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Multiplexity, generalized exchange and cooperation in organizations: a case study

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Abstract

Cooperation in an organization can be studied empirically by examining the routine transfers or exchanges among members of various kinds of resources. We argue that local regularities in the form of these transfers and exchanges shape the structure of cooperation. Using a case study of resource networks in a corporate law firm, we model the structure of cooperation in a specific work environment, one that is characterized by multifunctional and sometimes multidisciplinary work groups in which 'status competition' is argued to be a particularly strong motivation driving participation. Specific statistical tools, p^* models, are used to identify local regularities in the interplay between exchanges and transfers of three types of social resource (coworkers' goodwill, advice and friendship). We propose that these regularities help to provide structural solutions for the problems of collective participation and status competition in such organizations.

1. Introduction

In organized settings, participation in collective action—i.e., team production, regulatory activity, or enforcement of previous agreements—requires cooperation with others. As many authors have previously argued, this cooperation can be investigated by examining the routine transfers or exchanges of various kinds of resources among participants (Lévi-Strauss, 1949; Gouldner, 1960; Ekeh, 1976; Crozier and Friedberg, 1977; Galaskiewicz and Marsden, 1978; Burt, 1982; Cook, 1987, 1990; De Graaf and Flap, 1988; Lazega, 1994; Lin, 1995; Bearman, 1997; Breiger and Ennis, 1997;

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Lindenberg, 1997; Han and Breiger, 1998): such resources include information, coworkers' goodwill, advice, emotional support, and many others. Using a case study, a network study of a corporate law firm, we investigate how three important production-related resources (coworkers' goodwill—understood as strong commitment to collaborate—, advice and friendship, or role-distance) are exchanged by members of the firm. We analyze the interlocking of these exchanges and identify regularities among them that go beyond any transfer of a single resource. We argue that these regularities provide a structural answer to the problem of members' participation in collective action. By giving rise to expectations about future patterns of exchange, these regularities help to give cooperative meaning to particular transfers and exchanges.

We also argue that, since the problem of orderly collective participation requires simultaneous consideration of the commitments of many members, it is unlikely that these regularities are confined to dyadic exchanges. Any particular exchange or transfer of resources occurs in a context of other exchanges and transfers, and regularities in patterns of exchange involving more than two members provide one possible means by which particular exchanges are integrated into a wider collaborative effort. Lévi-Strauss (1949), among others, recognized the importance of regularities in exchange systems that involve substructures larger than the dyad, and distinguished direct or *restricted exchange* (dyadic) from indirect or *generalized exchange* (structural). The latter type allows that productive members can share several types of resources with team members without the need for immediate reciprocity. Rather, in a generalized exchange system, members' cooperation involves forms of indirect reciprocity that take into account several resources as well as exchanges with other participants.

We argue that regularities in the transfer or exchange of resources are likely to be particularly important in an organization such as the one studied here, in which temporary teams composed of partners and associates (at least one of each) constitute multifunctional and sometimes multidisciplinary (litigation, corporate) workgroups. These small, flexible and heterogeneous workgroups (Lazega, 1992a, 1999b) must be able to cooperate quickly and efficiently in order to react to complex nonstandard problems. The importance of cooperation in these teams to effective individual participation is evident from the fact that individual economic performance is positively and significantly associated with team membership and constraint (Lazega, 1999a).

A specific aspect of cooperation in such a 'collegial' firm (Waters, 1989) involves what can be termed *status competition* (Bourricaud, 1961). Work in a partner–associates team can be very deliberative: 'brainstorming' and 'status auctions' (Sutton and Hargadon, 1996) are common. But at some point in these deliberations, there is often a need for someone, usually the partner in charge, to step in and stop the deliberation. This is an action likely to create conflict, and it may therefore be necessary for other members to help alleviate the negative effects of this hierarchical intervention. In this paper, we argue that regularities in the structure of exchanges in the firm may serve, in part, to mitigate this problem of status competition.

After describing the case study in more detail below, we introduce a set of broad expectations about the forms of exchange regularities. We then briefly describe the p^* models (Wasserman and Pattison, 1996; Pattison and Wasserman, in press) used to analyze the interplay between three social resources shaping cooperation among these

professionals, and identify the specific regularities in local and multiplex exchange substructures which describe the organization of this cooperation.

2. Lawyering together in a corporate law firm

In order to assess the possible implications of specific regularities in exchange structures in the firm, it is important to understand the work process typical of professional members in this organization, as well as the resources needed to carry it out (Crozier and Friedberg, 1977; Lindenberg, 1997). The case study is based on fieldwork conducted in 1991 in a Northeastern US corporate law firm, here called Spencer, Grace and Robbins (SG&R). At the time, the firm comprised 71 lawyers (36 partners and 35 associates) in three offices located in three different cities. All the lawyers in the firm were interviewed. In the terminology of Nelson (1988), the firm is a 'traditional' rather than 'bureaucratic,' with no formally defined departments. Interdependence among attorneys working together on a file may be strong for a few weeks, and then weak for months. As a client-oriented, knowledge-intensive organization, the firm tries to protect its human capital and social resources, such as its network of clients, by the usual policies of commingling partners' assets, including clients, experience and innovations (Gilson and Mnookin, 1985), and by the maintenance of an ideology of collegiality. Informal networks of collaboration, advice, and 'friendship' (socializing outside work), are argued to be crucial to the integration of the firm (Lazega, 1992a).

SG&R is a relatively decentralized organization that grew out of a merger, but it has no formal and acknowledged distinctions among profit centers. Although not departmentalized, the firm comprises two general areas of practice: the litigation area, involving about half the lawyers of the firm; and the 'corporate' area, including anything other than litigation. Sharing work and cross-selling among partners is done mostly on an informal basis. Given the classical stratification of such firms, work is supposed to be channelled to associates through specific partners, but this rule is only partly respected.

A weak administration provides information, but does not have many formal rules to enforce. The firm has an executive committee comprising a managing partner and two deputy managing partners who are elected each year, renewable once, from partners who are prepared to perform administrative tasks and temporarily transfer some of their clients to other partners. At the time of the study, the incumbent managing partner was not a 'rainmaker' and did not concentrate strong powers in his hands. Rather, he was a day-to-day manager, making recommendations to functional standing committees (finance, associate, marketing, recruitment, etc.) and to the partnership.

Partners' compensation is based exclusively on a seniority lockstep system without any direct link between contribution and returns. The firm goes to great lengths, when selecting associates to become partners, to take as few risks as possible that they will not contribute adequately to the work of the firm. In the event of 'free-loading,' partners have the power to 'punish' each other seriously by preventing elevation to the next seniority level in the compensation scale. A partner can be expelled, though, only if there is near-unanimity against him or her, and buying out a partner is very difficult and

costly. Therefore, despite the existence of direct financial controls, the firm does not have many formal ways of dealing with 'free-loading.' The harm that a single partner can inflict on others might become very substantial in the long run. Informally, partners can try to isolate one of their own by, at the very least, not referring clients, not 'lending' associates, and not providing information and advice.

The organization of work in the firm prescribes that, when the firm takes in a client and opens a file, two lawyers at least (one partner and one associate) must be assigned to the case. Since clients are usually corporations, the cases are often large and the team may include more than two lawyers. This does not mean that team members necessarily perceive each other as reliable coworkers (Lazega, 1992a, 1999b). Partners keep their autonomy in the negotiation of means and ends, and associates are often expected to brainstorm with higher status members. This creates a pseudo-market for strong cooperation between members with similar and different statuses.

