of the status of any other community member. Having high status can be important for those who want to make key contributions to open source software projects (Raymond, 1999; Mockus et al., 2000). Peer certificates are used as the basis of a tiered status ordering consisting of four categories: masters (high status software developer), journeyers (high-middle status software developer), apprentices (low-middle status software developer), and observers (low-status member). The published criteria for defining a user's status revolve around that user's skill and dedication to the free software community, with an emphasis on how influential a user's contributions have been to the development of open source software projects. Once a user gives a certificate, it appears on the pages of both rater and the receiver. For a more specific definition of the published guidelines used to define each level, see Appendix A.

Once peer certificates are received, each certificate is weighted by the status of the sender and then combined with all other certificates received in order to calculate a publicly displayed status rank that corresponds with the overall level of certificates that the member has acquired. Thus, all status

ratings given and received, as well as each member's overall status rank, are publicly visible to all other members. For a more complete description of the metric used to determine a member's Advogato rank, see Appendix B.

Certifications were designed as a way to confirm whether or not an Advogato member is a legitimate member of the open-source software community (Levien, 2004). Therefore, each new user is, by default, given the low status of "observer". The only way in which a member can gain a status beyond "observer" is to be recognized as such by another Advogato member who already holds a status higher than "observer". In other words, a new "observer" must be given a rating of "apprentice" or higher by at least one person who is already ranked as being an "apprentice" or higher. This system of trusted certification protects the integrity of the system by deterring attempts at status mobility by the use of invalid accounts and fake status certifications.

A second major part of the Advogato community is the use of "project" pages, which users can create to describe their participation in a specific open source software project. A project page typically contains information on the name of the project, its web address, notes describing the project, a list of which Advogato users participate in the project and their roles in the project. Once a user is listed as being a project participant, a line is added to his personal page stating which project the user is involved with and what his self-assigned role is within the project. Since actors build connections to one another through different projects, we use the project data to construct our network brokerage measure.

During the time of this study, the Advogato community had over 5000 members who were working on approximately 1100 unique projects. Due to the size of the community, it seems unlikely that any individual member would be familiar with all of the other community members. As such, members may not know each others' work very well and, therefore, status ratings between community members may be affected by social processes.

Hypotheses: Status and Network Brokerage

Previous studies of social networks suggest that there is a tension between the benefits of network expansion (beyond an actor's existing group boundaries) and network exclusion (which confines the actor

to only certain groups of others) (Podolny, 2001). A series of work has shown that extensive network connections can give a focal actor information benefits and, consequently, that actor may incur performance advantages. The information benefits of networks have been well documented in the pursuit of jobs (Granovetter, 1974), creativity (Burt, 2004), organizational learning (Powell, 1990; Uzzi, 1997), and the diffusion of organizational practices (Davis, 1991; Davis & Greve, 1997).

Brokerage has been shown to be particularly influential in terms of acquiring unique information from different groups (Burt 1980, 1992, 2004; Galaskiewicz, 1979; Marsden, 1982; Gould & Fernandez, 1989). Actors in a brokerage position, a position which links individuals or groups that would otherwise not be linked, are most likely to maximize the information benefits derived from network ties (Burt, 1992, 2004). A structural hole, defined as "a relationship of non-redundancy between two contacts" (Burt, 1992, p.18), indicates the degree of brokerage opportunities available to an actor (Burt, 2004). Studies have shown that brokerage positions (positions with more structural holes) lead to earlier promotions for managers (Burt, 1992, 1995, 1997a; Podolny and Baron, 1997), more successful deals in commercial banking (Mizruchi & Sterns, 2000), faster solutions (Hansen, 1999), and higher bonus compensation to investors (Burt, 2000). The impact of brokerage on an actor's status, however, is less clear. Burt (2000) showed that an investor with more structural holes is more likely to be evaluated as having a productive working relationship with the evaluating peer. Still, the particular dimension being measured in Burt's study does not necessarily indicate the presence of a clear status ordering among actors, especially if we think of status as being independent of (or only loosely linked to) an actor's performance.

While most of the research on brokerage focuses on its information benefits, we contend that in an environment where structural features are clear but the quality of actors is hard to observe and highly ambiguous (i.e. the scope conditions suggested by Zuckerman, 1999), the role of brokerage positions comes to be characterized by its signaling effect. Specifically, we argue that third parties will make inferences about the identity of a focal actor (ego) based on ego's is connections to different groups. In an environment where the performance of actors is difficult to observe and highly uncertain, scholars have argued that actors tend to use observable network connections to infer the quality of actors, and thus the

status rating received by ego simply reflects the perception of quality based ego's position in relation to other actors (Leifer & White, 1987; White, 1981; Podolny, 1993). It has also been argued that the properties of networks which are good for the establishment of identity are different from the properties which are conducive for information transfer (Podolny & Baron, 1997).

We propose that an actor's brokerage position can negatively affect the focus of the actor's identity, leading to diluted attention from alters and lower status ratings. Since the identity of social actors is shaped by pre-existing social and cognitive categories, identities differ in their focus, as indicated by audience perceptions of the degree of category spanning by an actor (Baron, 2004). The identity of a social actor is more focused if the actor constrains his activity in fewer categories (Zuckerman, 1999, 2000; Baron, 2004). In our specific context, the identity that is important to others is not the identity as a "broker" per se, since observers who see an actor connecting to different project groups do not necessarily view the actor as a typical broker (one who bridges groups and has information benefits). Rather, what they observe is simply that the particular actor is connected to different project groups. Consistent to the definition of identity used by Pólos et al. (2002) and similar to the understanding of identity in Zucker et al. (2003), one important factor that affects an actor's identity in our study context is how the audience perceives an actor's standing in particular programming groups, which is loosely associated with an actor's skill set. For instance, if an actor is linked to a project that fits into the audience-defined category of "database management", that actor is likely to be perceived as belonging to the social group "database management programmers" and should be perceived as having corresponding competencies.

