

Looking at Social Capital through Triad Structures

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Abstract

The concept of social capital, which has gained wide currency in the literature, examines how actors' ties to others advantage or disadvantage them and the groups to which they belong. Two conceptually distinct types of social capital, closure and brokerage in Burt's (2005) terms, have been identified. In this paper, we propose a method by which brokerage and closure can be distinguished using a census of patterns of ties in triads of actors. We apply this method to network data gathered on 24 non-profit organizational actors. Our findings show when a network is characterized by brokerage or closure and how that network coincides with the presence/absence of trust and reciprocity. We conclude with a discussion on the nature of non-profits, and how the larger social context of network actors, in this case non-profits, play a role in interpreting the network structures uncovered via social network analysis.

Keywords: social capital, social networks, triad census, non-profits

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Introduction

Social capital's rise in popularity in recent years is a phenomenon many have noted (Kadushin 2004; Portes 1998). Social capital consists of a network of relations and the resources embedded in those relations. As Putnam (1997) notes, social capital consists of the "features of social life—networks, norms of reciprocity and trust—that facilitate cooperation and coordination for mutual benefit" (pg. 31). Research on social capital shows it is not just the presence or absence of a relational tie that matters, but the overall structuring of the network (Baker 1990; Nahapiet and Ghoshal 1998). It is this issue of *how* a network is structured, and how a network characterized by that structure coincides with the presence/absence of trust and reciprocity, that our paper primarily addresses.

While social capital is typically used in studies of networks of persons, the concept is general enough that it can be applied to networks of other entities, such as groups or organizations. At this level of analysis, one would consider how some groups or organizations are connecting to other organizations, how these relations are structured, and what kinds of benefits these relations and network structures provide. The data explored in this paper represent various types of relations among a set of non-profits. These relations, reflecting the three main aspects of social capital, include trust, communication (or social relations), and the exchange of resources. Research shows that certain kinds of relations should coincide with one another; for example, actors who trust one another are more likely to help one another (Wellman and Frank, 2001).

In addition, how certain relations are structured should also coincide with the

accessibility and ease in which resources get exchanged. This last issue of the structuring of relations is not as clear cut as it may seem for two reasons. First, there are two major and seemingly contradictory ideas about which structures embody social capital – in Burt's (2005) terms, is it closure or is it brokerage? We elucidate this contrast in the next section. Second, while various measures of social capital have been proposed (see Borgatti, Jones and Everett 1998), these measures are purely descriptive and do not address the question of whether a particular network exhibits more or less of a structural attribute than would be expected by chance. If we can determine that, in a given set of actors, a structural attribute is statistically significant then the co-presence of the exchange of resources for that set of actors would give us a firmer foothold upon which to state the claim that it is indeed the network structure which contributes to the presence of a particular beneficial outcome.

In succeeding sections, we briefly review the social capital literature, paying particular attention to drawing the distinction between closure and brokerage, and how these two structural attributes relate to social capital. We then propose a method based on the census of triads to identify when a network has more or less of a certain structural attribute than expected by chance. A triad census refers to how all triads in a network are distributed over different types of patterns of ties in the triad. There is a long history in social network analysis of using the triad census to detect systematic patterns that structure a network. We then introduce the data, in particular, the organizations that were examined and the methods used for gathering and analyzing these data. Finally, we present and discuss our results regarding social capital: to what extent can we determine the presence and/or

absence of particular network structure and link the network containing that structure to the presence/absence of trust and reciprocity?

Social capital: Closure or Brokerage?

Within the social capital debate, two distinct network structures have drawn the most attention, these being cohesive networks, also referred to as 'network closure,' and networks composed of bridges and structural holes, also referred to as 'brokerage' (2005; Burt 2001). *Closure* refers to networks where actors are tied to one another through mutually reciprocated, strong ties. In addition to considering the strength of tie, measuring closure involves looking at the overall network structure. For example, common measure for closure is *density*.¹ This dense, closed structure is argued as enabling certain group behaviour and attitudes. For example, Coleman (1988; 1990) discusses closed, dense networks as conducive to social capital as they create feelings of mutual obligation and trust among members of the network. Coleman's (1988) work on social capital and school children suggests that a cohesive network made up of parents, teachers, and neighbours creates a supportive social structure resulting in more children within this structure completing their education. These findings are in keeping with Putnam's (2001) description of "bonding" social capital. For Putnam, bonding social capital refers to strong ties within a more or less closed, homogenous community that help community members get by, but not ahead.