When deliberating about a case, associates and partners can sometimes adopt temporarily collegial and egalitarian attitudes in which all arguments have equal weight. However, at some point, partners' greater experience, greater skill and judgment, or responsibility to the client, becomes a ground for justifying stopping these exchanges and for making a decision about how the case will be handled and efforts allocated. This is often perceived as autocratic behavior on the part of partners, with partners imposing idiosyncratic standards of proper practice on frustrated associates, but the latter rarely say so. They hope to advance to the top of the associate pyramid, and to become partners. To partners, having the final word with associates seems to be an obvious duty as a service-provider and as a professional educator. Differences among partners, though, may be treated simply as differences in style; but they may also trigger associates and partners to seek advice from partners outside the temporary team. Partners whose advice and arbitration are sought in such situations are usually of higher status and more senior (Lazega, 1995; Lazega and Van Duijn, 1997) and may be required to smooth over potentially conflict-laden situations, for example, by either sustaining or attempting to moderate these contentious differences in view.

3. Cultivating and mitigating status competition

This form of status competition is likely to be an efficient mechanism for motivating professionals at work. If receiving social approval from peers is one of Weberian value-oriented actors' goals, allocation of this approval through honors and recognition —along with the privileges of rank in the pecking order—is a powerful motivation device. However, status competition can also get out of hand. Status can be endlessly challenged, especially on behalf of different conceptions of professionalism. In this firm, status-related conflicts can become personalized. They can subsequently have negative or destructive effects on learning and on the circulation of knowledge and experience (Lazega, 1992b, 1995). Of course, there are always moral exhortations to preserve consensus among peers, but these can remain artificial and rhetorical. However stimulating, competition can easily get in the way of cooperation, and professionals know that

they can lose control of this process. Status competition is thus a double-edged sword, and it is both encouraged and contained.

From a management perspective, status competition creates problems for professional organizations and firms, as they are always in danger of unraveling (Olson, 1965). It is therefore of some interest to understand how status competition is contained. Economic approaches to labor markets (Frank, 1985) assert that incentives such as specific compensation systems take care of the negative effects of status differences. Thus, low performers and low status members tend to be over-compensated relative to the value they produce, whereas high performers and high status members tend to be under-compensated relative to the value they produce: they pay a price for being recognized as high status members. The firm's lockstep system can therefore be considered a mitigation device for economic status competition among partners. A majority of partners support the lockstep system, since they believe that it prevents yearly conflicts among themselves, especially conflict about each member's value to the firm.

Since compensation in the firm is tied to seniority, and since each member's rank in the seniority scale is defined once and for all, status competition loses one of its most dangerous stakes, namely, money. But it is thus refocused on other issues at stake, such as professional reputation and authority in workgroups. For example, partners can put down associates through associate reviews, which can also be considered to be humbling rituals, illustrating to associates that there are acceptable limits to challenges to partner status in the work process (Bosk, 1979; Nelson, 1988; Lazega, 1993). The effects of these humbling rituals are softened by comparisons to other associates or by other members who indicate that they would have behaved or handled the case in another way. Status differences among the ranks are nevertheless underscored (Bosk, 1979: p. 143). [2]

4. Production-related resources: coworkers' goodwill, advice and friendship

Since work in the firm is carried out by case-driven teams that are dependent on both cooperation and status competition, it is important to examine the transfers and exchanges of resources central to the functioning of such teams, including resources that might be involved in the mitigation of status competition. Here, we consider three types of resources: coworkers' goodwill, advice and friendship or 'role distance.' As in any

[2] This process is similar to the 'subtle give-and-take' identified and analyzed by Charles Bosk's classic *Forgive and Remember* (Bosk, 1979: p. 143) between senior and junior surgeons (in senior members' work of junior socialization to the profession). On the one hand, senior members encourage subordinates to question the grounds of their (seniors') action; yet, on the other hand, senior members also try to limit that questioning so that it does not impair the quick judgments necessary in surgery. This similarity holds even though ritualized self-criticism seems much more limited in corporate law firms than in surgery wards. Surgeons are socialized into the heroic ideal of grace under pressure (Bosk, 1979: p. 144). Lawyers live in a much more adversarial environment.

organization, there is an unequal distribution of such resources among the members of this firm.

The first type of resource is *coworking*, indicating a commitment to work, or goodwill related to cooperation. Given the flexibility needed to accommodate clients' needs, and the size and complexity of some files, a good and committed coworker is an important resource for individual attorneys. When working on a case, partners usually decompose the problem into several parts, and attribute to each associate working with them a small part of the task to be performed (Nelson, 1988). Forced cooperation is routine for many partners and most associates, but members also give themselves room to manoeuvre and to be strategic in their choices of coworkers. In this structure, partners and associates need one another. For example, partners may depend on each other because they may share a client in a large and complex file. This form of cooperation is thus dictated by the requirements of the market. In addition, one well-known way of keeping a client is to cross-sell services that can be provided by partners of different specialties. Thus, a client who initially needs advice for a specific problem, say buying a shopping mall, will also be offered tax and litigation services by the firm. This increases revenues and helps to establish a relationship with the client. Sharing work and cross-selling among partners is done mostly on an informal basis, although less so among lawyers in general when including associates.

Under such organizational and professional rules, members of the firm have two preoccupations: finding interesting work; and getting cooperation from colleagues to carry it out, especially colleagues who are interested in a long-term relationship, *and not in taking advantage of them*. Most members want shared work with reasonable people who will 'pull their weight' and will not grab all the credit for themselves, especially in successful cases. An important concern is therefore to build strong, secure, and durable work relationships with others. Partners want to be able to rely on other well-connected partners and on flexible associates; associates want to be able to rely on rewarding partners. In other words, strong work ties are a sort of insurance policy: they provide security beyond the short-term horizon of current commitments.

The second type of resource is *advice*. SG&R organizes work among experts who often refer to abstract legal knowledge. The nature of knowledge-intensive work requires accumulation, transfers and exchanges of knowledge and experience. In this context, transfers and exchanges of advice among members can be seen as vital, indeed as one of the main reasons for the existence of such knowledge-intensive firms. Members rely constantly on advice from others. Advice can be seen as a product of goodwill, but it is also different from goodwill in the sense that it can be provided by someone who is not necessarily a strong coworker. In law firms of this type, advice is not billed to the advice-seeker. It does not show in lawyers' time sheets or in firm accounts. Advisors cannot claim credit in successful cases. Lawyers who are not assigned to a case may advise, but if they want to claim their share of the credit they would have to become official coworkers on the case. This is accepted only beyond a certain contribution and negotiated with the lawyers already in charge. It is difficult to predict unilaterally when providing advice may become collaboration. To seek advice in such a context is therefore sometimes a delicate operation. In a law firm which structures itself so as to protect and develop its human and social capital (Wilensky, 1967; Smigel, 1969; Gilson

and Mnookin, 1985; Nelson, 1988), such a resource is particularly vital to individual members. Members see expertise as accumulated by the firm, and they rely constantly on advice from others. Without it, they cannot solve the usually complex legal problems that they handle (Lazega, 1995). In sum, members sought out for advice are likely to be members with high status (Blau, 1964; Lazega and Van Duijn, 1997; Van Duijn, 1995; Van Duijn and Snijders, 1995).

