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The co-evolution of power and friendship networks in an organization

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Abstract

Despite the pivotal role that both power and interpersonal trust play in a multitude of social exchange situations, relatively little is known about their interplay. Moreover, previous theorizing makes competing claims. Do we consider our relatively more powerful exchange partners to be less trustworthy, as rational choice reasoning would suggest? Or do more complex psychological mechanisms lead us to trust them more, as motivated cognition reasoning implies? Extending the latter approach, we develop and empirically test three hypotheses on the interrelation between perceptions of interpersonal trust and power. According to the status value hypothesis, individuals are more likely to befriend those whom they or others perceive as powerful. The status signaling hypothesis states that the friends of people one perceives as powerful will also be seen as powerful. According to the self-monitoring hypothesis, high self-monitors are more likely than low self-monitors to befriend those they or others perceive as powerful. We use multiplex stochastic actor-based models to analyze the co-evolution of trust and power relations among $n = 49$ employees in a Dutch Youth Care organization. Data covers three waves of a longitudinal sociometric network survey collected over a period of 18 months in the years 2009–2010. In general, we find some support for all three hypotheses, though the effects are weak. Being one of the first organizational field studies on the co-evolution of power and trust, we conclude with discussing the implications of these findings for the study of social exchange processes.

Keywords: *power perceptions, friendship, network co-evolution, self-monitoring, motivated cognition, status value, status signaling, interpersonal trust, organizations, multiplex stochastic actor-oriented modeling*

1 Introduction

The social capital perspective gave a major boost to our understanding of intra-organizational processes and their outcomes at the level of individual employees, teams, departments, or whole organizations (Burt, 1992; Coleman, 1990). The reasoning underlying the social capital approach seems straightforward: social connections can yield substantial material and non-material benefits, including influence, status, and positive reputation (Flap & Völker, 2013).

A major assumption of the social capital approach is that individuals build their networks with the aim of increasing the potential future benefits that their ties may yield. Social capital's building blocks are multifaceted interpersonal relationships,

which cover different relational aspects. This network history of prior resource exchange, combined with a communication network, forms the basis for a network of interpersonal trust, friendship, and individual reputation. Network connections individuals create vary in intensity and structure. The resulting differences in individual social capital can give rise to differences in informal power (Pastor et al., 2002): being rich in social capital can reduce one's dependence on others. As such social capital is inextricably linked to both, interpersonal trust and power. Yet the interrelationship between the two turns out to be a surprisingly under-explored area of research (Schilke et al., 2015).

In one of the first attempts to bridge this gap, Schilke et al. (2015) emphasized the importance of closely scrutinizing the underlying behavioral micro-foundations. Specifically, they disentangle the assumptions and competing predictions of the two major theoretical paradigms: a standard rational choice (or encapsulated interest) explanation and a motivated cognition explanation. A key assumption in the *encapsulated interest* perspective is that high power exchange partners anticipate on the fact that their low power exchange partners have fewer exchange opportunities: they assume that it is not in the interest of a low power party to defect. Conversely, *motivated cognition* explanations posit that the desire to reduce cognitive dissonance drives low power individuals to hope that their dependence on a high power exchange partner will not be exploited, whereas high power individuals have no motive to adjust their expectations. In a series of experimental studies, they found that power decreases trust in others. This result puts pressure on the cost-benefit account underlying most of current social capital reasoning, and suggests that motivated cognition plays a major role in the dynamic interplay between interpersonal trust and structural power.

The present study aims to further disentangle this interrelationship. Following Schilke et al.'s (2015) lead, we extend the motivated cognition framework in three respects. First, we suggest that cognitive dissonance reduction is but one of several possible motivated cognition mechanisms behind the power-trust link. Specifically, we draw on two additional psychological theories of motivated cognition: the status value theory of power and the self-monitoring theory. The *status value theory of power* assumes that individuals attach more value to resources of high status exchange partners than of low status exchange partners: we therefore suggest that individuals will not only develop close interpersonal relationships to those whom they or others perceive to be powerful, but also attribute more power to those whom the powerful consider as trustworthy friends. Based on *self-monitoring theory's* assumption that individuals differ with regard to the degree in which they strive for instrumental motives, we further posit that friendship relations of self-monitors should be more in line with the predictions following from an encapsulated interest approach.

Second, we posit that a comprehensive account of the power-trust relationship requires modeling both (changes in) interpersonal power attributions *and* (changes in) the attribution of interpersonal trust. In other words, to fully disentangle the relationship between power and trust, we need to formulate and test a model that accounts for development over time and co-evolution of power and trust in social networks. This allows us not only to analyze how individuals allocate trust in a given power structure, in which potential exchanges are pre-determined and fixed, but also

to assess how a close interpersonal relation (e.g. friendship) between the exchange partners affects the attribution of power. It further enables us to investigate the mechanisms that are at work if the trust decision involves the initiation of a new or maintenance of an existing friendship relation.

Third, and related, Schilke et al. (2015) use an experimental paradigm in which the power distribution is a given (subjects could not choose their exchange partners), and trust is assessed in relation to specific decision situations, with both behavioral and perceptual indicators measuring an individual's inclination to trust others. We designed a longitudinal sociometric field study to test our hypotheses, thereby extending earlier experimental research to real-life organizational settings. In such a natural environment, both informal power and trust manifest themselves in ways that are distinct from the highly controlled environment of an experimental setting. In organizations informal power, for example, is more of a dynamic phenomenon with power positions changing over time. In fact, given that the number and structure of social ties have a key influence on one's power position in a group, informal power is likely to change with every change in the social network. Furthermore, in a real-life organizational setting trust is often a strong correlate of relationship quality/strength, and thus of friendship ties between people. Repeated cooperation in a work setting strengthens the relationship between colleagues, increasing the probability that they trust one another (Burt, 2001). Referring to a colleague as a friend implies a strong personal tie, and, thus a high degree of emotional closeness to and trust in that person. Therefore, for the purpose of this study the two key constructs—power and trust—were framed at the dyad level as, respectively, attributions of perceived informal power and attributions of friendship.