Other social capital theorists do not consider closure in such optimistic terms. For example, Burt (2001) argues that norms

can emerge from such networks that constrain social behaviour and inhibit innovation. Others note how closure might enable less socially-desirable groups to become stronger, for example, the Mafia and neo-Nazi groups. Finally, closure might work to keep socially isolated groups, such as immigrant communities and/or urban ghettos, from becoming more integrated within mainstream society (Huysman and Wulf 2004; Narayan 1999). Thus, because closure is not always seen as helpful, a competing view of group structure has emerged that builds upon Granovetter's (1973) strength of weak ties argument. Granovetter (1973) argues that weak ties between actors are more likely than strong ones to carry non-redundant information across the disconnected segments of a network (Granovetter 1973; 2005). In doing so, weak ties are actually more important than strong ties for building social cohesion within heterogeneous networks.

One implication of this argument picked up by social capital theorists is the importance of weak ties as bridges, linking together more tightly bound, clique-like sections of a network. Putnam's (2001) notion of 'bridging social capital' reflects this idea: bridging social capital consists of ties that link across different community groups, thus providing actors access to diverse resources. Thus, bonding capital can help individuals or communities get by, but bridging capital is what helps individuals and communities get ahead. Similarly, Burt (2005; 2001; 1992; 2000) develops the concept of a "structural hole" to convey how bridging ties can benefit an actor. Structural holes are instances where two actors or two groups have no ties between them, but there is a third actor or group with ties to both of them, thus creating a "hole" opportunity for that third entity.

¹ Density is the proportion of possible ties in a network that are actually present.

In occupying a hole position, a third actor performs the role of a ‘broker’ between the two disparate entities. Such a broker position provides this actor key benefits,² but in addition, the two disparate entities linked through the broker also potentially benefit in being brought together. Without ‘brokerage’, these two entities would remain separate, and thus not gain access to one another’s knowledge and other resources. Thus, while the broker has the strategic advantage of controlling when and how these two entities will interact, the fact remains that these two now have an indirect connection where none existed previously. This notion of ‘brokerage’ as a means of advantaging both the individual and the network as a whole has become an alternative form of social capital, and for Burt, one potentially more powerful than closure social capital.

Over time, empirical research has supported both of these competing views of social capital, and now scholars are arguing that a mixture of closure and brokerage is preferable for communities and groups. For example, Narayan (1999) argues that healthy societies need a combination of cohesive micro units (his examples are the family or tribal clan) that are then linked together through both weak and strong ties. Woolcock and Narayan (2000) make a similar argument for policy development purposes, noting that both bonding and bridging social capital are needed for communities to be truly healthy. Finally, Burt (2001) makes a similar argument for organizations, saying that “while brokerage across structural holes is the source of added value, closure can be critical to realizing the value buried in the structural holes” (pg. 52).

The above discussion summarizes the closure-brokerage argument. There are a number of measures for closure and brokerage that have been proposed by various scholars (see Borgatti, Jones, and Everett, 1998 for a good review). Yet, one criticism that can be made about all these measures is that all are purely descriptive, and thus do not address the question of whether a particular network exhibits more or less of a structural feature than would be expected by chance. Such a gap in the literature requires a baseline against which to calibrate the tendency to inhibit or enhance.