The third type of resource is *friendship*, understood as a form of open-ended support which is not related to the work tasks themselves. Rather, it is a form of 'backstage resource,' to use the idea of Goffman (1961) of a place where actors retreat to create some distance between themselves and their formal roles. We call this support friendship, and understand it, in a nonromantic way, as a willingness to help in difficult situation by providing different types of resources, such as role-distance, socialization, emotional support, information, and a definition of the situation. A friend is considered a potential source for many resources, for example, help in asserting or negotiating one's status, for carving out a place for oneself in the group. The importance of this definition of friendship is that it does not assume reciprocity and is not directly connected to the work process itself. Lawyers say that, in law firms, such ties tend to be forged among associates of the same class, or between associates who went together to the same law school, and to last throughout their career.

It might be surprising that friendship ties are described as a third type of resource to be considered systematically in a competitive corporate environment. When speaking about the firm in general, many members perceive that there are not many bases other than business for building ties with others. This underlies discourse about the firm as an 'almost exclusively' economic unit. [3] Friendship ties are not needed to drive the work process itself. However, even if general discourse on present day collegiality often stresses the contrast between a business-oriented firm and an idealized collegial past, members do mix professional and social ties with some selected colleagues in the firm. [4] The partners quoted here speak more of a general atmosphere, not of the existence of

[3] Listen for example to Partner 18: ''*Our firm is almost exclusively a joint economic enterprise. If I were to pick up a paper tomorrow morning and learn that a lawyer was hit by a car, I would be concerned. If he is in my firm, I would be more concerned. But that marginal difference would not be that significant. Unless I work with him, know his family and his children. There are lots of lawyers in the community that I care more about than for some of my partners. I see a partnership more like an economic unit. There is the economic sense of mutual obligation, of enhanced goodwill and cooperation. We help each other with work. I expect more goodwill from a partner than from a stranger, but that's all. 'I'll be glad to do that.' But my whole life does not revolve around my partners. When people are too close, it creates problems too. And it is not necessary for partnerships to survive. There is a leap of faith that's required that a partner would not seek a circumstance that is harmful to me. That may be naive. Our compensation system is a guarantee for that leap of faith. A change in that would undermine the sense of security that I feel with my partners.*'' Or to Partner 19: ''*I am amazed with the lack of emotional connectedness. Logistic support, sharing overhead, staff support: OK. But the lack of emotional connectedness assumes that people will have a rich enough life outside the office. They won't need to do it through the office. So if you vote for someone for partner, you have to think: does this person have enough of a life outside? Is he mature enough for us? Is he capable of respecting the taboos of the tribe?*''

[4] Overall densities for cowork, advice and friendship networks are 0.22, 0.17 and 0.11, respectively.

selected friendships and personalized relationships in the firm.[5] In general, they consider that, among business heads, sympathizing hearts also mean interference. Therefore, they tend to keep associates at arms' length, and friendship ties with most other partners are often uneasy. But the select few can help accept negative outcomes of status comparisons, and help deal with potential threats.

5. The structure of cooperation in the firm

What kinds of regularities might be expected in the transfer or exchange of these three types of resource? Recall that our central claim here is that transfers or exchanges involving any of the three types of resources are interdependent, and that this interdependence has important ramifications for the way in which particular exchanges might be understood, both by observers and by the participants. We claim, in other words, that exchanges do not occur at random or in a way that is determined only by the particularities of any two lawyers involved and their specific work at hand. Rather, collaborative exchanges occur in a local context of other collaborative or informal exchange ties. We argue that regularities in these contextual patterns give structure to collaborative exchanges, and so provide a means by which particular exchanges are integrated into a broader collaborative enterprise. Indeed, discernible regularities in the patterns of exchange should mean that any particular form of exchange develops a broader social interpretation, one that includes the likely exchange contexts in which it occurs. We claim that actors are likely to have some awareness of these contextual regularities and may use their implicit understanding of these patterns to inform their collaborative exchanges.

We can give some broad shape to our expectations of the form that these patterns might take, both from the preceding account of key issues for such professional organizations as well as from a wider set of claims in the literature. First, we might expect substantial reciprocity in the transfer and exchange of resources since, on the basis of the arguments reviewed earlier, an exchange of resources between a pair of lawyers is one way of ensuring orderly future collaboration. Specifically,

HI: Transfers or exchanges of resources are likely to occur in contexts of direct reciprocation or *direct exchange*.

Second, since coordination of collaboration needs to be achieved across the entire firm, we would expect the interdependence of resource ties to take forms that are not

[5] This comes across in Partner 13's following observation: ''*When the firm was small among other things all partners had a good idea of what other partners were doing. There was a much greater level of social integration, I think, firmwide. And a tendency to look much more inwardly toward the firm as sort of almost a family away from a family. In our instance probably thirty years ago the partners in the firm tended to represent the most central social circle for themselves. When the firm gets to be this size there is still a tendency to look inwardly toward the firm but it's obviously no longer a closely knit family because there are lots of partners that you won't see for weeks at a time. And so there tends to be if anything a tendency for partners to start to look outward from the firm as opposed to inward to the firm. The closeness tends to be reduced. Now what you have are people whose predominate social circles may include other lawyers within the firm. But probably include many more people outside the firm. That's a healthy development not an unhealthy development.*''

simply dyadic. Instead, at least triadic and possibly higher-order interdependencies might be expected. Resources are not infinite and in contemplating a transfer or exchange involving another member of the firm, a lawyer is likely to take account of his or her own experience and commitments to third parties as well as those of the other lawyer. The precise form of these interdependencies is likely to depend on the types of resources involved, since transfers or exchanges of each type are likely to be subject to different constraints. For example, some resource exchanges might be expected to exhibit some of the characteristics of indirect or generalized exchange, whereas others, like advice-seeking, might be expected to reflect status differences, and so to demonstrate more hierarchical patterns of interdependence. Thus,

HII: Interdependencies among resource ties that are triadic in form are likely to occur. The precise form of such interdependencies is likely to depend on the types of resource ties involved.

The form of extra-dyadic interdependencies involving several types of resource ties are also difficult to predict, but we can, nonetheless, draw out some general expectations regarding their likely form from the preceding discussion. We would expect, for example, considerable extra-dyadic interdependence among collaborative exchanges and advice-seeking, since, as noted earlier, advice is likely to be sought out in relation to problems induced by collaboration (see also Morrill, 1995). One such class of problems involves disputes over opinions; the advice of higher-status partners is likely to be sought. As a result,

HIII: Collaborative and advice ties are likely to exhibit strong extra-dyadic interdependence.

In addition, friendship and advice ties are likely to be interlocked, since as Lazega and Van Duijn (1997) have argued elsewhere, friendship ties may be used to soften the potentially negative effects of status competition. Moreover, the presence of friendship ties is likely to create a context for advice-seeking in difficult situations. Hence,

HIV: Advice and friendship ties are likely to show both dyadic and extra-dyadic patterns of interdependence.

Finally, although propinquity through collaboration is likely to be one possible precursor to friendship, views like those of the partners cited earlier on the mixing of collaboration and friendship, and the fact that partners always have the upper hand over associates in the same workgroup, are likely to mean that any dependence is weak. That is,

HV: Collaborative and friendship ties are likely to demonstrate only weak dyadic and extra-dyadic interdependencies.

These expectations are evaluated using the p^* class of multivariate random graph models (Frank and Strauss, 1986; Strauss and Ikeda, 1990; Wasserman and Pattison, 1996; Pattison and Wasserman, in press; Robins et al., in press).