In the remainder of this article, we first sketch the theoretical background and formulate empirically testable hypotheses. We then outline our research design and analytical method, including a sketch of the organizational context of our field site. The results of our multiplex stochastic actor-oriented model and a general discussion are presented thereafter.

2 Theoretical background and hypotheses: a motivated cognition approach

Much social capital reasoning rests on a straightforward rational choice assumption (Flap & Völker, 2013; Lin, 2002), according to which the decision to start, to maintain, and eventually to dissolve ties to others is based on a continuous comparison of material and immaterial costs and rewards associated with the relationship, like emotional and instrumental support, care, compliments, advocacy, status, or advice. Ties can vary in strength from low intensity, low commitment acquaintance requiring low levels of trust, to very close bonds involving high trust and even friendship.

One of the implications of this framework is that it is rational for low power players not to trust high power exchange partners, because the latter have many alternative options for exchange and are therefore less committed to specific partners. The opposite holds for high power actors' trust in low power partners: anticipating their dependence, high trust players assume they will not defect and therefore trust them. Schilke et al. (2015) suggest replacing this *encapsulated interest* reasoning with

a *motivated cognition* argument. Specifically, they argue that feeling dependent on others creates anxiety and cognitive dissonance. Individuals reduce this anxiety by “perceiving power holders in a positive light, even if little or no relevant information would support such perceptions”. Hence, one form of motivated cognition that brings low power individuals to trust high power exchange partners is hope or “wishful thinking”.

Motivated cognition (or motivated reasoning) research investigates the role of motivations or emotions in cognitive processes like information processing, decision-making, or the formation and change of perceptions and attitudes (Kunda, 1990; Kruglanski, 1996). Emotion regulation through cognitive dissonance reduction is only one of a variety of mechanisms that might be involved in motivated cognition (see also, Lemay & Clark, 2015; Lydon & Karremans, 2015, for recent reviews). More specifically, we argue that in order to understand the co-evolution of friendship and power positions in informal networks, two additional-motivated cognition mechanisms deserve closer attention. We refer to them as status and self-monitoring.

2.1 Status

According to the *status value theory of power* (Thye, 2000), the exchangeable resources controlled by high-status actors are perceived as more valuable than the resources controlled by low-status actors. Therefore, relationships with high-status or powerful individuals are likely to yield more benefits than ties to less popular individuals (Graen et al., 1977). A personal connection to informally powerful actors can provide the less powerful with more opportunities to access-valued resources and gain them distinct competitive advantage (Braendle et al., 2005). Field studies have already showed that individuals actively attempt to establish personal ties with high-power actors (Benjamin & Podolny, 1999). This is also supported by experimental evidence revealing that “subjects connected to a high-status and a low-status partner indicated they (1) tried harder to acquire the goods associated with the high-status partner, (2) would prefer to be awarded these goods, and (3) attached greater value to their acquisition.” (Thye, 2000, p. 427). Consequently, building and maintaining ties with powerful individuals is more attractive. The assessment of someone’s power can be based on both first-hand and second-hand experience (see below). Therefore, the likelihood that Ego will befriend Alter increases if Ego or Tertius perceive Alter to be powerful:

Hypothesis 1 (status value): Individuals are more likely to befriend those whom (a) they or (b) others perceive as powerful, than those they or others do not perceive as powerful.

Hypothesis 1 assumes that the degree to which *others* perceive a group member as powerful can also influence an individual’s decision as to whether or not to befriend this group member. In this case, signaling considerations may complement the motivation to befriend the powerful, because one may expect additional benefits to come from others who consider him or her as powerful. Friendship ties to the powerful thus have a positive-signaling effect: individuals who are perceived to be

connected to powerful others may come to be seen as powerful themselves. Attempts to enhance one's public image by proclaiming bonds to successful others (Cialdini et al., 1976) are also known as the "basking-in-reflected glory effect" (Cialdini et al., 1976; Kilduff & Krackhardt, 1994; Mehra et al., 2009). The strategy is successful if this close relationship also enhances one's own power position in the eyes of others. We therefore predict that status value considerations will not only influence our desire to befriend the powerful, but also affect whom we perceive as powerful. Other people's friendship ties to and/or from high-power players act like a distorting prism or proxy signals to assess their power (Podolny, 2001). Our second hypothesis therefore states that if Ego perceives Tertius as powerful, and Tertius is a friend of Alter, then Ego will also perceive Alter as powerful:

Hypothesis 2 (status signaling): The friends of people one perceives as powerful will also be seen as powerful.

2.2 Self-monitoring

There is a lot of evidence that individual differences in personality affect status attainment (Judge et al., 1999), leadership emergence (Judge et al., 2002), and employee performance (Mehra et al., 2001). Self-monitoring is a construct that has yielded important insights into the dynamics of impression management (Snyder & Copeland, 1989, p. 7), conflict and information management, performance, and leadership emergence (Snyder, 1987, pp. 88–90; Kilduff & Day, 1994; Mehra et al., 2001). Self-monitoring affects the way individuals perceive and shape their social worlds, and how they present themselves in social contexts (see Gangestad & Snyder, 2000, for a review).