There could be two related mechanisms that link brokerage to a less focused identity. First, prior studies have pointed out that expansion of relationships into multiple groups can confuse an actor's identity (Podolny, 1994; Podolny & Philips, 1996), especially if expansion into non-focal groups violates previously-held expectations about how an actor should act in a focal group or category (Zuckerman, 1999). When others see an actor expand his/her network ties into different groups, especially groups with distinctive differences in institutional boundaries or technical focus, others can become less clear about the actor's core identity.

Second, the negative impact of brokerage on identity can also be understood in terms of the principle of allocation (Hannan et al., 2007). According to the principle of allocation (Hannan & Freeman, 1989), there is a trade-off between resource investment in a single, specialized target and diverse set of targets. Since it takes time and effort to develop a membership in any particular group, if an actor invests in multiple groups, the actor is likely to invest less time and effort in each of the groups. Consequently, for an actor with a diverse set of memberships in different groups, the strength of membership in any particular group will be weakened and the distinctiveness of an actor's identity may be negatively affected (Hannan et al., 2007).

The negative correlation between brokerage and identity has also been suggested in empirical research (Tang, Sullivan & Kuilman, 2009). Because a less focused identity leads to a lack of attention from an evaluating audience (Zuckerman, 1999, 2000), brokerage positions will have the following impact on status evaluation. In a setting where actors can freely choose whom to evaluate, the first step in the process of status evaluation is the actual decision whether to rate a particular actor. Prior research in performance evaluation suggests that evaluators experience different cognitive emotions in the evaluation process, with attention from the evaluator as the first step (Mitchell, 1983). Without significant attention from evaluators, ego is not likely to receive any ratings from alters. In our particular context, the receipt of an evaluation is an important step to being noticed by others. It is a necessary step for an actor to establish status in the community. Actors who broker positions (and thus have a less focused identity) may become less salient to within-group alters (in other words, they become less likely to gain the attention of evaluators) and, therefore, are less likely to be evaluated.

Due to a lack of distinctive identity, a broker is not only less likely to attract attention for status evaluation, but brokerage may also create negative reactions from the audience if a less focused identity leads the audience to have a less clear and consistent perception of the focal actor's image (Lounsbury & Rao, 2004; Hsu, 2006a) and also because a less focused identity tends to have a lower degree of cognitive legitimacy due to lack of a well-structured meaning system that is consistent to the believing system held by a core audience (Baron, 2004; Hannan et al., 2007). This negative reaction from the audience will

ensure the actors with brokerage positions to receive lower status evaluations.

As brokerage roles are often expressed by brokerage opportunities (or structural holes) (Burt, 2000, 2004), indicating the degree to which an actor connects to different and diversified groups, it is a logical extension for us to hypothesize that structural holes can negatively affect the status ratings received by ego. As argued by Burt (1992), not only does an actor in a networked position attain information benefits in terms of access and timing, but information about that actor also spreads more effectively to others because of the legitimacy of referrals generated from network ties. With increasingly effective diffusion of information about the actor, it becomes less of a problem for others to see the actor's connections and to make corresponding inferences about the identity of the actor. Therefore, we have the following hypotheses:

Hypothesis 1 (H1): An actor with more brokerage opportunities will be less likely to receive status evaluations.

Hypothesis 2 (H2): An actor with more brokerage opportunities will receive lower status evaluations.

To further support our theoretical arguments, we explore whether other factors affecting the perception of the focal actor's identity can moderate the effect hypothesized above. If the driving force for the negative impact of brokerage is the lack of a focused identity affecting attention and perceived legitimacy, we should observe that the strength of the effect will be contingent on factors that influence identity. One factor we focus on in this paper is a focal actor's prior established status, since an actor's established status is an important and highly visible trait.

The effect of brokerage opportunities might vary for actors of different established statuses. While a strong identity may not ensure a high status, high status actors are likely to have a well established and positive identity in their focal domain (Tajfel & Turner, 1986). For instance, a well-established scholar is likely to be well known for his or her expertise in a particular area. The chance of being rated might be higher due to increased visibility and attention resulting from higher status. Second, this well-established and pre-existing identity for the high-status actor can alleviate a certain amount of

the tension caused by extensive connections to different groups since, for high status actors, an established status by itself can be a sufficiently strong signal to others about their identity and quality. For a low status actor, the lack of a positive identity within a particular default category certainly does not help to ease, and perhaps worsens, the negative impact of brokerage across categories. As a result, the negative effect of brokerage on status evaluation might be weaker for an actor of higher status. Prior research has also suggested that once an actor is well established in a community, that actor is much less affected by the instrumental use of network connections (Faulkner, 1983).

Hypothesis 3 (H3): The negative effect of brokerage on receiving status evaluations is weaker for a focal actor of higher prior status.

Hypothesis 4 (H4): The negative effect of brokerage on the level of status ratings is weaker for a focal actor of higher prior status.

Method

Data

We test our hypotheses in the context of an emerging organization of computer software programmers, Advogato.org. The data was analyzed in a series of panels provided to the authors by the founder and administrator of the Advogato web site. The site administrator provided 13 discrete panels, which were received in the form of .xml snapshots of the web site, taken at approximately one-month intervals. Each panel included an .xml file for every page that existed on the site at the time of the panel, so the data are inclusive of each member of the community, each status certificate given and received, and each project that existed at that time.