Thus, the question before us is how can we tell whether a particular network exhibits more or less of one or the other types of social capital than we would expect by chance? Similar questions have been addressed throughout the literature on network analysis. Holland, Leinhardt, and Davis, in a series of papers in the 1970s, for instance, proposed a way of investigating whether complex network patterns can be the result of local, triad structures (Davis 1977; Davis and Leinhardt 1972; Holland and Leinhardt 1970; 1972). The authors’ method compared a census of observed types of triads to a census of triads expected by chance. Different types of triads were weighted differently in calculating a summary score, with the different weights determined by the property of interest. The method then determined whether the observed summary score was sufficiently different from the summary score expected by chance.

Davis, Holland, and Leinhardt’s work linked such network structural features as partial orderings, ranked clusters, and transitivity to the presence or absence of

² Benefits could include such things as access to different sources of knowledge and resources.

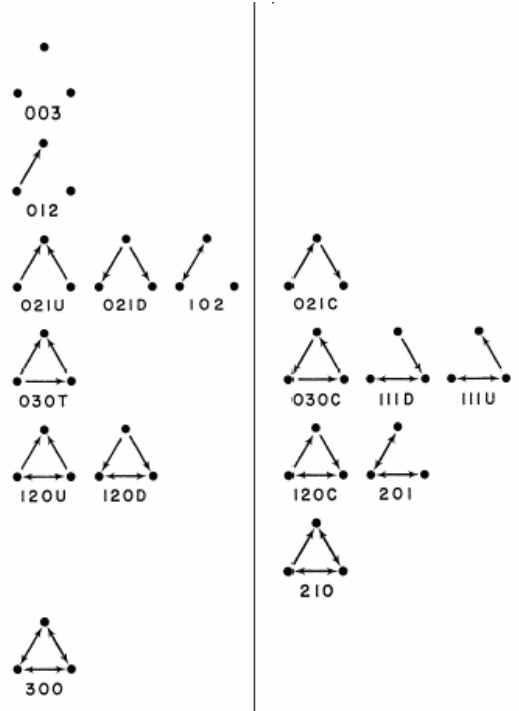
particular triad structures.³ Their work was complemented by Granovetter's (1973) work on weak ties, in which the author argued that cohesion in large, heterogeneous networks could be explained 'more precisely' by looking at whether the network's triads contained strong, weak, or absent ties (pg. 1363). Since this series of papers, many scholars have come to view triads as valid 'building blocks' of larger, more complex, network structures (Laumann and Marsden 1982; Robins, Pattison and Woolcock 2005).

Based on the bulk of this previous work, we will now look at a triad census and describe how this census can be used for analysing brokerage and closure on the triad level.

Triad Census

A triad census refers to a census of all the possible types of triads that could be found in a given network (Holland and Leinhardt 1970). Such a census is depicted below in Figure 1.

Figure 1: Triad census⁴



This triad census codes the different triads according to their number of mutual, asymmetric, and null dyads. A mutual dyad refers to instances where one actor nominates another actor as someone they share a tie with, and this second actor reciprocates that nomination. An asymmetric dyad refers to instances where an actor nominates another, but this nomination is not reciprocated. Finally, null dyads refer to instances where neither actor nominates the other. For example, in triad 012 in Figure 1, the triad contains zero mutuals, one asymmetric, and two null dyads within its structure. In those instances where triads have the same number of dyads, the census uses letters to indicate the direction of the ties in the dyads. For example, in triad 021U, the "U" refers to ties directed upwards, whereas 021D refers to

³ For a full description of each of these structural features, please refer to Wasserman and Faust, 1994.

⁴ Adapted from Holland & Leinhardt, 1970.

ties directed downwards, and 021C refers to ties structured in a cyclic formation.

Linking this triad census to social capital, both closure and brokerage can be related to these triad structures. Closure can be taken to mean the number of triads which are fully connected, or ‘closed.’ In our triad census, such triads would be 030T, 030C, 120U, 120D, 120C, 210, and 300. The idea that social capital pertains to brokerage – meaning an actor rests between two unconnected actors – brings to prominence all the triad structures with one null dyad while the other two dyads have at least one connection. Such triads include 021U, 021D, 021C, 111D, 111U, and 201. Thus, for a network rich in closure social capital, one would expect there to be more of the closed set of triads than one would expect by chance. Similarly, a network rich in brokerage social capital should have more triads from the second set outlined above than expected by chance.