High self-monitors are people who actively construct public selves in order to achieve social ends (Gangestad & Snyder, 2000, p. 546). Moreover, they are particularly motivated to act on the cues available to them in ways that cultivate and allow maintaining a favorable public image. They tend to view interpersonal contact, and particularly interactions with more powerful others, as opportunities rather than threats (Perrewé et al., 2000). Like social pragmatists, high self-monitors constantly attempt to impress others in order to win their approval and respect and to get ahead in organizations (Gangestad & Snyder, 2000, p. 531).

Self-monitors' superior understanding of social situations in combination with their tendency towards a pragmatic, somewhat more opportunistic approach to social relationships (Snyder, 1987, pp. 68–69), often makes them more successful in eliciting conferrals of status (Flynn et al., 2006; Kilduff & Krackhardt, 1994). In fact, high self-monitors possess good social interaction skills, tend to emerge as group leaders (Zaccaro et al., 1991) and are more interested in developing reputations that express social status. Hence, we expect that high self-monitors' motivation to enhance their social standing among peers makes them more likely to approach relationship building instrumentally, and hence likely to establish close personal ties to people who are perceived as powerful in the group.

Hypothesis 3 (self-monitoring): High self-monitors will be more likely than low self-monitors to befriend people whom (a) they or (b) others perceive as powerful.

3 Data and method

3.1 *The research setting*

Longitudinal data were collected in one site of a medium-sized Dutch non-profit organization at three time points six months apart, namely in spring 2009, autumn 2009, and spring 2010. The organization was an independent, subsidized, regional child protection/care institution.

The research questions we have posed and the subsequent hypotheses we have formulated place strict requirements on the type of data that had to be collected. First, this sort of inquiry requires sociometric panel data collected from all members of the group under study. It also requires a relatively small setting that would allow collecting reliable data on complete networks using self-administered questionnaires. One of the sites within the organization at hand—a specialized kindergarten providing treatment for children with problems in their social, psychological, and/or physical functioning—met these specific criteria.

At the time of the first measurement wave, this specific site had 44 employees, among them (in decreasing order of seniority) a location manager, behavioral scientists, specialists (such as physiotherapists or pediatricians), social workers, administrative, and household staff. Most of the employees worked part-time (3–4 days a week) and only two of them were male. The site was rather autonomous in a sense that there was limited contact (on a daily basis) between its employees and organizational members outside the site. The work environment within the site; however, could best be characterized as sociable and cooperative with people committed to working together towards the common goal of providing the best possible care for children and their families.

Children attending the specialized kindergarten were divided into five groups. A team of two to six social workers supervised each group. The treatment progress is regularly evaluated in the so-called multidisciplinary teams consisting of social workers, behavioral scientist, and the relevant specialist(s). The team members are working closely together in a collaborative manner. Competence and trust are key to this collaboration.

The behavioral scientist has an advisory, supervisory, and a coordinating role within the multidisciplinary team. He/she also has the ultimate responsibility for the individual supervision/treatment plan of the child, which is used as a guideline for the supervision/treatment subsequently administered by the team of social workers. The social workers are responsible for the daily supervision and support of children and their families during the treatment. They have regular (in some cases daily) contact with them to assure that the intended progress is being made. They are also responsible for maintaining the contacts with the behavioral specialist and the other professionals involved in the treatment process, and thus have a crucial signaling role, for example in situations when the treatment is not progressing as intended and the need arises to modify the treatment plan. This continual and direct access to/contact with children and their parents, combined with a connecting position within a network of professionals involved in the treatment process, provides social workers (who generally do not have much power within the site's formal hierarchy) with considerable informal power. In contrast, the more (formally) senior behavioral scientists are involved in the initial assessment of the child and the family situation,

but subsequently maintain far less personal contact with children and parents, and thus must often rely on information and observations of the social workers to make informed decisions with regard to the (changes in) treatment plan.

The sample size varies between the three measurement waves because some employees joined or left the site in the course of the study. In the first wave, 30 out of 44 employees (68%) filled in the survey. In the second wave, 28 out of 42 employees (67%), and in the third wave, 34 out of 38 employees (89%) participated. Over the whole period 49 employees took part in the study. The mean age of the employees at the beginning of the study was 36.0 (range: 23–60; $SD = 10.65$), and on average they had been employed in the organization for six and a half years ($M = 6.5$; $SD = 6.8$; $Mdn = 3$; $minimum = 1$; $maximum = 23$).

3.2 Measures

Measures included network data capturing the power and friendship relationships between employees, as well as individual-level data on self-monitoring disposition of employees. Both power and friendship were incorporated as dependent network variables in the analysis.

3.2.1 Peer-rated informal power

Due to the relatively small size of the site under study, in each of the three measurement waves informal power relations among employees could be addressed directly by presenting the respondents with a roster of the names of all employees working at the site. Building on previous work on power reputation in organizations (e.g. Brass, 1984; Pfeffer, 1981) individual power was assessed by asking each respondent to indicate on a 5-point Likert scale ranging from 1 (very little influence) to 5 (very much influence) how much influence each colleague has on the state of affairs within the site. The question was worded as follows (rough translation from Dutch): “It is often the case at work that some people are more influential than others. With this we mean, for example, people who have clear ideas concerning work-related issues, who communicate their ideas to others and in such way influence the opinions of their colleagues. Indicate for each of the following people the degree of influence that they have on the state of affairs within the site”.

In this study, attributed power is conceptualized as a phenomenological construct: someone is powerful when he is perceived as such by others (Pfeffer, 1977). This approach to assessing power perceptions is similar to and consistent with earlier research on the linkages between social networks and leadership perceptions (for a review, see Shaw, 1964), as well as more recent work focused on social networks and leader reputations (e.g. Mehra et al., 2006; Mehra et al., 2009). Also building on insights from previous work (e.g. Brass, 1984; Burkhardt & Brass, 1990; Brass & Burkhardt, 1993), we chose to use the term “influence” rather than “power” in the questionnaire. Although some scholars have made definitional distinctions between the two concepts, distinctions of this sort are not common in everyday usage of the words. Furthermore, the term “power” frequently involves undesired negative connotations (Pfeffer, 1981) that are likely to bias the results of the study.

