Network Capital in a Multi-Level World: Getting Support from Personal Communities

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Abstract

Multi-level analysis provides a new approach to studying the sources of network capital by integrating analyses of individuals, interpersonal ties and the personal networks in which they are embedded. Using this approach aids theory and substantive analysis. Toronto data show that while tie characteristics are key predictors of supportive behavior, networks facilitate the supportive behavior of ties and individuals. For example, parents and children are more supportive in networks with high percentages of parents and children. Individual agency, dyadic duets, and network properties all make network capital available for social support.

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Ties and Networks

When people need help, they can either buy it, trade for it, steal it, get it from governments and charities, or obtain it through their *"personal community networks"* – supportive ties with friends, relatives, neighbors and workmates. Such ties supply *"network capital,"* the form of "social capital" that makes resources available through interpersonal ties.[1] It is widely available, usually specialized, and unevenly distributed among people, ties and networks. Network members provide emotional aid, material aid, information, companionship, and a sense of belonging. Their *"social support"* is one of the main ways that households obtain resources to deal with daily life, seize opportunities, and reduce uncertainties.

These are not trivial pursuits, for people or for society. For people, personal community networks are flexible, efficient, available, and custom tailored sources of social capital that are low in financial cost. They may strengthen bonds while providing needed resources (Fischer 1982; Wellman 1999; Schweizer, et al. 1998). For society, network capital conveys resources, confirms identity, influences behavior, and reinforces integrative links between individuals, households and groups Durkheim 1893; Espinoza 1999; Ferrand, Mounier and Degenne 1999). The nature of network capital affects the quality, quantity, novelty, and availability of resources (Popielarz 2000). Moreover, the loosely-coupled, networked nature of contemporary societies means that social capital comes contingently from a variety of persons, ties and networks, rather than stably from a single, solidary group (Barry Wellman 1999, 2001).

Bases of Support

Where does network capital come from? The explanation for who gives what to whom may be in the nature of the giver and receiver, the relationship, or in the composition and structure of the network in which people and ties are embedded. When people need assistance, they often want to know which *relationship* is likely to help them: They wonder:

Will my brother or my mother lend me money to buy my dream house?
Will my best friend or my sister be more understanding of my marital problems?
Who is the best person to ask to babysit tomorrow night?

Such questions provide the basis for our investigation of network capital:

- Is it the *social characteristics of the people* involved, as when a rich man gives money or information to a poor woman (Lin and Dumin 1986)?[2]
- Is it the nature of the *tie*, as when close friends are more supportive than acquaintances (Wellman and Wortley 1990)?
- Is it a network phenomenon, such as the network's *composition:* For example, does a network filled with close friends impel each of them to be extraordinarily supportive?

[1]Network capital is a form of "social capital". Social capital is a sprawling term, ranging from an individualistic framework that emphasizes the advantages that individuals can gain through their personal networks to a collective perspective that emphasizes the advantages of volunteerism to a community (Coleman 1988; Paxton 1999; Putnam 2000; Lin 2001). For further discussions of social support, see Erickson, Radkewycz and Nosanchuk 1988; Gottlieb and Selby 1990; Kadushin 1981; Lin, Dean and Ensel 1986; Wellman 1999. Two other means of obtaining resources, less prevalent in industrialized countries, are *self-provisioning* (Pahl 1984) and *coercive appropriation* (such as robbery, theft, and extortion (Dickens 1839; Pileggi 1985; Turnbull 1972).

[2]We ignore here personal characteristics, such as intelligence, health and attractiveness.

- Perhaps it is the network's *structure,* with densely-knit networks communicating about needs, enforcing norms of supportiveness, and coordinating deliveries of support (Burt 1992; Cook and Whitmeyer 1992; Lin 2001).

When people ponder these kinds of questions, they are analyzing their relationships with different kinds of network members. Because personal communities rarely operate as solidarities, people cannot count on all the people in their network to leap in and provide needed help. Nor is all help actively sought (Wellman 1982; Pescosolido 1992). Hence the provision of network capital depends on the social characteristics of each network member (or *alter)* and the *relational characteristics* of each *tie* with a network member. With respect to the *social characteristics of network members,* support may be a function of the characteristics of *egos* who may receive support or of *alters* who may provide support. For example, women are more likely to receive support, and parents and adult children are more likely to provide support.

People who provide support are not homogeneous grains of sand nor are their ties unstructured heaps of pick-up-sticks. Hence when analyses of *social characteristics* look only at the attributes of what aggregated heaps of individuals "possess," they neglect variation in which kinds of alters provide support. On the other hand, analyses at the *tie level*, of the providers and receivers of support, treat each tie as a discrete dyad and ignore the network context of supportive ties. Hence, they do not take into consideration how variation in network composition and structure might affect the provision of social support through ties (see the reviews in Gottlieb and Selby 1990; House, Umberson and Landis 1988; Wellman 1992a).