Linking these triad structures to our previous discussion on the differences between closure and brokerage, we can now distill our arguments down into the following:

Brokerage argument: weak ties tend to operate as bridging ties. Thus, networks composed of weak social ties should display a significantly high number of open triads. These open triads reflect the notion of brokerage. Networks characterized by brokerage should also be characterized by a high level of reciprocity. Trust is not an important factor for the brokerage argument.

Closure argument: strong ties tend towards closure. Thus, networks composed of strong social ties should display a significantly high number of closed triads and, also, be characterized by a high level of reciprocity and trust.

In what follows, we will investigate these two arguments using data gathered

from an ongoing case study in the social capital of non-profit organizations.

Connected Kids

To explore these two arguments, we analyzed network data gathered on 24 non-profit organizations in Troy, New York. These non-profits were participating in a project lead by City Hall and the local university, Rensselaer Polytechnic Institute (RPI), to build an IT system for the local population. The project leaders of this IT initiative were two professors from RPI, and they selected representatives from these non-profits who were either a) administrators who had an overview of the sorts of programs and services their organization provided, or b) managers of youth programming within the organization. These organizational representatives dealt directly with youth service and programming issues and were thus in a more likely position to know how their organizations collaborated with others. Network data were gathered through structured interviews in each respondent’s own work setting. Respondents were handed a roster of the other 23 actors and their respective organizations, and questions were posed to respondents on their relationships with these actors’ organizations. The data gathered reflected the three important aspects of social capital, social networks, trust, and reciprocity. These data, as they were conceptualized and measured, are described below:

1) *Social networks.* The literature on social capital notes how social capital is embedded in social relations (Coleman 1988; 1990; Foley and Edwards 1999; Lin 2001). Thus, we mapped out social relations among these 24 nodes, and conceptualized a social relation as any form of communication contact existing between

two organizations. To measure communication contact, we devised a frequency of communication contact item, whereby respondents were asked to rate how often they had any sort of communication contact with the 23 other organizations listed on the roster. Respondents could rate their frequency of communication contact from 1 to 7, with 1 as 'not much communication contact' and 7 as 'a great deal of communication contact.' These data, organized into a matrix, were then dichotomized to create two separate matrices: a less frequent communication contact matrix (compiled from data containing a value of 3 or less for communication contact) and a more frequent communication contact matrix (compiled from data containing a value of 4 or more). Thus, networks for strong and weak communication were created.

2) *Trust*. In conceptualizing trust, we are keeping stride with notions from the social capital literature, drawing on Coleman's (1990) notion that trust arises from, and thus exists within, social relations. We, thus, see trust as specific to a relationship between two actors, and to measure this, we devised two attitudinal trust items adapted from Tsai's (2000) network study on social capital. The first asked respondents to nominate those on the roster with whom they were willing to collaborate without a contract. The second item asked respondents to nominate those on the list whose information regarding youth respondents found trustworthy. Respondents' answers were coded using 1 for those who were nominated as trustworthy and 0 for those who were not nominated.

3) *Reciprocity (or 'resource exchange')*. In the social capital literature, the notion of reciprocity pertains to either a 'norm of reciprocity' (e.g. 1995; 2001; e.g. Putnam 1993) or the act of doing favors for others