Based on the informal power question we retrieved a **directed, valued adjacency matrix for each measurement wave capturing the power nominations of the employees**. However, our analytical approach elaborated below required a dichotomized power variable. We therefore recoded all of the “influential” and “very influential” nominations as 1, and the remaining types of nominations as 0. This way we could identify the present power relations in the network (i.e. actor A nominates actor B as powerful), and create a directed, binary adjacency matrix for each measurement wave, where 1 stood for presence of power nomination, and 0 implied absence.

3.2.2 Friendship

In addition to inquiring about the power relations among employees, respondents were asked to **describe the quality of their social relationships with every other employee on the following 5-point Likert scale: 1 (very difficult), 2 (difficult), 3 (neutral), 4 (friendly), and 5 (good friend)**. The wording of the question is roughly translated from Dutch as follows: “With some colleagues we have a very good relationship. To some we would even *confide personal things*. With other colleagues, however, we can get along less well. The following question asks about your relationship with your colleagues. How would you describe your relationship with each of the following people?” Employees’ answers to this question provided us with a directed, valued network capturing the quality and strength of the dyadic relationships in the network, as reported by each individual. Given our interest in the degree to which people trust one another, we operationalized the degree of friendship in terms of a respondent’s willingness to “share sensitive information”. This is in line with earlier attempts to capture the relational dimension of interpersonal trust in real life organizational settings through sociometric measures (e.g. Burt, 1992). Put differently, we consider nominating a certain colleague as a friend as synonymous with trusting this colleague.

The chosen analytical approach required a dichotomized friendship variable. Nominations of the participants appeared to have a bimodal distribution, with majority answer codes being 3 and 4. **The “friendly” and “good friend” relationships were therefore recoded as 1, and all other types of relationships as 0**. As a result, we retrieved a directed, binary adjacency matrix for each measurement wave, where 1 stood for presence of friendship nomination in the network, and 0 implied absence.

3.2.3 Self-monitoring

Employees’ self-monitoring orientation was measured at the first time point with **a selection of 8 items from the 13-item self-monitoring scale** proposed by Lennox and Wolfe (1984). Responses to these items were given using a 7-point Likert scale ranging from 1 (completely disagree) to 7 (completely agree). The overall reliability coefficient (i.e. Cronbach’s α) for the scale was 0.66. Examples of items included are: “I have the ability to control the way I come across to people, depending on the impression I want to give them”, “My intuition is quite good when it comes to understanding others’ emotions and motives”, “I have found that I can adjust my behavior to meet the requirements of any situation I find myself in”. The self-monitoring score derived from the respondents’ answers is used as a continuous

variable indicating the probability that an individual is a high or a low self-monitor. Self-monitoring was included as a constant actor covariate in the analysis (mean = 4.79, SD = 0.59, $N = 21$).

3.2.4 Formal team membership

As mentioned earlier, the setting under study was organized into five teams with sizes ranging from two to six employees. The data on the sites' formal work team structure was provided by the organization prior to the start of the study. This information allowed us to test whether working in the same team (i.e. high proximity) may lead to more friendship ties or power attributions between employees. Formal team membership was included as a nominal varying actor covariate in the analysis, as team composition changed from period to period.

3.2.5 Hierarchical level

Prior to the study, we also obtained information on the employees' formal functions within the site. These data allowed us to investigate whether employees in similar hierarchical positions tend to befriend or attribute power to each other more often. Hierarchical level was included as a constant actor covariate in the analysis.

3.3 Analysis strategy

Stochastic actor-based models for network evolution (Snijders et al., 2010) were used to study the co-evolution of friendship and power networks in our organizational setting. There are three basic principles of this model family. The first is the assumption of *temporal separability*, which means that power attributions and friendship ties evolve gradually. The totality of tie changes observed between two discrete observation moments is assumed to be the result of a change process unfolding in continuous time, in which many smallest changes (i.e. *tie swaps* = breaking an existing tie, or creating a new one) happen one after another. Second, these smallest changes are assumed to be under control of the actors in the network (*actor-basedness*). Each actor is assumed to have control over her own power attributions and friendship nominations, i.e. her outgoing ties. Third, actors are assumed to behave as if they based their decisions about a given tie swap on a rational comparison of the immediate consequences of all possible tie swaps under their control in the given network, at the decision moment (*myopic rationality*). All three model assumptions seem reasonable and not very restrictive in our application.

The main model components are two functions for each dependent network. Following the model's rationale, they are formulated on the actor level. The *rate function* is a Poisson regression model of exponentially distributed waiting times. It models the intensity in continuous time at which an actor gets opportunities to swap one of her outgoing ties. A random waiting time is drawn repeatedly for each actor in each network. The shortest of these times in turn determines which actor gets the next opportunity to swap one of her outgoing ties and in which network. The *objective function* is a conditional logit discrete choice model. It models probabilities of a tie swap at a given opportunity as the result of an evaluation and comparison

of the immediate consequences of all the different tie swap options that an actor can choose from. In this objective function, mechanisms of network evolution are instantiated, in particular the dependencies between the two networks that are expected based on Hypotheses 1 through 3 of the current study.