6. Data and analyses

Based on this organizational analysis of resources associated with production, standard sociometric data were collected in the firm. The name generators used to

conduct the network study are presented in Appendix A. As argued above, such ties represent channels for the transfer of various types of important resources among members of the firm. The first is the network of strong *cowork contacts*; close coworkers can be relied upon for their cooperation, they provide future work, more desirable work, or access to clients. [6] The second is the network of *advisors*; advisors provide solutions to, or make final decisions in, complex problems in a knowledge-intensive organization handling sophisticated legal cases. The third network is the *friendship* network, identified as socializing outside work; friends provide many different resources associated with role distance, such as emotional and symbolic support, or a definition of the situation.

In order to evaluate the expectations derived above, it is necessary to formulate a model that permits dependencies among network ties. Only with such a model is it possible to identify the specific forms of regularity in the exchange of resources that may help members to solve the problems of collegial organizations, such as status competition. The p^* class of models was developed specifically for the analysis of tie interdependencies and is used here to analyze interdependencies among the *coworker*, *advisor* and *friendship* networks.

6.1. The p^* class of models and model selection strategy

Models within the multivariate p^* class are probability models for multirelational networks (Pattison and Wasserman, in press). In their most general form, p^* models express the probability of an overall multirelational network structure in terms of parameters associated with particular network substructures. [7] By *substructure*, we mean a specific hypothetical configuration of network ties linking a small set of network members, for instance, a pair of lawyers joined by mutual cowork ties, or a triple of

[6] Note that the name generator elicits recalled behavior, but 31% of the choices of a strong coworker are not reciprocated. While there is some room for asymmetric responses to the name generator, the level of asymmetry probably means that some work relationships recalled and expected to be strong and reliable by i may not be perceived in the same way by j. In the description of the mechanism of mitigation of status competition, we consider that reciprocated strong coworker ties are actually strong enough to guarantee the triggering of status competition. Members strongly involved together in cooperation compete for status. This is an assumption that trusts respondents' perception when it is mutual. Description of the mitigation process is mainly based on configurations that include such dyads. However, we do not consider that unreciprocated choices of a strong coworker are purely imaginary. They may involve a misunderstanding by i of the extent to which j is prepared to cooperate; but it is still safe to assume that in this case, i will provide j with strong cooperation, even if j does not reciprocate *in kind*. We therefore consider that this unreciprocated choice is highly informative in itself about asymmetric transfers of resources, especially when such asymmetric transfers are systematic enough to occur in regular patterns of the kind identified below.

[7] The model is $Pr(X = x) = \exp(\Sigma_A \lambda_A \Pi_{X_{ijm} \in A} x_{ijm})/\kappa$, where X is a random multivariate network with possible ties X_{ijm} (X_{ijm} denotes a possible tie of type m from lawyer i to lawyer j); x is a realisation of X comprising observed network ties x_{ijm} (with $x_{ijm} = 1$ if there is an observed tie of type m from lawyer i to lawyer j, and $x_{ijm} = 0$, otherwise); A is a subset of possible ties (defining a substructure of interest); λ_A is a parameter associated with the substructure A (to be estimated); and κ is a normalizing quantity.

lawyers, two of whom are linked by mutual advice ties and a third linked by friendship to one of these two. The substructures appearing in the model are determined by the independence assumptions that one makes: specifically, the substructures are defined by sets of possible exchange ties, each pair of which is assumed to be conditionally dependent, given the remaining ties. (The number of possible ties in a particular substructure is termed the *level* of the substructure.) Pattison and Wasserman (in press) have argued that the multivariate Markov assumption permits one to examine many of the forms of interdependence among ties that have been proposed in the network literature. These forms are associated with notions of role-set, exchange, path-dependence, structural position and actor effects. The multivariate Markov assumption specifies that two possible network ties are conditionally independent, given all remaining ties, unless the pair of possible ties has a lawyer in common. The consequence of this assumption is that multiplex ties and multiplex dyadic and triadic configurations are all potentially critical in modelling the overall network structure. [8]

In order to describe the exchange system of the firm, we present analyses based on the p^* class of models in two stages. In the first stage, we identify a reduced univariate Markov random graph model (Wasserman and Pattison, 1996) for each of the three network relations (cowork, advice and friendship). These models analyze the network distribution of each kind of resource in the firm in terms of local dyadic and triadic characteristics. In the second stage, we derive a multivariate p^* model for the three network relations simultaneously. This model is based on the multivariate Markov assumption and allows us to explore interdependencies among the three types of relations that can be evaluated at the level of ties, dyads and triads.

If a substructure has a large positive parameter in a p^* model, then the presence of the substructure enhances the likelihood of the overall network. All models presented here are homogeneous in the sense of assuming that a relational substructure of a given form (e.g., a pair of reciprocal friendship ties, or some particular triadic structure) has a constant effect on the likelihood of the overall network structure and is not dependent on attributes of the participating nodes. As a result, the models have a single parameter corresponding to each possible substructure, and a large positive parameter for a substructure indicates that networks exhibiting regularities of the form specified by the substructure have enhanced probability (other substructures being equal).

Parameters are estimated in all cases using pseudolikelihood estimation (Strauss and Ikeda, 1990; Pattison and Wasserman, in press). The approximate standard errors that accompany the pseudolikelihood estimates are given only for guidance as to likely order of magnitude; all comparisons among models are based on two indices of model fit,

[8] In the case of a multirelational Markov assumption, the model for the network is expressed in relation to substructures of a multivariate triad, or of a multivariate *star* of order $n-1$ (for a network of n nodes; see Pattison and Wasserman, in press). We have not reported analyses of the role of higher-order stars of order three or more (that is, of substructures comprising three or more ties directed to or from a member of the firm), since preliminary investigations suggested that higher-order stars play a much less substantial role than the multivariate triadic configurations on which we focus here.

Table 1
Fit of univariate Markov models for the advice, friendship and cowork relations

Level	Number of parameters	Advice		Friendship		Cowork	
		−2LPL[a]	MAR[b]	−2LPL	MAR	−2LPL	MAR
1	1	4677.8	0.295	3561.1	0.205	5264.2	0.346
2	5	3698.2	0.231	2194.1	0.125	3202.5	0.193
3	9	2852.9	0.174	1785.9	0.102	2982.0	0.180
4	13	2813.8	0.172	1756.6	0.101	2909.3	0.176
5	14	2809.7	0.172	1755.7	0.101	2907.2	0.176
6	15	2808.1	0.172	1749.2	0.101	2905.8	0.176

[a] −2LPL = −2 log pseudolikelihood.
[b] MAR = mean absolute residual.

namely −2 times the log of the maximized pseudolikelihood, and the mean absolute residual for each possible network. [9]

6.2. The local distribution of each type of resource

Table 1 reports the fit statistics for univariate models for the advice, friendship and cowork relations that include terms at increasing levels from 1 to 6. In the case of cowork, no improvement in fit is evident beyond the model that includes level 4 terms, whereas, in the case of both advice and friendship, it is clear that only marginal improvements in fit are obtained by including terms beyond level 3. To identify a more parsimonious model for cowork, the terms of the level 4 model were subjected to a hierarchical backward elimination procedure. [10] For advice and friendship, a backward elimination strategy was applied to the level 3 model. The resulting models are presented in Table 2 (cowork), Table 3 (advice) and Table 4 (friendship). The dyadic and triadic substructures corresponding to model parameters are identified in Fig. 1.