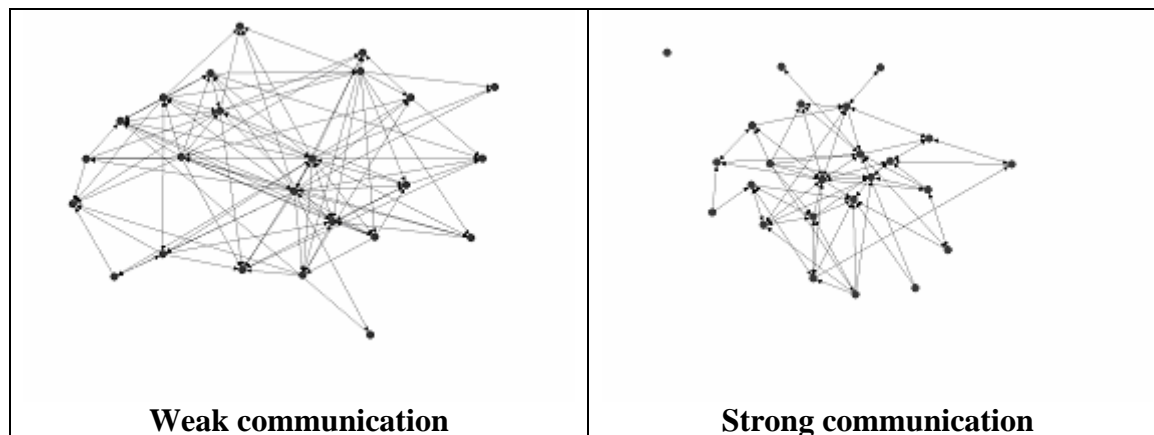
and exchanging resources with others (Coleman, 1990; Foley and Edwards, 1999). Within the network view of social capital, resources are seen as embedded within social structures, and the structuring of these social relations (e.g. size, level of cohesion, structural holes, etc.) determine how these resources get exchanged (Bourdieu 1986; Burt 2001; Coleman 1990). With this view of reciprocity as resource exchange among actors, we asked respondents questions about the giving and receiving of resources germane to the non-profit youth-service community within Troy. Respondents were asked the following: a) to whom they gave funds, b) from whom they received funds, c) with whom they shared clients, and d) with whom they had performed some sort of joint programming within the past year.

All actors receiving nominations were recorded as 1's on the data sheet, and all other actors listed who were not nominated were coded as 0s.

Network Characteristics

Figure 2 displays graphs for the social networks based on strong and weak communication.

Figure 2: Graphs of Strong and Weak Communication Networks



Looking at Figure 2, neither network appears to have any sub-groups linked together through bridging ties. In addition, weak communication appears to have more ties linking the actors together than strong communication does. Strong communication, in addition to holding fewer ties, also contains an isolate. Taken together, we may tentatively conclude that weak communication is more cohesive than strong communication. This result is not surprising: it is easier for an actor to hold many weak ties, as strong ties are more demanding and energy intensive. Thus, a network can be more or less held together through weak ties, just as Granovetter (1973) discussed. From the graphs alone, we can not say anything about the overall distribution of ties, or the structure of these networks.

Triad Census Results

A triad census for each network was conducted,⁵ testing for the two types of social capital mentioned earlier: closure and brokerage. The analysis involved counting the observed triads in each network and then comparing these observations with expected counts from a random network having the same number of dyad types (mutual, asymmetric, and null). As stated earlier, we expect that if a network is rich in closure, it should have more of the closed triads, i.e. more triads where every dyad contains at least one tie, than expected by chance. If a network is rich in brokerage, it should have more triads, expected by chance, in which exactly one of the dyads is null.

We tested these ideas by computing a weighted score in which each triad containing the key attribute (closure or

⁵ Skvoretz and Agneessens's (2004) SPSS program script was used for this analysis.

brokerage) is weighted equally. This weighted score was computed from the observed distribution and from the expected distribution; the difference between the observed and expected score was taken and expressed relative to the standard deviation of the expected score. In effect, we computed two z-scores, one to test for the overabundance of connected triads, and another to test for the possible overabundance of triads with a structural hole.