In order to fully capture inter-actor rating information, we chose to analyze the data at the level of each member-to-member dyad. Thus, the panel data was reconstructed by creating unique observations for each i-to-j (ego-to-alter) dyad combination that was possible as of time t. In other words, if both ego and alter had joined the community on or before the date of a given panel, a unique i-to-j observation was inserted into the data set for that panel.

For each dyad, a starting time was given as the date upon which the latest member (ego or alter)

joined the community. For each dyad, covariates were updated and a new observation was added in each subsequent panel. Due to capacity limitations in computing technology available at the time of the analysis, we drew a random sample from the total number of 43 million dyadic observations that were available and removed observations in which there was no new or changing data from t_0 to t_1. After drawing samples of different sizes, it was found that a sample of 33% of the original data (sampled by ego's id number) would be small enough to analyze without exceeding the limitations of the available computer hardware and software. Comparing descriptive statistics between the full data set and multiple samples of 33% revealed only minute variance across samples in the mean and standard deviations of independent variables, suggesting that the sample size chosen is a robust representation of the full data set. Within the sample, there were nearly 14 million observations representing roughly 6 million unique dyads. As detailed in the following, we used the project data to construct our network measures. By excluding those actors who did not participate in joint projects, we further reduced our observations to about 5.4 million.

Dependent Variables

We consider the receipt of a peer certificate to be evidence that a status evaluation has occurred. Therefore, we test our hypotheses using the following dependent variables: *ego receives a rating*, *the level of rating ego received from alter*. We treat the certificates of "master", "journeyer", "apprentice", and "observer" as a descending measure of status in order to capture the continuous effect of networks on all status levels. In this study, we coded "master" as "4", the highest status level, followed by "journeyer" as "3", "apprentice" as "2" and "observer" as "1", the lowest status level. We coded it as "0" if alter did not rate ego for a particular time period. We treat this variable as an ordinal variable in our analyses (although we also conducted a supplementary analysis that treats this variable as a continuous variable in fixed-effect regression models.). In models where the dependent variable is the receipt of any rating, the binary event is coded as "1" if an ego receives a rating, regardless of the level of the rating.

Independent variables

We used the project data to construct our network measures. To compute members' network

measures, we constructed an adjacency matrix representing only those Advogato members who were participating in one or more projects during a particular time period. While projects may exist only for one time panel, they usually exist for multiple panels. If two actors had one (or more) joint project in a given panel, we regarded them as having a network tie, and then coded the matrix cell with a "1". If actors were not tied through any projects in a particular time panel, we coded the matrix for network analysis with "0". The matrix for network analysis is non-directional and symmetrical. This approach is consistent with our theoretical arguments that focus on the actor's overall connection pattern to different groups rather than the particular tie strength or structural equivalence of the actors.

Brokerage opportunities were measured by the presence of structural holes in an actor's network, using the procedure outlined in Burt (1992) (see Burt 1992: 54-56 for details on this measure). Following Podolny (2001), the formula used to calculate the brokerage opportunities is as follows:

$$H_i = 1 - \sum_j (p_{ij} + \sum_q p_{iq} p_{qj})^2, i \neq j \neq q,$$

where p_{ij} is the proportion of *i*'s network that is invested in the relationship with *j*, p_{qi} is the proportion of *q*'s network that is invested in its relationship with j. We used UCINET (Borgatti, Everett and Freeman, 2002) to calculate this variable. To address the concern about the direction of causality between an actor's status and structural properties, we used the ego's brokerage score in prior panel (*t-1*) in the models.

Moderating Variables

Ego's status in the prior time period is a variable that should moderate the effect of brokerage opportunities on status. This is measured by ego's publicly displayed status rank, as generated by Advogato's trust metric algorithm, which creates a receiver's status position according to the level of each certificate received, weighted by the status of the sender and then combined with other certificates received. An actor's current ratings should be affected by the level of his previous ratings (Stewart, 2005) and, therefore, we also expect to see a large main effect from this variable.

Control Variables

The focal actor's tenure is controlled for in the models, since it is possible that an actor with longer tenure may develop more extensive ties in the community. It is also likely that an actor's identity and status will become institutionalized over time. The focal actor's tenure is measured by the length of time, in days, since the actor created his Advogato account.

To address the concern that the measure of structure holes is also a function of direct ties (Burt, 1992), we include *network degree centrality* to control for the total number of connections ego might have, measured by the number of people to whom an individual connects through projects.

Bonacich centrality (Bonacich, 1972; Wasserman & Faust, 1994), which weights focal member's status by the status of the member's network partners, was also included as a control variable. This measure indicates an actor's relational status derived from connections to other centrally connected actors. Bonacich centrality has been used as a measure of status in prior research (i.e., Podolny et al., 1996; Podolny, 2001; Jensen, 2003). We control for network status because status derived from network connections may also gives the focal actor status assessment benefits. We used UCINET (Borgatti, Everett & Freeman, 2002) to calculate both network status control variables.

We included a control variable indicating *if ego is a project leader* for any of the joint projects between ego and alter, with "1" indicating an existing leadership role. This is included because a project leader is more likely to exhibit commitment to a project. Because they spend more time with other members, it is more likely that project leaders will receive status ratings.

The *total number of certificates received* by ego was controlled for since there should be variation in the number of certificates received by individuals of different status. We also controlled for *panel time* in order to control for any other systematic environmental or macro-level factors that might vary with time or be related to the focal actor's status level.