The cowork relation appears to have a local structure that is strongly suggestive of both restricted and generalised exchange (e.g., Bearman, 1997; Breiger and Ennis, 1997). Two of the parameters that are large and positive correspond to configurations in which cowork is exchanged directly among pairs of lawyers, namely, τ_{11_WW} (direct exchange for two individuals) and τ_{6_WWWW} (direct exchange of cowork by one lawyer with each of two others). In addition, the parameter for cyclic exchange among a group

[9] The mean absolute residual is computed as the average value of $|x_{ijm} - z_{ijm}|$, where z_{ijm} is the estimated value of $Pr(X_{ijm} = 1)$, computed from the conditional logit form of the p^* model, namely, logit $Pr(X_{ijm} = 1) = \Sigma_B \lambda_B \Pi_{X_{klh} \in BX_{ijm}} x_{klh}$), where B is the set of substructures including the possible tie X_{ijm}. The value of −2 times the log of the maximum pseudolikelihood is a general index of goodness of fit.

[10] The model elimination procedure is hierarchical in the sense that, at any step, only those parameters corresponding to higher-order substructures are considered for elimination (i.e., setting to zero). Thus, if one substructure is a subset of another substructure in the model at any step, only the second is considered for elimination at that step. The criterion for elimination of terms in model selection was a decrease in the value of −2 times the log of the maximum pseudo-likelihood of 10.8 or less.

Table 2
Pseudolikelihood estimates for univariate model for the cowork relation

Term	PLE	(Approx. SE)
$\tau_{3\_W,W,W,W}$	−0.135	0.022
$\tau_{6\_W,W,W,W}$	0.207	0.034
$\tau_{7\_W,W,W}$	−0.085	0.018
$\tau_{8\_W,W,W}$	−0.045	0.016
$\tau_{9\_W,W,W}$	0.130	0.014
$\tau_{10\_W,W,W}$	0.280	0.049
$\tau_{11\_W,W}$	4.184	0.415
$\tau_{12\_W,W}$	0.078	0.010
$\tau_{13\_W,W}$	−0.084	0.014
$\tau_{14\_W,W}$	0.092	0.016
τ_{15_W}	−3.320	0.280

$-2\text{LPL} = 2913.7$, MAR = 0.177.

of three lawyers (τ_{10_WWW}) is also large and positive. [11] The other positive parameters are τ_{12_WW}, τ_{14_WW} and τ_{9_WWW} and indicate several ways in which cowork ties can occur less symmetrically. In the case of τ_{12_WW} and τ_{14_WW}, it appears that some lawyers may express or be nominees for unreciprocated cowork ties with several (unconnected) others. In the case of τ_{9_WWW}, some transitivity in the arrangement of cowork ties is evident. The negative estimate for τ_{3_WWWW} suggests that configurations that 'break' the exchange balance inherent in the three-cycle are unlikely. Taken together, these parameters suggest a structure of cowork ties that is consistent, at least in part, with direct and generalized exchange of cowork. Further, it is clear from configurations such as τ_{6_WWWW} that these exchange structures may overlap, and so we are led to view the overall cowork structure as a collection of overlaid smaller exchange substructures. In addition to these structural tendencies, though, it is clear that cowork ties have some properties that would not be expected in a structure whose only 'logic' was that of exchange. These latter properties include a propensity for differentiation among lawyers in the expression and receiving of cowork ties, as well as a weak tendency towards transitivity. We discuss these characteristics further in the context of the multivariate p^* model below.

The advice relation has positive parameters for both reciprocity (τ_{11_AA}) and transitivity (τ_{9_AAA}), although the reciprocity parameter is not as strong as for the other two relations, presumably because lawyers sought out for advice tend to have equal or

[11] It is also worth mentioning that the estimated values of the parameters reported in Table 2 are virtually unchanged from their estimates in the level 6 model of Table 1; thus, the positive estimate for the cyclic effect in the model of Table 2 is not an artefact of the absence of higher-order triadic terms. In addition, we note that a separate analysis of symmetric cowork ties produces additional evidence of a generalised exchange structure. Specifically, the parameter corresponding to a four-cycle of cowork ties adds substantially to the fit of a model permitting cyclic and joint dyadic exchange and all three of these parameters are positive. This analysis together with the one reported in the text suggests that cowork ties possess a richly overlaid generalised exchange structure.

Table 3
Pseudolikelihood estimates for univariate model for the advice relation

Term	PLE	(Approx. SE)
τ_{15_A}	−2.190	0.184
$\tau_{14\_A,A}$	−0.016	0.008
$\tau_{13\_A,A}$	−0.077	0.007
$\tau_{12\_A,A}$	−0.016	0.008
$\tau_{11\_A,A}$	1.459	0.137
$\tau_{10\_A,A,A}$	−0.200	0.029
$\tau_{9\_A,A,A}$	0.287	0.012

$-2\text{LPL} = 2855.6$, MAR = 0.175.

superior status to advice-seekers: one does not seek advice from lawyers of lower status. In addition, the two-path parameter (τ_{13_AA}) and the three-cycle parameter (τ_{10_AAA}) are large and negative. This pattern of parameter values is consistent with tendencies toward both local clustering and partial ordering (e.g., see Johnsen, 1986), and suggests an advice structure that is globally hierarchical, with some local clustering.

The friendship relation has even larger positive reciprocity (τ_{11_FF}) and transitivity (τ_{9_FFF}) parameters than the advice relation. In addition, the two-path parameter (τ_{13_FF}) and the three-cycle parameter (τ_{10_FFF}) are also negative, suggesting that the friendship relation also displays strong local clustering as well as some hierarchical organisation. In fact, the values of the reciprocity and transitivity parameters suggest that local clustering is stronger for friendship than for advice. The weak, but positive two-out-star parameter (τ_{12_FF}), suggests that at least some lawyers socialise with friends who may be untied to one another; thus, at least some friendship ties bridge denser local clusters.

Thus, Hypothesis I is confirmed with respect to the direct exchange of a single resource by a pair of lawyers, especially for cowork and friendship ties. Hypothesis II is also confirmed, in general. Regularities in triadic interdependencies are seen in each of the three types of tie. Generalized exchange characterizes potential work relationships, whereas advice and friendship ties exhibit the loosely clustered, partially ordered

Table 4
Pseudolikelihood estimates for univariate model for the friendship relation

Term	PLE	(Approx. SE)
$\tau_{9\_F,F,F}$	0.325	0.021
$\tau_{10\_F,F,F}$	−0.187	0.052
$\tau_{11\_F,F}$	3.087	0.162
$\tau_{12\_F,F}$	0.057	0.013
$\tau_{13\_F,F}$	−0.120	0.014
$\tau_{14\_F,F}$	0.022	0.017
τ_{15_F}	−3.254	0.189

$-2\text{LPL} = 1795.9$, MAR = 0.102.