In our analysis, both friendship network and power network serve simultaneously as explanatory and as outcome variables. An analysis with several dependent (outcome) networks is referred to as a *multiplex analysis*. More details about multiplex stochastic actor-based models can be found in Snijders et al. (2013); an application to organizational networks is given by Ellwardt et al. (2012). We analyzed the data for this paper using RSiena (release 289, Ripley et al., 2015), which allows to study multiplex dependent networks, and thus to test whether tie configurations in one dependent network affect change in another dependent network.


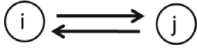
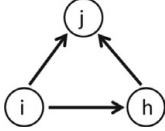

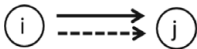

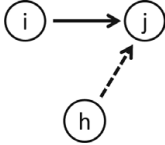

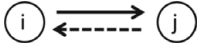

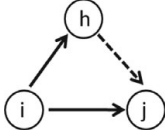
The model is specified by giving a selection of *effect statistics* for the objective function of each dependent network. We needed to specify two objective functions—one for power attribution and one for friendship nomination. An effect statistic measures one aspect of the high-dimensional network embedding of an actor (see examples below). For each effect fitted to the data, a parameter, and a standard error will be estimated, which allows to test whether the effect significantly contributes to the explanation of the data. The model parameters are estimated using an iterative stochastic approximation algorithm. The estimation was performed using the MCMC maximum likelihood algorithm (Snijders et al., 2010).

A visual presentation of some of the effects selected into our model is given in Table 1. For example, the relational exchange of power for trust is measured with the multiplex reciprocity effect. By including this effect in the objective function for power attribution, the actors' tendency to attribute power to those who befriend them can be estimated. By including the same effect in the objective function for friendship, we estimate the degree to which actors "reward" an incoming power attribution with a friendship nomination in return. Most interesting for this paper are the operationalizations of our hypotheses, so we continue with an illustration of the effects corresponding to the formulated hypotheses. We then proceed to a discussion of effects included to control for several well-known features of social networks.

Hypothesis 1 about status value states that a recipient of power attribution ties attracts friendship ties (a) from the same actors that attribute power to her, and/or (b) from other actors. Because friendship figures as the outcome in this hypothesis, it needs to be operationalized by effects in the objective function for friendship. The two effects that achieve this are graphically depicted in Table 1 as "multiplex outdegree" and "multiplex indegree alter", respectively. Actors who strive for embeddedness (as actor i) in many of the depicted configurations when they decide about their friendship nominations behave as predicted by the indicated hypothesis; a significant positive parameter estimate for this effect would therefore confirm our expectation.

Hypothesis 2 about status signaling states that when two actors are linked by friendship, they tend to share power attributions by the same third parties. The outcome here is power attribution, so for operationalization we need to select an effect in the objective function for this network. Because the third party actor is the one attributing power, the effect statistic needs to be formulated from this actor's

Table 1. Verbal description and visual presentation of the effects in multiplex SIENA.

Effect	Verbal description	Visual presentation
Uniplex endogenous network effects (examples)		
Outdegree	Ego's baseline preference for having ties in a network	
Reciprocity	Ego's preference for having reciprocated ties in a network	
Transitivity	Ego's preference for having ties with also indirectly connected alters (indicator of network closure)	
Multiplex endogenous network effects (examples)		
 Multiplex outdegree (H1a: status value)	Ego's preference for friendship (solid) with alters whom they also attribute power to (dashed)	
 Multiplex indegree alter (H1b: status value)	Ego's preference for friendship (solid) with alters whom others attribute power to (dashed)	
 Multiplex reciprocity (control effect)	A tendency for ego's ties in network "solid" to reciprocate alter's nominations in network "dashed"	
 Multiplex mixed transitivity (H2: status signaling)	Dependence between ego's power attributions (solid) to two actors connected by a friendship tie (dashed). Score-tested are two variants: in the first, the outcome is tie $i \rightarrow j$; in the second, it is tie $i \rightarrow h$.	

Note: Ego always is depicted as actor i .

"viewpoint", as depicted in the last row of Table 1 (multiplex-mixed transitivity). As the diagram shows, the two power attributions involved in the triad are not in equivalent positions. We distinguish between *variant (a)*, where a power attribution to a first recipient is transferred to a second recipient if the first one nominates the second one as friend (power transfer downstream friendship), and *variant (b)*, where a power attribution to a first recipient is transferred to a second recipient if the second one nominates the first one as friend (power transfer upstream friendship). The latter variant is what theorists of the "basking in reflected glory" effect discussed above would say motivates people to claim friendly bonds with powerful others. Given that both variants lead to the same end result, they are hard to differentiate empirically. We therefore proceeded as follows when testing them. We included an effect estimating actors' overall preference for being embedded in the network configuration depicted in the last row of Table 1, thereby testing the non-nuanced Hypothesis 2. We then ran score tests for assessing evidence for the nuanced variants

(a) and (b) of the second hypothesis. Score tests (aka *Lagrange multiplier tests* in econometrics) assess the steepness of the likelihood function at the estimate into the direction of non-estimated parameters, and as such can be used to test whether non-included parameters would significantly add to the model's fit. In this case, they help keeping the estimated model reasonably parsimonious while still offering a statistical test of the nuanced hypotheses 2(a) and (b).

Finally *Hypothesis 3* addresses self-monitoring as a potential moderator of the effects postulated by Hypothesis 1. As such, it can be operationalized as an interaction between the self-monitoring of the sender of the friendship tie and the effects used to operationalize Hypothesis 1.