We also control for whether *ego and alter participate in at least one joint project* in the current time period. Since, by participating in a project with ego, alter is more likely to have direct knowledge about ego's actual level of performance, including this variable in the models helps to control for alter's

knowledge of the underlying quality of an actor, strengthening our arguments that status evaluations are enhanced by social factors.

Finally, in order to address the possibility that our network and status measures might be a function of the number of projects that ego participates in during a particular time period, we created a series of *dummy variables for the number of joint projects* that ego participated in during each corresponding period. This also effectively controls for the possibility that actors who participated in only one joint project might be in the periphery of the network. The number of projects per actor ranged from 1 to 23 during each period in our sample. Since only a limited number of community members participated in 15 or more projects in a given panel, we grouped them in one category. In our models, therefore, we entered 14 dummy variables, with one omitted category. We also used the number of project as an alternative measure and the results remained the same.

Models

To model the hazard rate of receiving a ranking, we used the Cox proportional model specified as the following:

$$h(t) = h_0(t)\, e^{\beta_1 x_1 + \ldots + \beta_k x_k},$$

where h(t) is the hazard rate and h_0 is the baseline hazard, which is not estimated.

To model the level of received ranking, hypotheses were tested using ordered logistic regression models, under the assumption that our dependant variable (received status rating) is an ordinal variable. We adjusted the standard errors by clustering the same subjects within the same time period, controlling for the fact that each ego appears in the same time period repeatedly[1]. The model to be fitted is the following:

$$\Pr(outcome_j = i) = \Pr(\kappa_1 \chi_{1j} < \beta_1 \chi_{1j} + \beta_2 \chi_{2j} + \ldots + \beta_k \chi_{kj} + \mu_j \leq \kappa)_i$$

where the probability of observing outcome *i* corresponds to the probability that the estimated linear

[1] A fixed effects model can also control for other actor-specific factors that may affect an actor's status level, thus giving us more confidence that our results indicate the impact of a social construction process independent of actor-specific quality. However, given the complexity of our data structure, the ordered logistic models used in this study are unable to use fixed effects. To check the robustness of our results, we also ran OLS models with fixed effects. With only minor differences, the overall results from both modeling methods are consistent (see Tables 3 and 4).

function, plus random error, is within the range of the cut-points estimated for the outcome. Standard errors were corrected by clustering the same subject in the same time period.

Since not all members of the Advogato community participated in the projects which we used to construct our network matrix, we incorporated Heckman's procedure for addressing sample selection bias. Using Heckman's selection model, we obtained the inverse Mills ratio or "nonselection hazard" (λ) from a random-effects probit model predicting the probability of an actor's participation in a project for a given time period, an approach suggested by Nijman and Verbeek (1992) and Kyradzidou (1997). We ran this model on the full sample using the focal actor's prior status, tenure, and the number of single person projects they had during a particular period as predictors where the number of single person projects serves as an instrumental variable (see Table 1 for the results of the random probit model). We then calculated the inverse Mills ratio as a new variable in the subsequent ordered logit models, which include only those members who participated in projects during our sample time period.

(Insert Table 1 about here)

RESULTS

Table 2 presents descriptive statistics and correlations for key study variables. Table 2 shows that the correlation among certain variables is quite high, raising concerns about multicollinearity. To correct possible multicollinearity problems in models with interaction terms, we centered the variables involved in the interaction terms by subtracting the mean of the variables before we entered the variables into the models. We also entered our key variables one by one in order to detect possible collinearity problems and we did not observe multicollinearity problems in the results[2].

(Insert Table 2 about here)

Receiving any Status Rating. Table 3 presents the results of models where the binary dependent variable is whether ego receives a ranking from alter in time *t*. Model 1 in Table 2 includes all the control variables and the network structural hole measure. It shows that an actor's prior established status has a

[2] Given the high correlation between Bonacich Eigenvector and network degree centrality, we ran models with either of the variables and the main results from all the models remain similar in terms of coefficient directions and magnitudes.

positive and significant effect ($p < 0.01$) on the actor receiving a current status rating, suggesting that high status does generate more attention from evaluators. The diversity of ego's received ratings and the number of certificates received by ego all have positive and significant ($p<0.01$) effects. The positive effect of the diversity of ego's previous received ratings might be a reflection of "attention effects" whereby high status and highly visible individuals (i.e. politicians) often receive large amounts of simultaneous praise and criticism. The average status of raters who gave ego high ratings had a negative yet non-significant effect on receiving a ranking, suggesting that merely receiving ratings from high status others may not create enough attention from other evaluators in terms of deciding whether or not to issue a ranking. If ego is a project leader or ego had at least one joint project with alter, ego is likely to receive a rating, suggesting commitment and prior relationships can have a significant impact on receiving ratings. In this model, we also entered network control variables: Bonacich centrality and network degree centrality. As shown in Model 1, while an actor's Bonacich centrality has a positive effect ($p<0.01$) on the actor's chance of receiving a rating, network degree centrality has a negative effect ($p<0.01$). Consistent with prior literature, this suggests that the status derived from connections with other central players can help an actor gain ratings. In addition, the impact of network degree centrality suggests that actors might be perceived as being less committed to projects if they are connected to too many other actors. In this model, we find support for our Hypothesis 1, which states that an actor with more brokerage opportunities will be less likely to receive status evaluations, as evidenced by the negative and significant ($p<0.01$) effect of structural holes on receiving a rating.