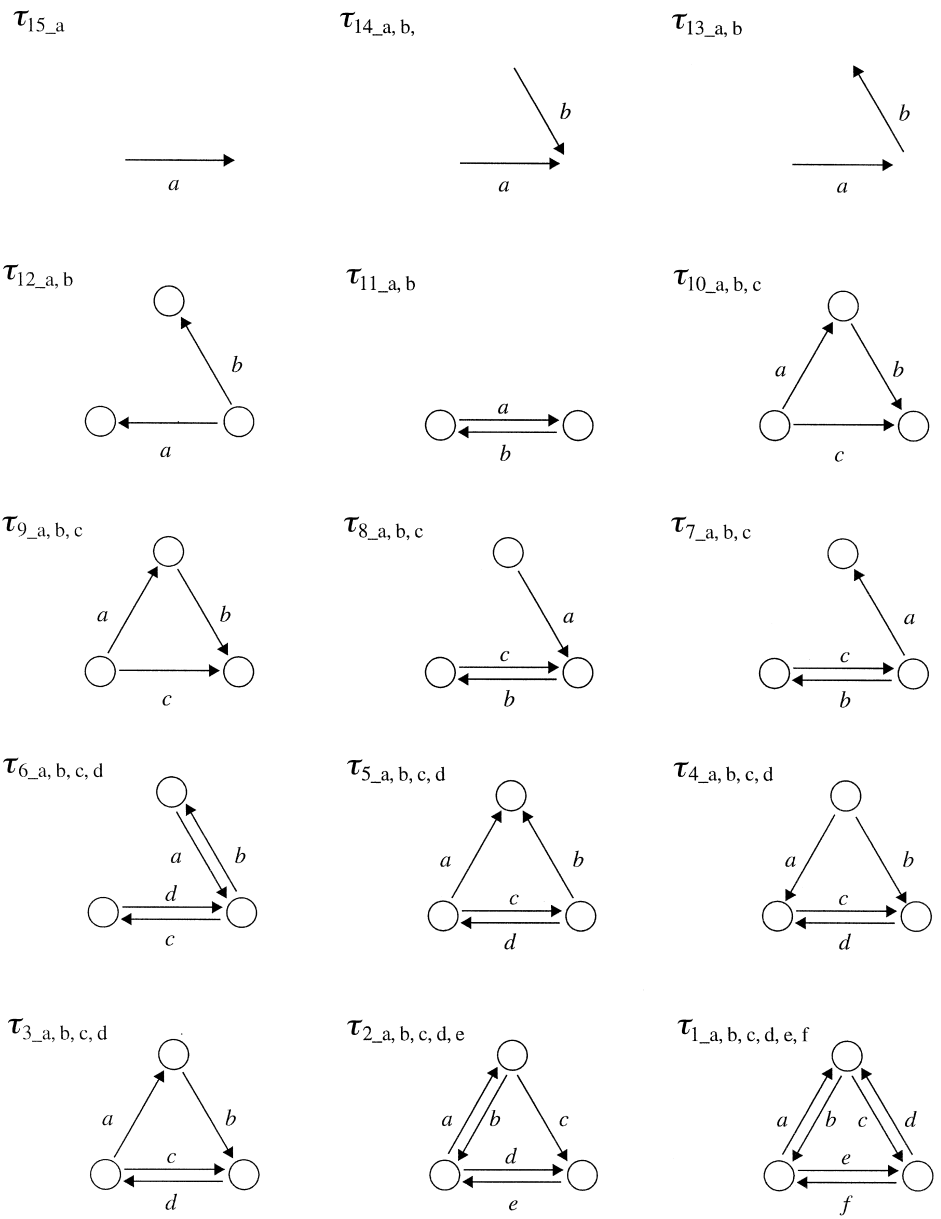

Fig. 1. Configurations corresponding to p^* model parameters. The symbols *a*, *b*, *c*, *d*, *e* and *f* may refer to any of the uniplex or multiplex relations, namely: W (cowork), A (advice), F (friendship), WA (cowork and advice), WF (cowork and friendship), AF (advice and friendship), WAF (cowork, advice and friendship).

structures exhibited by such structures in many other contexts (e.g., Johnsen, 1986; Krackhardt, 1987).

Table 5
Summary information for multivariate model fits

Model	Number of parameters	−2LPL	MAR
Model 1: level 1 terms	3	13503.0	0.282
Model 2: level 2 terms	33	7510.6	0.149
Model 3: level 3 terms	171	6144.5	0.122
Model 4: after step 1	175	6064.9	0.120
Model 5: after step 2	59	6255.3	0.124

6.3. Characteristics of the firm's exchange system: the interplay of resources among members

The number of possible distinct dyadic and triadic substructures involving three relations is very large. As a result, the class of substructures used to define an initial multivariate p^* model was restricted to: dyadic structures of level four or less; triadic structures of level three or less; and the level 4 triadic substructures identified in the univariate analyses. [12] Multivariate model-selection was performed in two steps. In the first step, a forward selection strategy was used to determine whether the level 4 configurations in the initial class added substantially to the fit of the model containing all level 3 terms. Then, in the second step, a hierarchical backward elimination strategy was used to reduce the model obtained at the first step. A summary of model fits is presented in Table 5; it includes, for comparative purposes, the fit of models containing, respectively, all terms of level 1 or less, 2 or less, and 3 or less. The parameter labeling is indicated in Fig. 1.

The pseudolikelihood estimates for parameters in the final model are presented in Table 6. The estimates are organized according to the types of tie involved in the corresponding configurations. Before discussing the structural implications of these estimates, we note that, in addition to the unirelational substructures already described, there are at least three different *types* of multirelational network substructures that are important to modelling the multivariate network. These are: (a) multiplex ties linking one lawyer in the firm to another, suggesting some *alignment* of resource dependencies across the different types of resource; (b) multiplex dyadic exchange structures in which a pair of lawyers exchange different types of resource, suggesting some *complementarity* of resource dependence; and (c) various triadic configurations involving multiple resource ties, suggesting more complex patterns of structural *interlock* among resource

[12] Bivariate analyses confirmed that no additional level 4 triadic structures involving two relations made substantial contributions to model fit. We acknowledge that, despite our efforts to reduce the number of parameters as far as possible, the number of parameters in the final reported model is still large for the 14,910 potential observations (from 71 respondents) to which the model was fitted. We believe, though, that there are at least two reasons why more concise parameterizations are likely to be difficult to attain: first, for ease of interpretation, it is useful to restrict attention to hierarchical models; and, second, there are likely to be a number of distinct forms of regularity in a complex social system such as the one analyzed here. In support of this multiplicity of form, we note that the pattern of regularities identified appears readily interpretable. Clearly, though, analyses of exchange networks in a number of organizations of similar form would be very informative.