Table 1: Tests for closure and brokerage for strong and weak communication

	STRONG	WEAK
CLOSURE	5.1*	4.2*
BROKERAGE	-0.2	3.7*

Note: * indicates $p < 0.01$

Strong communication shows significantly more closure triads than expected by chance, but the observed number of brokerage triads does not differ from chance. In this case, closure does not occur at the expense of brokerage. Weak communication ties exhibits both types of triads occurring at significantly levels greater than chance. That is, both closure and brokerage are present in this network, although perhaps to different subsets of actors. These findings are partly in keeping with what we would expect from the literature; we expect a network composed of strong ties to be characterized by closure, not brokerage. Similarly, we expect a network composed of weak ties to be characterized by brokerage, not closure. In this case, the network composed of weak ties comprises a significantly high level of *both* types of triads. One possible reason for this would be that all these organizations are

located within the city boundaries. As Troy is not a large city, it is possible for nearly all organizations to have some sort of tie with one another. The strong ties, however, seem to be more dear. This is a point we shall return to shortly.

Trust and Reciprocity

For these data, we have uncovered the extent to which strong ties correspond to closure and weak ties, to brokerage. To what extent, then, are these social networks, composed of strong and weak ties, linked to trust and reciprocity? As a reminder, we are expecting a network characterised by strong ties and closure to be one in which trust and reciprocity are also present. A network characterized by weak ties and brokerage should also be one where reciprocity is present. Trust, in other words, should not figure strongly in the ‘brokerage’ network.

Below, we have performed QAP correlations⁶ (Krackhardt, 1987) on the different relations on which we gathered data, which together reflect the three aspects of social capital. These correlations are found below:

⁶ The correlation procedure used here is the QAP procedure, which is used to test the association between relations. As relations data have interdependencies that traditional case by variable data do not, calculating statistics for such data needs to account for these interdependencies. Thus the QAP procedure involves first computing Pearson's correlation coefficient between the corresponding cells of the two data matrices (relational data is stored and structured as matrix data). In the second step, it randomly permutes rows and columns of one matrix and recomputes the correlation. This is done hundreds of times in order to compute the proportion of times that a random coefficient is larger than or equal to the observed coefficient calculated in the first step. A low proportion (where $p < 0.05$) suggests a statistically strong relationship between the two matrices

Table 2: Correlations Across the Eight Relations

	Strong Communication	Weak Communication
1	0.38**	0.15**
2	0.47**	0.17**
3	0.17**	0.08*
4	0.28**	0.12**
5	0.12*	0.07
6	0.17**	0.07*

Note. * indicates $p < 0.05$ and ** indicates $p < 0.001$.

TRUST

- 1 Trustworthy information
- 2 Willingness to collaborate without a contract

RESOURCE EXCHANGE

- 3 Sharing clients
- 4 Joint programming
- 5 Giving funds
- 6 Receiving funds

Overall, Table 2 shows social, trust, and resource relations being intercorrelated. Both strong and weak communication ties show a similar pattern: both correlate with relations of trust and resource exchange, although stronger communication correlates slightly more with trust and resource exchange than weaker communication. Thus, stronger communication ties seem to be doing more of the work with this set of organizations.

The closure argument that trust and reciprocity are found in networks composed of strong ties receives support from these data (Coleman 1988; Coleman 1990). These non-profits seem to be utilizing their strong ties more so than their weak ties for accessing resources and forming joint programs, although both strong and weak ties are showing significant correlations with both trust and resource exchange.

Although more closure seems apparent in these findings, re-thinking the nature of this research site and these data could suggest otherwise: these relations are all, first and foremost, inter-organizational ones. As such, actors involved in these ties are embedded in different social circles, and a tie established between two such actors can be viewed as a bridging tie between two cohesive sub-groups. Thus, one might argue, a strong tie that bridges together different non-profits could, arguably, reflect the mixture of ‘closure’ and ‘brokerage’ advocated by certain scholars (e.g. Burt, 2001; Narayan, 1999).

Thinking still further about the nature of this research site, however, one could also argue that the prevalence of closure over brokerage is not surprising: non-profits based in local communities have a direct interest in developing long-term relationships with all members of their community. This means forming strong ties with clients, other local non-profits and municipal agencies. In this context, ‘getting ahead’ is not so much about forming ties with the outside world in order to bring in new resources and ideas as about forming strong ties within one’s world and making good use of the resources and ideas found therein. Thus, in certain contexts, in particular community-based non-profits, success and getting ahead are defined by the extent to which bonding and closure can be attained.