Model 2 in Table 3 presents the test of our Hypothesis 3 (H3), which states that, the negative effect of brokerage opportunities on receiving status evaluations is weaker for a focal actor of higher prior status. Model 2 shows that the interaction between brokerage positions and prior system status is positive and significant ($p < 0.01$), indicating that the negative effect of structural holes was reduced with increased prior status of an actor. Thus, H3 is strongly supported.

Level of Received Status Rating. In Table 4, we present the results of models where the dependent variable is the level of status rating received from alter in time *t*. Model 3 in Table 4 includes all the

control variables and network structural holes. It shows that an actor's prior status has a positive and significant effect ($p < 0.01$) on the level of received status rating[3]. The diversity of ego's received ratings and the number of certificates received by ego have negative and significant ($p<0.01$) effects on the level of received status alter. The average status of raters who give ego high ratings had a positive and significant ($p<0.01$) effect on the level of received status, supporting arguments in prior research that status evaluations are significantly influenced by evaluations from high status others. If ego is a project leader or had at least one joint project with alter, ego is more likely to receive a higher status rating.

We also entered network control variables in this model. As shown in Model 3, Bonacich centrality has a negative and significant ($p<0.01$) effect on the actor's receipt of higher evaluations. Network degree centrality has a positive and significant effect ($p<0.01$), suggesting that while commitment may help an actor to receive a rating, it may not help to receive a higher rating. In this model, we find support for our Hypothesis 2, which states that an actor with more brokerage opportunities will be less likely to receive a higher status rating, as evidenced by the negative and significant ($p<0.01$) effect of structural holes on the level of status evaluation.

In Model 4 of Table 4, we add the interaction between structural holes and an actor's prior status level, which is shown to be positive and significant ($p<0.01$). This finding supports our Hypothesis 4, which states that the negative effect of brokerage positions on the level of received status rating is weaker for an actor of high status.

(Insert Table 3, and 4 about here)

To summarize thus far, we find support for all of our hypotheses. We find that having structural holes in a network can lead to a lower chance of being evaluated, and can also lead to a lower status evaluation. The impact of brokerage positions is independent of the number of joint projects, the number of total connections an actor might have, and various other factors. The impact of brokerage seems to vary depending on the actor's prior established status.

[3] To rule out possible regression to the mean (Greve 1999), we also ran models without the highest and lowest status actors. The main effects of status remain similar to the effects reported here. Also, due to the small range of our dependent variable, concern about regression to the mean should be minimal.

One limitation of this study is that it is possible that actors had pre-existing friendship before they joined the Advogato community. In this case, actors with pre-existing friendships might generate more favorable ratings through their friendship connections. Although the data does not have information on pre-existing relationships, in our preliminary analyses, we attempted to control for the impact of pre-existing relationships by using the presence of a reciprocal certification (where ego and alter certify each other) as a possible indicator of a pre-defined friendship. Reciprocity did have a significant positive effect on the status rating. However, even after controlling for reciprocity, the effect of network structure and position is still significant ($p < 0.01$) (results available from the authors). This suggests that, even with the presence of a pre-existing friendship, network ties still have strong independent effects on the emergence of status. Thus, an actor's status is formed not only by the friendships an actor has, but also by that actor's position in the social network.

DISCUSSION

This study empirically and systematically examines the manner in which an actor's position in a network structure affects the emergence of that actor's status. Overall, our research supports the general proposition that the process of status emergence are subject to social influence (Rao, 1994; Gould, 2002; Zhou, 2005; Stewart, 2005) by showing that the structure of an actor's network plays a key role in the social construction of status and identity. As elaborated in previous research, non-focal actors form their perceptions about a focal actor's quality and intentions by the signals inferred from the focal actor's network connections (Podolny, 1993; 2001). This study makes an important contribution to this line of research by showing that, although network brokerage is conducive to information exchange actor performance, the signals sent by an actor who brokers can weaken the strength of his status order across domains. That is, if an actor has more brokerage opportunities in his/her network, that actor is less likely to receive evaluations or to receive high ratings. Consequently, this actor is likely to have a low status in the community.

This study furthers our understanding of how an audience interacts with a focal actor and influences that actor's identity, a subject for which much empirical research is needed (Hannan et al., 2007). Our results suggest that extensive network connections to distinct groups might create confusion regarding an actor's identity. Moreover, membership in multiple groups may dilute an actor's identity in any specific group, leading to a lower level of status evaluation from others. By examining interactions which affect the strength of this main effect, we are also able to define some scope conditions under which brokerage is more or less effective as a status-bearing mechanism. Our findings suggest that factors that affect the attention from and identity focus of the audience, such as an actor's prior established status, seem to compound the impact of brokerage on status ordering.

Implications

This study has important implications for research on status emergence. The current literature emphasizes that actors in communities or markets evaluate each other based on mutually understood and shared assumptions about core status evaluation standards (Rao, 1994; Zhou, 2005). As part of the interaction process between actors, actors look for social cues that confirm their assumptions about the legitimization of status evaluations (Rao, 1994; Zhou, 2005; Stewart, 2005). Our study demonstrates how the process of legitimacy building and status establishment can reside fundamentally in network connections surrounding actors. For instance, in the process of status emergence amongst occupations (e.g. Zhou, 2005), we might speculate that the legitimacy of an occupation is influenced by the nature of the connections that actors can develop through that occupation.

Another implication of this study lies in the area of social networks. Consistent with arguments in prior research (Podolny, 2001), our study suggests that there is a tension between network expansion, or networks with extensive structural holes, and network closure, which defines an actor's identity by confining the actor within a certain group. Our study suggests that under certain conditions, the information benefits derived from the expansion of network ties might be overshadowed by the negative signaling effect of holding extensive ties. These findings provide an identity-based complement to Ahuja (2000), who found that, in the process of innovation, the information benefits of structural holes were

outweighed by the trust benefits that could be derived from having a network characterized by cohesiveness. In essence, we suggest that the information benefits of structural holes should be weighed against the identity benefits that might be derived from cohesiveness or closure. Thus, the value of structural holes is contingent on the context in which they reside.