3.3.1 Controlling for structural effects

The model included several effects controlling for well-known dependencies between ties in social networks. In both networks' objective functions, we controlled for *reciprocity* and *transitivity* (see Table 1) as well as an interaction between these two (cf. Block, 2015), and an effect capturing the closure of *3-cycles*. We controlled for *degree distributions* by including not only the intercept *outdegree* effect, but also the tendency to send ties to a recipient of many other ties (*Matthew effect* of reputation, Merton, 1968; here called *indegree-popularity*), to send ties when one is already sending many other ties (*expansiveness bias*, Feld & Carter, 2002; here called *outdegree-activity*), and to send ties when one is already receiving many other ties (*indegree-activity*). These effects model the indegree variance, outdegree variance, and indegree–outdegree covariance, respectively. We will discuss their meaning in the results section.

4 Results

4.1 Descriptive statistics

The descriptive statistics of the analyzed networks are summarized in Table 2a (cross-sectionally) and 2b (longitudinally).

In the beginning of the study, employees on average attributed power to 11 colleagues and nominated equally many as friends; these numbers went down over time to 7 and 9 respectively, at the end of the study. The power network shows a stronger variance in indegrees than in outdegrees, indicating that there is more agreement about whom to nominate as powerful than about how many to nominate as powerful. The size of one's power base (the indegree) carries more information for differentiating employees than one's willingness to attribute power (the outdegree). For friendship, the opposite is the case, indicating that there is less agreement about who is a friend than there is about how many friends one has. Actors' willingness to nominate colleagues as friends (outdegree) carries more information than their popularity among colleagues (indegree). Finally, friendship has higher reciprocation indices than power, and lower transitivity indices. Noting that transitivity is consistent with a hierarchical ordering of employees while reciprocity is intrinsically egalitarian, the overall and unsurprising picture that emerges from these descriptives is one of a hierarchically structured power attribution network and a more egalitarian friendship network.

Table 2a. Cross-sectional description of the two networks.

	Respondents	Average degree	SD (out)	SD (in)	Reciprocity	Transitivity
Power attribution						
Wave 1 ($N = 44$)	27	11.3	5.7	7.8	0.59	0.64
Wave 2 ($N = 42$)	26	9.3	5.3	6.7	0.47	0.70
Wave 3 ($N = 38$)	31	7.4	4.7	6.9	0.63	0.54
Friendship						
Wave 1 ($N = 44$)	28	10.6	7.3	4.7	0.75	0.59
Wave 2 ($N = 42$)	28	11.4	9.0	4.3	0.74	0.63
Wave 3 ($N = 38$)	34	8.6	7.8	4.2	0.69	0.55

Note: The reciprocity index is the fraction of ties that are reciprocated; the transitivity index is the proportion of indirect ties (two-paths) that are closed by a direct tie.

Table 2b. Longitudinal description of the two networks.

	Hamming	Jaccard
Power attribution		
Wave 1 \rightarrow Wave 2	110	0.58
Wave 2 \rightarrow Wave 3	121	0.52
Friendship		
Wave 1 \rightarrow Wave 2	134	0.59
Wave 2 \rightarrow Wave 3	143	0.57

Note: The Hamming distance is the number of tie swaps observed in a period (i.e. the number of broken ties plus the number of newly created ties). The Jaccard index is the proportion of stable ties in a period among the ties that existed at least at one of the two observation moments.

The dynamics of the networks summarized in Table 2b show that it will be possible to estimate a reasonably complex stochastic actor-based model like ours with reasonable power. Jaccard indices are all above 0.5, indicating that more than 50% of ties per period are stable, which will make it possible to identify the structural effects (the RSiena manual recommends Jaccard indices above 0.3; Ripley et al., 2015, p. 20). Hamming distances measure the minimum amount of tie swaps needed to connect two observations. As such, they give an indication of statistical power of the analysis. In our case, more than 100 actor decisions per network per period need to be made by the actors, resulting in a reasonable sample size (in terms of tie swaps) and correspondingly reasonable power.

4.2 Results from the multiplex actor-based model

The results of the multivariate analysis are reported in Table 3a (for the outcome network *friendship*) and 3b (for the outcome network *power attribution*). We first

Table 3a. Results from RSiena analysis of the co-evolution of friendship and power attribution (friendship part of the model).

Friendship dynamics		
Effect	Estimate	St.error
Rate of change		
Period 1	17.0	1.88
Period 2	16.3	1.44
Basic dyad effects		
Outdegree	-3.91***	0.30
Reciprocity	1.21***	0.17
Closure-related effects		
Transitive triplets	0.20***	0.03
Transitive reciprocated triplets	-0.11**	0.03
3-cycles	-0.11***	0.03
Degree-related effects		
Indegree-popularity	0.034*	0.013
Outdegree-activity	0.005	0.007
Indegree-activity	0.055**	0.018
Homophily dimensions		
Same team	0.57***	0.09
Tenure similarity	0.41*	0.20
Same formal function	0.17†	0.09
Same sex	0.32	0.25
Age similarity	0.37†	0.22
Cross-network effects		
Power (H1a)	0.59†	0.34
Reciprocity with power	0.46**	0.17
Indegree power alter (H1b)	-0.013*	0.007
Self-monitoring-related effects		
Self-monitoring ego	-0.22†	0.12
Self-monitoring ego × power (H3a)	0.56†	0.30
Self-monitoring ego × indegree power alter (H3b)	0.005	0.014

† $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

discuss the results of the effects used for testing our hypotheses, and then give a comprehensive overview of the other effects. The status value hypothesis (H1) suggested that (a) own and (b) third actors' power attributions explain friendship relations. The results can be found in Table 3a in the section of *cross-network effects*. They show a weakly significant positive effect of own power attributions on friendship nominations ($\theta = 0.59$, $p < 0.1$). This suggests that overall employees were more inclined to befriend those co-workers they personally considered to be powerful, i.e. evidence for Hypothesis 1(a). With regard to other actors' power attributions, we even find a small but significant *negative* effect ($\theta = -0.013$, $p < 0.05$), which means that those employees considered to be powerful by more colleagues are less likely to be nominated as a friend—a rejection of Hypothesis 1(b).