Summary and Further Thoughts on the Nature of Non-profits

These results have led us to some interesting findings: using the triad census approach helps us ascertain the extent to which closure and brokerage are statistically significant. In doing so, the census also helps us better ascertain the extent to which

strong and weak ties correspond to closure and brokerage.

Once we established the extent to which strong and weak ties corresponded to closure and brokerage, we then assessed the extent to which these networks related to trust and resource exchange. We uncovered that a strong communication network not only contains more closure, but also relates to more trust and resource exchange. Our weak communication network contained an abundance of both types of triads, a finding we attribute to these non-profits all existing in close geographical proximity to one another. In addition, this network did correlate to trust and resource exchange, but not as strongly as the network based on strong ties. These findings both supported and were slightly at odds with the social capital literature, and we have interpreted this difference to the nature of our research site. Thus, a strong tie between two organizations can be interpreted differently than one, say, in a single organization. Additionally, in the context of non-profit community organizations, the goal of 'getting ahead', which is normally linked to weak ties and brokerage, seems out of place; such organizations have goals traditionally associated with closure, i.e. building strong community-based ties. Thus, searching for brokerage social capital among non-profits in a community might be an inappropriate research endeavor.

This last comment regarding the usefulness of brokerage within the context of non-profit research calls for more discussion on the nature of non-profits. In this study, non-profits had historical tensions and larger structural inequalities than our network analysis shows. Such tensions emerged in the qualitative data gathered alongside the network analysis. For example, the vast majority of non-profits in this study expressed a struggle with finding

time, space and energy to form and maintain ties to other non-profits. This struggle was for a variety of reasons: non-profits lacked the staff numbers to network properly, which in itself was a result of small budgets, and they also needed to spend more time reporting back to a large number of external bodies, e.g. government and funding agencies. These pressures inevitably took their toll. As one respondent said to me in an interview, "we don't have time to network. None of us do. We're too understaffed (interview with non-profit employee, June 2001)." In the world of non-profits, where the realities of low staff numbers and pinched funds make networking difficult, an organizational actor might be more strategic about forming ties, only forming ones where a clear payback is evident. Thus, these actors might put more energy into fewer ties, relying more on their strong ties for the resource exchanges they need to survive.

The network capital literature tends to look at the social networks of individuals (Lin, Fu and Hsung 2001; Van Der Gaag and Snijers 2005; Wellman and Frank 2001), schools and business/organizational contexts (Burt, 2001; 2005; Coleman, 1988; 1990), and geographically-bound communities (Huysman and Wulf, 2004; Narayan, 1999). These are unique settings, and what tends to get overlooked is how such settings might play a role in the presence or absence of social capital. To what extent *ought* we pay attention to these unique contexts in which social networks are embedded? Paying attention to the wider context implies attention to additional structural features such as institutions, cultures, local histories, and socio-economic environments, things which social network analysts tend to ignore (Portes 1998). It is these features which might be the very influences we need to focus our attention on

in order to gain a fuller sense of the role of networks within the social capital debate.

Research has long shown that non-profits need a different consideration from other organizational settings (Newman and Wallender 1978). For example, the 'corporate ethos' found in for-profit organizations emphasizes marketing and management strategies geared towards making profits that can be distributed to shareholders. Non-profits, on the other hand, are not accountable to shareholders, but rather to external funders, political, and governmental bodies, which constitute a larger range of external influencing bodies than those dealt with by for-profits. Thus non-profits must contend with greater external scrutiny of their activities and a greater degree of public accountability. They

must balance more goals and services than those primarily guided by the for-profit motive (Potter 2001; Schwenk 1990). They also play a major role in all aspects of public policy (Bryce 2006). Thus, non-profits are, indeed, different than for-profit organizations. As such, the social capital discussion might need to account for this difference.

In conclusion, we have managed to push the social capital research forward a slight bit on methodological grounds through our use of the triad census. However, more research on social capital is still needed, both conceptually and methodologically, for exploring the links between larger social structures and the ones found via social network analysis.

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