Third, in the social network literature, the network has been argued to be a form of social capital which can help actors generate returns in terms of performance outcomes (Coleman, 1988; Lin, 2001; Burt, 2004). The brokerage role, in particular, has been shown to offer great advantages in terms of acquiring information and generating control among actors (Burt, 1992). The relational and structural standing of a focal actor within a social network has been shown to be a key ingredient in an actor's attempt to develop social capital (Adler & Kwon, 2002; Burt, 2004; Lin, 2001). Our findings seem to suggest that whether or not network connections enhance social capital depends on the social context where the ties are developed. In settings where social cues (such as the signals sent by network ties) are a predominant force in making inferences about actors' quality, the full benefits of information, control, or trust derived from relational ties may not be realized. **Future Studies**

There are several areas in which this research project might be extended. First, we did not distinguish in this study between direct and indirect network ties. We suspect that direct ties may be more likely to capture the effects of friendship between tightly linked actors, while indirect ties may be more likely to capture the effects of information diffusion amongst loosely affiliated community members. When an actor evaluates others who are indirect ties, a focal actor may be more likely to rely on patterns in evaluations from the broader community, such as whether the majority of alter's raters gave a high rating, or whether high ratings were given by high status raters. When an actor evaluates others who are direct ties, however, the effect of responses from others in the community might be relatively weaker since the focal actor is more likely to possess direct knowledge about alter.

Second, future research could profit from a more detailed examination of other network properties, such as the distribution of clusters among the actors within the network and the distribution of structural holes in the periphery of an actor's network. It is possible that actors within certain clusters are

just more prone to giving each other favorable ratings. However, a focal actor's positional or structural advantage may also stem from properties that come from beyond his focal cluster(s). For instance, an actor with fewer structural holes in the periphery of his or her network may be more likely to have information advantages over others, while at the same time avoiding the possible punishment resulting from extended connections to different groups. Consequently, that actor might be able to generate higher status ratings.

Third, in our context, ratings can only be given by raters of equal or higher status. With such a constraint, a high status individual can influence the status emergence of a low status actor but the actor with a lower status cannot have any impact on the status mobility of an individual with a higher status. While this asymmetrical rating system ensures a relatively quick and smooth establishment of an actor's status in such a community, it holds an implicit assumption that the status order in a community is likely to be shaped by those at the top of the hierarchical structure. This might be true in general given the important role of status in generating status (Podolny, 1993, 1994, 2001). However, under the circumstance where a hierarchical structure experiences fluid changes (e.g. an emergence of a new industry field), the influence of a low status actor on the status ordering in a community could be stronger than what our setting has suggested. Future studies in a context without the limit on the rater's background could help to shed more light on the role of low status individuals in others' status mobility.

Finally, future studies might benefit from a more detailed examination of how different dimensions of actor quality affect an actor's group affiliations and, consequently, affect the actor's identity. Our current study does not have specific objective measures about an actor's skills since there is no such data. We believe that our inclusion of a measure for ego/alter shared project(s) can to a large extent control for alter's knowledge of and perception of ego's quality. However, future studies which examine the detailed influence of objective quality could help us better understand the role of networks in identity formation and status.

CONCLUSION

This study provides empirical evidence of the impact of social networks in the process of status emergence. The results demonstrate that the emergence of status is shaped by the dynamics of status evaluations among the actors and that such dynamics can be influenced by the structure of an actor's network connections. We find that an actor's brokerage opportunities (structural holes) have a negative impact on his chance of being rated and on the rating itself if an actors receives a rating, due to a lack of attention from alters as a result of confusion and dilution of that actor's perceived identity among the audience. Given that the generation of attention is the first step necessary for actors to receive status evaluations, it is more beneficial for an actor to establish a clear identity through connections to a cohesive group of others if he wishes to establish a good status. Supporting our theoretical arguments, we find evidence that the negative effect of brokerage on status varies for actors on an important dimension that can affect the attention of evaluators, specifically the actor's prior established status. Moreover, this study dissects the process of status construction by analyzing the most basic unit of analysis available: the dyadic relationship, which is the basis for the formation of an organized social space.

By analyzing the interaction between status and social networks in a large real-world setting, this study contributes to our general understanding of the manner in which markets and communities evolve. Status matters a great deal not just in software communities (Stallman, 1999), but also in other markets where referrals matter (i.e. law, medicine, academic labor markets) and in contexts in which attention and relationships form the basis of competition (i.e. relational marketing networks [Morgan and Hunt 1994]). Thus, we expect that the findings of this study should generalize to a number of important contexts.

APPENDIX A. Advogato Certification System (Source: **http://www.advogato.org/certs.html**)

Master

A Master is the principal author or hard-working co-author of an "important" free software project, i.e. one that many people depend on, or one that stands out in quality. A Master has command of the tools and is an excellent programmer. Generally, a Master works equivalent to full time (or more) on free software. Ideally, a Master writes clearly about the work and its broader context, and serves as a mentor to others in the free software community.

Journeyer

Journeyers are the people who make free software happen. A journeyer contributes significantly to an important free software project, or is the author of a useful or technically innovative project. A Journeyer is generally a competent programmer, but significant contributions of documentation, artwork, or other non-code goodies counts too. Ideally, a Journeyer works with others in the free software community to polish and refine the library of free software. While not necessarily the equivalent of full time, a Journeyer spends a significant amount of time on free software.