Staying with the dependent network *friendship*, we continue with the test of Hypothesis 3, which predicted that high self-monitors are to a greater extent than


others driven by instrumental motives, and therefore, may be particularly prone to befriend those co-workers that (a) they or (b) others consider powerful. These hypotheses were tested by an interaction between self-monitoring and the effects used to test Hypothesis 1. The results are reported in the section *self-monitoring-related effects* of Table 3a. There is statistically weak evidence that self-monitoring indeed strengthens an employee's tendency to befriend those actors she herself considers to be powerful (interaction term $\theta = 0.56$, $p < 0.1$). Moreover, high-self-monitors are generally more selective in their friendship nominations (main effect $\theta = 0.56$, $p < 0.1$). With regard to Hypothesis 3(b), no significant result was found ($\theta = 0.005$, n.s.), meaning that high self-monitors are not more inclined than others to befriend employees that receive power attributions from many other colleagues. In sum, these results suggest that not all employees are equally inclined to befriend the powerful, rather the more instrumentally oriented ones (high self-monitors) build personal ties to the colleagues they deem as powerful.

The status signaling hypothesis (H2) posits in general that the friends of co-workers whom one perceives as powerful will also come to be seen as powerful. More specifically the claim is that this happens (H2a) “downstream”, i.e. a powerful actor nominating a powerless friend will lead to this friend also being considered powerful by others, as well as (H2b) “upstream”, i.e. a powerless actor nominating a powerful friend will lead to the powerless actor being considered powerful, too (the common reasoning behind the so-called basking in reflected glory effect). The general effect is estimated in the section labeled *cross-network effects* in Table 3b and is, as predicted, positive and significant ($\theta = 0.05$, $p < 0.01$). This implies that whenever one of two friends is considered to be powerful by a third actor, the other also will come to be seen as powerful. The nuanced hypotheses are tested by score tests as explained above, i.e. the parameters are not estimated but rather the sensitivity of the likelihood function to their inclusion is assessed. We see that the “downstream” hypothesis (H2a) (when the powerful call someone a friend, this friend will also be seen as powerful) is weakly supported ($z = 1.93$, $p < 0.1$), while the “upstream” hypothesis (H2b) (when you call a powerful colleague a friend, you will also be regarded as powerful by others) is not ($z = -1.33$, $p > 0.1$). We therefore conclude that the significant overall effect is likely due to the “downstream” variant, not the “upstream” one. This implies that actors do not gain power by merely claiming friendship to the powerful, they only do when the powerful acknowledge the friendship—a nuance that deepens our understanding of the mechanisms underlying the “basking-in-reflected-glory” effect.

Next to the hypotheses-specific effects, there are a few additional effects of the multiplex/cross-network kind that are of interest. Results show that employees tend to reward incoming power attributions by an outgoing friendship nomination (Table 3a: $\theta = 0.46$, $p < 0.01$), but do not reward incoming friendship nominations with outgoing power attributions (Table 3b: $\theta = 0.16$, $p > 0.1$). Furthermore, score tests show strong evidence for the fact that people who are strongly embedded in the friendship network—be it by receiving, be it by sending many friendship nominations—are generally not likely to be seen as powerful ($z = -2.17$, $p < 0.05$ and $z = -3.65$, $p < 0.001$, respectively).

The remaining effects serve as controls needed to minimize bias in the effects of interest that were already discussed. In both networks, we find substantial

Table 3b. Results from RSiena analysis of the co-evolution of friendship and power attribution (power attribution part of the model).

Power attribution dynamics			
Effect	Score test	Estimate	St.error
Rate of change			
Period 1		18.8	1.40
Period 2		12.9	1.09
Basic dyad effects			
Outdegree		-4.55***	0.26
Reciprocity		0.62**	0.22
Closure-related effects			
Transitive triplets		0.13***	0.03
Transitive reciprocated triplets		-0.08†	0.04
3-cycles		-0.13**	0.04
Degree-related effects			
Indegree-popularity		0.081***	0.005
Outdegree-activity		0.009	0.009
Indegree-activity		0.047***	0.010
Homophily dimensions			
Same team		0.32**	0.10
Tenure similarity		-0.11	0.19
Same formal function		0.09	0.11
Same sex		0.57†	0.31
Age similarity		0.31	0.26
Cross-network effects			
Friendship		0.48	0.11
Reciprocity with friendship		0.16	0.22
Mixed transitivity with friendship (H2)		0.05**	0.02
Score-tested effects			
Mixed transitivity with friendship (H2a)	1.93†		
Mixed transitivity with friendship (H2b)	-1.33		
Indegree friendship alter	-2.17*		
Outdegree friendship alter	-3.65***		

† $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

evidence for reciprocity, closure, degree-related variability, and homophily in the networks. Of the latter category, interestingly, power attribution is characterized by sex homogeneity (power is attributed to others of the same sex) and tenure dissimilarity (apparently, lower-tenure employees attribute power to higher-tenure employees), while friendship is characterized by tenure similarity (friends are picked from similar levels of tenure) and shows no sex-based segregation.

5 Discussion and conclusion

Despite its pivotal role for small group dynamics, it is only recently that the nexus between power and trust has received systematic attention. Drawing on a motivated cognition framework and applying stochastic actor-oriented modeling on longitudinal social network data, this study explored the co-evolution of informal

power and interpersonal friendship in a Dutch childcare organization. Our analyses show that individuals, and in particular high self-monitors, build close interpersonal relations with those colleagues whom they deem informally powerful, and attribute power to those whom the powerful consider as a friend.