Table 6
Parameter estimates for final multivariate model

Cowork		Advice		Friendship	
Parameter	PLE	Parameter	PLE	Parameter	PLE
τ_{15_W}	−3.49 (0.25)	τ_{15_A}	−3.46 (0.25)	τ_{15_F}	−4.65 (0.29)
$\tau_{11\_W,W}$	4.45 (0.47)	$\tau_{11\_A,A}$	1.33 (0.24)	$\tau_{11\_F,F}$	2.91 (0.24)
$\tau_{12\_W,W}$	0.06 (0.01)	$\tau_{12\_A,A}$	0.06 (0.01)	$\tau_{12\_F,F}$	0.07 (0.01)
$\tau_{13\_W,W}$	−0.04 (0.02)	$\tau_{13\_A,A}$	−0.06 (0.01)	$\tau_{13\_F,F}$	−0.06 (0.02)
$\tau_{14\_W,W}$	0.10 (0.02)	$\tau_{14\_A,A}$	0.06 (0.01)	$\tau_{14\_F,F}$	0.03 (0.02)
$\tau_{9\_W,W,W}$	−0.03 (0.02)	$\tau_{9\_A,A,A}$	0.28 (0.02)	$\tau_{9\_F,F,F}$	0.28 (0.02)
$\tau_{10\_W,W,W}$	0.30 (0.06)				
$\tau_{7\_W,W,W}$	−0.09 (0.02)				
$\tau_{8\_W,W,W}$	−0.06 (0.02)				
$\tau_{3\_W,W,W,W}$	−0.11 (0.02)				
$\tau_{6\_W,W,W,W}$	0.21 (0.04)				
Cowork and Advice		Cowork and Friendship		Advice and Friendship	
τ_{15_WA}	2.44 (0.13)	τ_{15_WF}	0.96 (0.17)	τ_{15_AF}	2.42 (0.22)
$\tau_{11\_W,A}$	0.61 (0.21)	$\tau_{11\_W,F}$	0.48 (0.18)	$\tau_{11\_A,F}$	1.30 (0.19)
$\tau_{12\_W,A}$	−0.01 (0.01)				
$\tau_{13\_W,A}$	−0.03 (0.01)	$\tau_{13\_F,W}$	0.01 (0.01)	$\tau_{13\_A,F}$	−0.01 (0.01)
$\tau_{13\_A,W}$	−0.04 (0.01)	$\tau_{13\_W,F}$	−0.00 (0.01)	$\tau_{13\_F,A}$	−0.03 (0.01)
$\tau_{14\_A,W}$	−0.02 (0.01)	$\tau_{14\_W,F}$	−0.01 (0.01)	$\tau_{14\_A,F}$	−0.02 (0.01)
$\tau_{11\_W,AW}$	−0.39 (0.17)	$\tau_{11\_W,FW}$	−1.13 (0.23)	$\tau_{11\_A,AF}$	−0.87 (0.24)
$\tau_{11\_A,AW}$	−0.82 (0.14)			$\tau_{11\_F,AF}$	−0.90 (0.27)
$\tau_{9\_A,A,W}$	−0.08 (0.02)				
$\tau_{9\_A,W,A}$	−0.10 (0.02)			$\tau_{9\_A,F,A}$	0.07 (0.02)
$\tau_{9\_W,A,A}$	−0.12 (0.02)				
$\tau_{9\_A,W,W}$	0.13 (0.02)				
$\tau_{9\_W,A,W}$	0.18 (0.02)	$\tau_{9\_W,F,W}$	0.07 (0.02)		
$\tau_{8\_W,W,A}$	0.03 (0.01)				
		$\tau_{10\_F,F,W}$	−0.13 (0.02)	$\tau_{10\_A,A,F}$	−0.15 (0.02)
				$\tau_{13\_F,AF}$	−0.07 (0.02)
				$\tau_{11\_AF,AF}$	1.55 (0.45)

Cowork, Advice and Friendship	
Parameter	PLE
τ_{15_AFW}	−1.00 (0.21)
$\tau_{11\_W,AF}$	−0.30 (0.24)
$\tau_{11\_W,AFW}$	1.51 (0.31)

ties. We discuss the structures involving each combination of types of tie in turn, noting the implications that they have for the form of interdependence of ties in the firm. [13]

The parameter estimates in the multivariate model corresponding to unirelational configurations are generally very similar in magnitude to those already discussed for the univariate models. There are just three exceptions to this pattern. The first and arguably

[13] In all tables, the negative parameters for each type of tie signify that a tie between two actors is less likely than no tie (and the relative magnitudes of the parameters confirm, for example, that work ties are the most frequent and friendship ties are the least frequent).

most important is the estimate for the cowork transitivity parameter (τ_{9_WWW}): it is small (and negative) in the multivariate model, but positive in the univariate model. The absence of a positive transitivity effect in the multivariate model suggests that once the various associations between cowork and the other two types of tie are taken into account, there is no separate structural tendency for cowork transitivity. In other words, it is possible that the transitive tendency apparent in the univariate model is largely attributable to the entrainment of cowork ties with the highly transitive advice (and, to a lesser extent, friendship) ties. The second exception is the absence of negative three-cycle parameters for advice and friendship (τ_{10_AAA} and τ_{10_FFF}): in the multivariate model, these parameters had a less substantial contribution to model fit, presumably because of the associations between the various types of tie (particularly, advice and friendship). The third exception concerns the positive two-in-star and two-out-star parameters for advice (τ_{14_AA} and τ_{12_AA}) in the multivariate model; these were not evident in the univariate model. The positive parameters in the multivariate model suggest that, once various across-tie dependencies are taken into account, there is a tendency for differentiation among firm members in their seeking and being sought out for advice—but this differentiation is most evident in those advice ties that are not accompanied by cowork and friendship ties. We discuss this differentiation further below.

The large number of parameters in the multivariate model corresponding to configurations comprising both cowork and advice ties suggests that, in accord with Hypothesis III, cowork and advice ties are distributed in a highly interdependent manner. We note first that the multiplexity parameter (lawyer i sends a duplex advice and cowork tie to lawyer j) is large and positive and suggests that the co-occurrence of the two types of tie is likely; to some degree, cowork and advice are aligned in structure. Second, the exchange parameter (i sends an advice tie to j who reciprocates with a work tie) is also positive, reflecting a tendency for the two types of tie to be exchanged. Third, these tendencies towards alignment and exchange are somewhat disjunctive, as is evident from the negative estimates of the parameters $\tau_{11\_W,AW}$ and $\tau_{11\_A,AW}$.[14] Fourth, there is a clear and interesting form of triadic interdependence for advice and cowork ties: two paths comprising one advice and one cowork tie appear to be likely to coincide with a cowork tie, but not with an advice tie. Thus, being a coworker of an advisor or an advisor of a coworker is not a sufficient qualification for being a direct advisor. Such indirect ties are more likely to be associated with direct coworker ties. In this sense, the advice and cowork ties participate in configurations having some of the characteristics of the interlock of strong and weak ties, with advice ties the stronger of the two (Granovetter, 1973; Breiger and Pattison, 1978; Pattison, 1993). It might be hypothesized that advice ties drive the creation of new coworker ties, in the sense that new coworker ties may be forged with either the coworkers of one's advisors or the advisors of one's coworkers. Indeed, it is interesting to note that the two triadic advice and

[14] Despite the disjunction of these effects, at the dyadic level, aggregating for all members, after sorting all existing ties between i and j, we find that the most frequent type of tie is a reciprocated cowork tie between i and j with one unreciprocated advice tie from j to i [282 occurences, (5.6% of the total number of possible ties)].

cowork configurations with positive parameter estimates contain as substructures two of the few likely cowork forms in which exchange is not evident (namely, $\tau_{12\_W,W}$ and $\tau_{14\_W,W}$). One possibility, therefore, is that the advice tie has a stabilizing role in what otherwise may be a less stable pattern of work distribution in a system driven largely by exchange. That is, the lack of exchange in these configurations may be offset against the opportunity to work with individuals at higher status; it is in this sense that advice ties are strong and help to articulate the distribution of collective participation. But note that this capacity for work ties to straddle status differences does not extend too far: the advisors of one's advisors are not likely to be coworkers (as the negative estimate for $\tau_{9\_A,A,W}$ indicates). Further, we note that status-signaling advice ties play a role in providing access to work opportunities, and that this may help mitigate against status competition. In all, and as expected, the interdependence between coworker and advice ties is strong in this exchange system. Hypothesis III is thus directly confirmed, and both support and some detail in structural form is adduced for Hypotheses I and II.