Apprentice

An apprentice is someone who has contributed in some way to a free software project, but is still striving to acquire the skills and standing in the community to make more significant contributions. Ideally, the Apprentice is in touch with either an individual mentor or a community that helps to gain these skills. An Apprentice spends a significant amount of time learning the craft of software development, whether by hands-on practice, academic study, or careful observation.

APPENDIX B. Advogato Trust Metric (Source: **http://www.advogato.org/trust-metric.html**)

Advogato's trust metric

The basic trust metric evaluates a set of peer certificates, resulting in a set of accounts accepted. These certificates are represented as a graph, with each account as a node, and each certificate as a directed edge. The goal of the trust metric is to accept as many valid accounts as possible, while also reducing the impact of attackers.

Advogato performs certification to three different levels: Apprentice, Journeyer, and Master. This is actually done by running the basic trust metric three times, using the "level" value in the certificate as a threshold. Thus, certification of Apprentices is computed using all certificates, while Master is computed using Master certificates only. The computation of the trust metric is performed relative to a "seed" of trusted accounts.

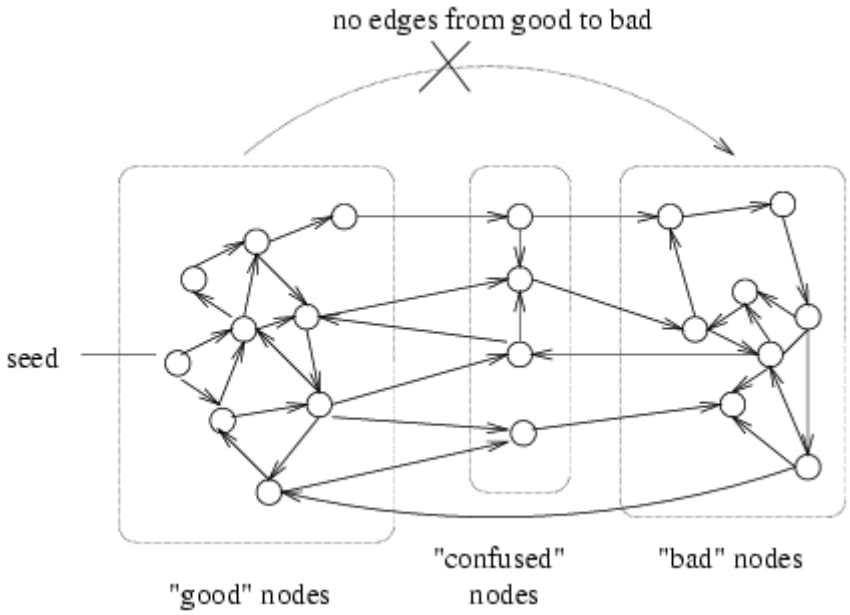
The core of the trust metric is a network flow operation. Informally, if there is a rich web of interconnections, flow reaches almost all the nodes. However, only a few accounts would be accepted from a large nest of bogus accounts, as long as there are only a few certificates from the "good" web to the bogus accounts. Those certificates represent a bottleneck in the network flow.

Mapping into graph

The mapping of certificates into a graph is dependent on a parameter: the certification level l . Each account on Advogato corresponds to a node in the graph. An edge exists from node s to node t when account s has certified account t at level l or higher. In addition, there is a distinguished "seed" node, with predefined edges to accounts.

Security proof

The nodes are split into three categories: good, confused, and bad. The bad nodes are under the attacker’s control. The confused nodes themselves represent valid accounts, but may contain certificates to the bad nodes. The good nodes are both valid accounts and have certificates only for other good nodes and confused nodes. This partition is shown graphically below:



Conclusion

The trust metric used in Advogato has a property not known in any previous trust metric: resistance to catastrophic failure in the face of a sufficiently massive attack. Instead, the number of bad nodes accepted scales linearly, and with a fairly small constant, with the number of certificates from valid accounts to bogus ones. It is also easy to compute efficiently and fairly simple to understand. As such, it should find applications in security infrastructures, as well as defining online communities, reliably excluding spammers, trolls, and other common annoyances.

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TABLE 1
RANDOM EFFECTS PROBIT ESTIMATES OF WORKING ON PROJECTS WITH OTHERS FOR AN ACTOR

	1	
Status of *i* (t-1)	0.593	**
	(0.0373)	
i's Tenure (days)	0.004	**
	(0.0002)	
Number of Single Person Projects by *i*	0.672	**
	(0.0715)	
Constant	-4.065	
	(0.1293)	
N (individual-panel)	20446	
Wald Chi-squared	595.080	**
Log likelihood	-3292.93	

** p<.01, * p<.05, # p<.1, two-tailed tests (Standard errors adjusted by clustering the same subjects within the same time period)