Before reflecting on the possible implications of these findings for research on the power-trust nexus, one limitation of our study needs to be taken into account. Our data were collected in one department of a non-profit organization in the Dutch child-care sector. The participants were mainly female pedagogic professionals, and the work environment could best be characterized as very sociable and cooperative. More research is needed to assess the generalizability of our findings to a broader range of organizational settings. In particular, the size and the organizational culture may vary between organizations. This, in turn, may affect the way in which the power and trust dynamics we have reported here unfold. Although our exploratory ethnographic study supports the notion that power and status competition are not the driving forces behind the relational dynamics in this particular organization, we nevertheless were able to show that employees differ considerably in their approach to building relationships. High self-monitors were more driven by the personal goal of achieving recognition and improve their status position. The fact that we were able to identify these tendencies in such a small scale and cooperative setting suggests that they may be even more prevalent in larger and more competitive organizations.

Our study has several implications for future research. First, whereas this longitudinal organizational network study provides some support for the findings of earlier experimental-motivated cognition research, it also points towards the need for further refinement. Specifically, it suggests that besides cognitive dissonance reduction there are many other potentially important motives that may drive the attribution of power and the development of interpersonal trust relations in organizations. Status motives play a particularly important role in this context, since they may influence not only whom we build close interpersonal relationships with, but also whom we perceive to be powerful in the first place.

Second, interpersonal differences matter. Our evidence confirms that individuals with a specific disposition—high-self monitors—tend to have a more instrumental approach to social relationships than low self-monitors. It appears that this group is particularly selective when it comes to nominating certain people as friends. The high self-monitors strategically invest in building closer interpersonal relations to the high-power co-workers than the less powerful ones. In doing so, they mostly rely on own power perceptions and are to a lesser degree influenced by the perceptions of other colleagues. Seen from this perspective, encapsulated interest can co-exist as one of several other motives driving cognitions in personal relationships. Put differently, whereas earlier research portrays encapsulated interest and motivated cognition as two competing mechanisms, our findings suggest that the former might be an element of the latter. But the current findings notwithstanding, the conditions under which individual social relations are transformed into a tool for accomplishing personal goals remains a relatively unexplored area of research. Future studies could shed light on important issues related to the instrumental and affective motivations in individual relationships and the specific mechanisms underlying their impact on the co-evolution of power and friendship.

Third, earlier motivated cognition explanations of *trust behavior* in decision experiments suggest that a powerful player “has no reason to engage in significant motivated cognition. Having multiple valuable exchange alternatives available, the power-advantaged party has little incentive to view his/her partner in a better light than the objective information would justify. In sum, according to the motivated cognition account, more powerful actors should place less trust in others compared to less powerful actors.” (Schilke et al., 2015, p. 2). Our model yielded a positive estimate of the multiplex reciprocity effect which suggests the opposite: individuals in our sample are more likely to nominate as friends those who perceive them as powerful, than those who do not perceive them as powerful. It needs to be stressed that this finding can be interpreted in at least three different ways. For one, it fits with the encapsulated interest mechanism as suggested by Schilke et al. (2015): the powerful anticipate the lack of exchange opportunities on the side of their less powerful exchange partners, and therefore trust them more than they would trust high power exchange partners. Furthermore, and in line with the previous, it could reflect a strategic attempt by high-power individuals to recruit a group of followers or allies, using signals of personal trust as an instrument to motivate them to stay connected to them, rather than moving into the sphere of influence of powerful others. Finally, the finding could be interpreted in line with a motivated cognition perspective, and more specifically with a third mechanism: when it comes to the initiation and maintenance of *close interpersonal relations*, high and low power individuals might be equally subject to reciprocity expectations, which usually loom large in situations of repeated interaction and thus in any social relation (e.g. Molm et al., 2007). Reciprocity implies the normative obligation that one should not benefit from other person’s benevolence without providing an appropriate compensation in return. The expectation that benefits will be given in return for benefits received—“reward your friends, punish your enemies” (Strauss, 1973, p. 358)—is also salient in organizational settings (Blau, 1955; Winstead & Derlega, 1986). But in order to disentangle to what degree and when these three alternative mechanisms underlying the interpersonal trust behavior of the powerful actually hold would require the availability of far more fine grained psychometric measures than available in our study.

Fourth, the present study also shows the strong potential of research designs that allow the investigation of network co-evolution. For example, the evolution of interpersonal trust in organizations has usually been studied independently of power attributions (e.g. Van de Bunt et al., 2005; 1999), thereby underestimating the substantial role of other kinds of relationships in shaping them. Our finding that power perceptions may serve as a pathway to establishing close interpersonal relations, rather than hamper their emergence, as some exchange theorists assume, is yet another indicator that the field will benefit from more research on network co-evolution.

Finally, our status value and status signaling hypotheses also extend prior research from the dyad to the triad level. In line with earlier studies (e.g. Kilduff & Krackhardt, 1994; Mehra et al., 2009), the significant parameters in our results confirm that third party embeddedness can have strong reputational consequences: the mere perception that a prominent group member considers someone to be a friend enhances this person’s power position in the perception of the rest. The fact that we found evidence

of such a dynamic in a highly collaborative small non-profit setting, indicates how strong status considerations permeate perceptions and behavior in human groups.

To conclude, while being in line with earlier research on the importance of motivated cognition as a key mechanism behind the nexus between power and trust, our study also extends this important line of research by moving beyond the motive of cognitive dissonance reduction, and by demonstrating that motivated cognition plays a pivotal role also for the co-evolution of power and trust in real-life organizations.

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