Advice and friendship ties also exhibit quite strong interdependence, with substantial multiplexity (i sends a duplex tie to j) and exchange (i sends an advice tie to j who reciprocates with a friendship tie) effects. In addition, the positive estimate for $\tau_{11\_AF,AF}$ indicates an enhanced reciprocity effect for one type of tie in the presence of a reciprocal tie of the other type; the enhancement is not observed however in the presence of an unreciprocated tie of the other type (as the negative estimates for $\tau_{11\_F,AF}$ and $\tau_{11\_A,AF}$ indicate). At the triadic level, the only positive estimate is associated with a triadic structure in which friendship links the advisors j and k of some lawyer i. Arguably, just as advice ties serve to articulate cowork relations, so friendship ties may serve a weak articulatory role with respect to advice ties (since configurations in which the friend of an advisor is also an advisor have a positive parameter estimate). It is interesting also to note that in 42% of such triads in which the advice-seeker is an associate, the advisors are both partners. Thus, in these cases where advice is sought by an associate from partners who may lie outside a current work team, friendship often links the partners, and may help to offset any difficulties that arise from their giving different advice or from their comparison to one another by a common subordinate. Negative parameter estimates are associated with three cycles comprising two advice ties and a friendship tie (suggesting that even though the advisor of an advisor is a source of potential advice, such a person is unlikely to return a direct friendship tie). In sum, one might argue that the interdependence of advice and friendship ties can be described largely in the dyadic terms of a propensity for multiplexity and exchange, but that there is also a weaker articulatory relationship between friendship and advice ties. These patterns of interdependence of friendship and advice ties can also be interpreted as suggesting that friendship 'softens' the status differences inhering in advice ties, both directly (through multiplexity and exchange effects) and indirectly (by tending to link the advisors of an individual). [15] Thus, these patterns are consistent with our general

[15] This can be exemplified by the likely presence of friendship ties between two mentors of the same member.

expectations regarding the role of friendship ties in the mitigation of status competition and, in particular, lend some support to Hypothesis IV.

As predicted, the parameters for configurations involving cowork and friendship tend to be much weaker. The multiplexity and exchange parameters are weak, but positive and, since the parameter for the configuration in which a mutual cowork tie occurs in the presence of an asymmetric friendship tie is large and negative, these effects appear to be disjunctive. At the triadic level, cycles comprising two friendship and one coworker tie are unlikely and there is a weak tendency for friendship ties to link the two lawyers with whom a third claims cowork ties. This latter effect is similar to, but much weaker than, the pattern by which advice was claimed to help sustain one of the asymmetric cowork configurations. Thus, Hypothesis V is largely supported, in that the members tend to sort their ties so as not to mix work and friendship too directly.

Finally, a very small number of dyadic configurations involving cowork, advice and friendship have large estimated parameters. In particular, the triplex tie from i to j has a negative estimate, whereas the triplex tie accompanied by a reciprocal cowork tie has a positive estimate. This suggests that, even though pairs of lawyers may be linked by duplex ties more commonly than the overall frequency of individual ties would suggest, the observation of *all three* ties linking a pair is not a common structural form (unless also accompanied by a reciprocal cowork tie).

7. Conclusion

Cooperation between members of an organization can be examined in terms of routine transfers or exchanges of various kinds of resources. Local regularities in the structure of these transfers or exchanges may help or hinder members in their participation in collective action. Using a case study, a network study of a corporate law firm, we were able to identify these local regularities in a specific work environment, one characterized by multifunctional and sometimes multidisciplinary workgroups in which 'status competition' is a strong motivation driving participation. Specific statistical tools, p^* models, were used to analyze the interplay between the three social resources shaping cooperation among these professionals and dealing with this problem of status competition.

To summarize these structural tendencies, a number of separable forms of interdependence describe the interlocking of the three relations. First, each type of tie appears to have its own characteristic pattern of organizational distribution. Cowork ties appear to be strongly (but not entirely) organized around principles of direct and generalized exchange, whereas advice and friendship ties exhibit a pattern of local clustering and partial ordering (with a greater emphasis on clustering for friendship, and a greater emphasis on a hierarchical distribution for advice). Second, despite these apparently quite different organizational principles, there is some evidence for the alignment of the different types of tie, particularly of advice ties with each one of the two others. This provides quite direct evidence for some form of mutual accommodation of the different types of tie. Third, there is also some evidence for dyadic exchange of different types of tie. This suggests another form of interdependence between the separate tie distributions,

one that might also be expected to provide a structurally supportive role. As for the alignment effects, the combination of advice with either of cowork or friendship yields the strongest manifestation of this form of tie dependence. Finally, a third type of interdependence links the arrangements of the different types of tie. This third pattern is one in which one type of tie appears to serve as a bridge supporting another. The pattern is strongest for cowork and advice: advice ties link individuals who are only indirectly connected through (asymmetric) cowork ties. A much weaker version of this pattern is also seen for advice and friendship (with friendship bridging individuals whose advice is sought from a common source) and cowork and friendship (with friendship again in the bridging role). These patterns invite speculation about processes giving rise to these configurations, but longitudinal data is needed to help distinguish various alternatives.

These results help in showing that cooperation may be understood in terms of regularities in a specific multiplex generalized exchange system, i.e., in terms of local patterns by which members exchange resources connected to their work life in the firm. Such configurations may be important to understanding how the problems of collective participation and status competition among professional peers are collectively handled. They therefore provide an important contribution towards a theory of collective action, since they extend our understanding of how a collegial organization creates a structure which can help individuals to find indirect ways to exercise restraint in the pursuit of status, and thus keep production going. In particular, they point to ways in which members may manage their resources in order to cooperate in the production of quality service. This, in turn, is likely to enhance our understanding of commitment to collective action.

In conclusion, this discussion points to the importance of considering organizations as exchanges systems, and these exchange systems as part of their corporate social capital (Coleman, 1990; Leenders and Gabbay, 1999) helping in the provision of structural solutions to structural problems. Given that analyses were applied to a single case study, we are in no position to generalize to other organizations based on the findings reported. It remains to be seen whether this pattern has relevance for other types of collegial organizations, among which professional business partnerships, for instance in medicine, engineering, accounting, scientific or R&D laboratories, and universities, in which one could also find a need to combine several kinds of resources to make collective action possible. Thus, beyond our general statement regarding the likely connection between specific forms of resource tie interdependence and members' participation in collective action or cooperation, more work needs to be done to extend such an approach to other types of organizations.

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Appendix A. Sociometric name generators used to elicit coworkers, advice, and friendship ties

Here is the list of all the members of your Firm.

Strong coworkers network. ''Because most firms like yours are also organized very informally, it is difficult to get a clear idea of how the members really work together. Think back over the past year, consider all the lawyers in your Firm. Would you go through this list and check the names of those with whom you have worked. [By 'worked with' I mean that you have spent time together on at least one case, that you have been assigned to the same case, that they read or used your work product or that you have read or used their work product; this includes professional work done within the Firm like Bar association work, administration, etc.]''

Basic advice network. ''Think back over the past year, consider all the lawyers in your Firm. To whom did you go for basic professional advice? For instance, you want to make sure that you are handling a case right, making a proper decision, and you want to consult someone whose professional opinions are in general of great value to you. By advice I do not mean simply technical advice.''

Friendship network. ''Would you go through this list, and check the names of those you socialize with outside work. You know their family, they know yours, for instance. I do not mean all the people you are simply on a friendly level with, or people you happen to meet at Firm functions.''

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