TABLE 2
DESCRIPTIVE STATISTICS AND CORRELATIONS FOR KEY STUDY VARIABLES

Variable	**Mean**	**S.D.**	**Min.**	**Max.**	1	2	3	4	5
1. Sysytem Status Rating of *i (t-1)*	2.97	0.88	1.00	4.00	1.00				
2. Diversity of *i*'s status rating (t-1)	0.42	0.30	0.00	1.44	0.29	1.00			
3. *i*'s Tenure (days)	341.14	141.02	21.00	666.00	0.15	0.24	1.00		
4. Average Status Rating of j (t-1)	2.17	1.09	1.00	4.00	0.01	-0.02	-0.07	1.00	
5. Total Number of Certificates Received for *j*	9.55	18.63	0.00	279.00	-0.01	-0.01	0.00	0.34	1.00
6. Average Status of *j* Who Give *i* High Status Ratings	1.18	1.43	0.00	4.00	0.64	0.42	0.19	-0.01	-0.01
7. Total Number of Certificates Received for *i*	20.44	30.30	0.00	527.00	0.36	0.28	0.25	-0.01	-0.01
8. If *i* a project leader	0.49	0.50	0.00	1.00	0.19	0.21	0.08	0.00	-0.01
9. If *ij* shares a project	0.02	0.15	0.00	1.00	0.02	0.01	0.00	0.13	0.14
10. Network Bonacich Centrality	2.26	4.31	0.00	36.50	0.05	-0.05	-0.05	0.00	0.00
11. Network Degree Centrality	5.98	6.72	0.10	39.68	0.13	0.04	0.04	0.00	0.00
12. Network Structural Holes	0.75	0.30	0.00	0.99	0.24	0.09	0.13	-0.01	-0.01

Variable	6	7	8	9	10	11
6. Average Status of *j* Who Give *i* High Reputation Ratings	1.00					
7. Total Number of Certificates Received for *i*	0.35	1.00				
8. If *i* a project leader	0.23	0.17	1.00			
9. If *ij* shares a project	0.00	0.03	-0.02	1.00		
10. Network Bonacich Centrality	-0.08	0.07	-0.14	0.14	1.00	
11. Network Degree Centrality	0.04	0.19	-0.11	0.16	0.88	1.00
12. Network Structural Holes	0.15	0.22	-0.16	0.09	0.37	0.56

TABLE 3

COX MODEL ESTIMATES OF RECEIVING A STATUS RANKING FOR AN ACTOR

	1		**2**	
Ego's Prior System Status Ranking	0.702	**	0.717	**
	(0.022)		(0.022)	
Diversity of *i*'s Status Ranking (t-1)	0.677	**	0.680	**
	(0.038)		(0.038)	
i's Tenure (days)	-0.004	**	-0.004	**
	(0.000)		(0.000)	
Status of *j* (t-1)	0.240	**	0.240	**
	(0.010)		(0.010)	
Total Number of Certificates Received (*j*)	0.018	**	0.018	**
	(0.000)		(0.000)	
Average Status of *j* Who Give *i* High Status Ratings	-0.010		-0.017	
	(0.010)		(0.010)	
Total Number of Certificates Received (*i*)	0.010	**	0.010	**
	(0.000)		(0.000)	
If Ego a Project Leader (yes=1)	0.236	**	0.233	**
	(0.024)		(0.024)	
If *i* and *j* have a joint project	2.799	**	2.800	**
	(0.025)		(0.025)	
Inverse Mills Ratio	2.112	**	2.094	**
	(0.140)		(0.140)	
Dummy Var. of *i*'s Joint Number of Projects in a Panel	included		included	
Network Bonacich Centrality(t-1)	0.063	**	0.064	**
	(0.005)		(0.005)	
Network Degree Centrality (t-1)	-0.057	**	-0.058	**
	(0.004)		(0.004)	
Network Structural Holes (t-1)	**-0.171**	**	**-0.191**	**
	(0.047)		**(0.047)**	
Structural Holes*Status of *i* (t-1)			**0.203**	**
			(0.044)	
Total Observations	4259510		4259510	
Total Event	10963		10963	
LR Chi-squred	31873	**	31894	**
Log likelihood	-137776		-137766	

** p<.01, * p<.05, # p<.1, two-tailed tests

TABLE 4
ORDERED LOGIT ESTIMATES OF RECEIVED STATUS RANKING FOR AN ACTOR

	3		**4**	
Status of *i* (t-1)	1.246	**	1.269	**
	(0.0009)		(0.0540)	
Diversity of *i*'s status ranking (t-1)	-1.172	**	-1.167	**
	(0.0110)		(0.0876)	
i's Tenure (days)	0.000	*	0.000	
	(0.0000)		(0.0009)	
Status of *j* (t-1)	-0.068	**	-0.066	**
	(0.0009)		(0.0123)	
Total Number of Certificates Received (*j*)	-0.004	**	-0.004	**
	(0.0001)		(0.0002)	
Panel Time	0.023	**	0.022	**
	(0.0006)		(0.0082)	
Average Status of *j* Who Give *i* High Status Ratings	0.447	**	0.430	**
	(0.0028)		(0.0189)	
Total Number of Certificates Received (*i*)	0.010	**	0.010	**
	(0.0002)		(0.0005)	
If *i* and *j* have a joint project	0.317	**	0.301	**
	(0.0091)		(0.0273)	
Inverse Mills Ratio	0.945	**	0.976	
	(0.0093)		(0.9384)	
Dummy Var. of *i*'s Joint Number of Projects in a Panel	included		included	
If *j* rated *i* (no rating given = 1)	-89.312	**	-84.437	**
	(0.0341)		(0.1827)	
Network Bonacich Centrality (t-1)	-0.017	**	-0.018	**
	(0.0016)		(0.0046)	
Network Degree Centrality (t-1)	0.036	*	0.048	**
	(0.014)		(0.014)	
Network Structural Holes (t-1)	-0.154	**	-0.080	
	(0.0038)		(0.0713)	
Structural Holes*Status of *i* (t-1)			**0.493**	**
			(0.0739)	
Intercept	37.750		35.150	
N (total number of dyads)	5403138		5403138	
Wald Chi-squred	1.09e	**	314291	**
Log pseudolikelihood	-45286		-45218	