Sociologically informed analyses of ties within networks have investigated whether the attributes of ties (such as tie strength or frequency of contact) are linked to support or information obtained through these ties. For example, Mark Granovetter has argued that weak ties with socially-heterogeneous alters provide more diverse information (1982), our group's research has shown that strong, intimate ties provide more emotional support and companionship (Wellman 1979; Wellman and Wortley 1990), and Haythornthwaite and Wellman (1998) have shown that coworkers who are friends exchange more email. But such analyses have examined effects at the tie level without accounting for the supportive effects of variations in the kinds of people involved and the networks within which they interact.

Support Comes from Ties and Networks

There is more to interpersonal life than just individuals and ties. People are often immersed in milieus filled with companionship, emotional support or caring for others whose dynamics go beyond the level of the individual alter or tie. Hence the compositional and structural characteristics of *networks* must be taken into account (Hogan and Eggbeen 1995; Wellman and Gulia 1999b). People wonder:

> *Where can I get help from? Is my network large enough, coordinated enough, and containing enough of the right kinds of people to give me someone – or perhaps, several people – who can babysit, lend me money, provide marital understanding, or help when I am ill?*

Network capital works differently than dyadic capital because in a network there may be group pressures to provide support. The Biblical tale of Cain and Abel describes the sanctions that will be imposed on those who act against group members. Those who are disconnected, who are not "their brother's keepers," will find themselves "a fugitive and a wanderer" (Genesis 4:12). God serves as the Simmelian third party who can punish transgression in the dyad (Simmel 1922).

Therefore, at the *network-level* of analysis, researchers look at the *composition* of the networks (e.g., network size, network heterogeneity, mean frequency of contact, the percent who are friends) and the *structure* of these networks (e.g., density of *links* among alters). Such analyses seek to understand how the properties of networks affect what happens in them (and to them). Which attributes of networks tend to occur together? For example, are densely-knit networks more supportive, more controlling, or both? The size and

heterogeneity of a network (its "range") affect its members' access to resources (Haines and Hurlbert 1992; Burt 1983, 1992), and networks with more socioeconomic resources better mobilize supportive network capital (Lin 2001).

Some theories of network capital directly link the provision of support to the social structure in which a person or a tie is embedded. For example, H.G. Wells (1913) wondered if "in the country of the blind" (but nowhere else) would a one-eyed man be king. Portes and Sensenbrenner (1993: 1325) describe *enforceable trust* as occurring in networks, when an "actor's behavior is not oriented to a particular other but to the web of social networks." (See also Weber 1922 on "particularistic obligations"). In our biblical example, Abel should have been able to enforce the trust of Cain due to their mutual obligation to the network which includes God. Thus we have the moral in terms sanctions imposed for violated trust. By contrast, other forms of network capital such as *specific exchanges*, *generalized reciprocity* (Sahlins 1965), and *altruistic value introjection* may depend on the specific circumstances of the tie if they are not embedded in a densely-knit network.

Nor is it only a question of whether the characteristics of the network *or* the tie *or* the alter independently affect the availability of network capital. The story of Cain and Abel illustrates how the effects of ties may be contingent on the types of networks in which they are situated. As in Biblical times, kin may be called on for support when they are enmeshed in networks, and adult sons are more likely to aid their elderly parents when there are not any adult daughters available (Stone, Rosenthal and Connidis 1998). People navigate nimbly through partial involvements in multiple networks, as members of these networks they are subject to the networks' constraints and opportunities. Thus, the helpfulness of ties for job searches is enhanced by being in a resource-rich network (Lai, Lin and Leung 1998).

How are the propensity of alters and ties to be supportive affected by the kinds of networks in which they are embedded? At this *interactive level* of analysis, we especially wonder if being in a network composed of similar others will foster a greater tendency to supportiveness. For example, are kin more apt to be supportive when the tie is embedded in a network filled with kin. This would be a potentiating interaction effect. But there could be suppressive interactions as well. Consider the folk saying, "quantity doesn't equal quality" which argues that intimates are less likely to be supportive in large networks.

Thus network capital operates through many aspects of interpersonal life that make resources available:[3]

(1) *Ego's Social Characteristics:* The needs and resources that a person already possesses, including their ability to attract social support.
(2) *Network Size:* The number of ties that a person ("ego") has in his/her personal network.
(3) *Resource Possession:* The resources that these network members ("alters") possess.
(4) *Ego-Alter Similarity:* The similarity of ego's and alters' social characteristics
(5) *Resource Availability:* The willingness of alters to provide these resources to ego.
(6) *Resource Delivery:* The ability of alters to deliver these resources to ego.
(7) *Support History:* The support that alters have already given to egos, short-term and long-term
(8) *Reciprocity:* The history of support that egos have given to alters.
(9) *Network Composition*: The characteristics of all alters in a network, both:
    (a) Similarity: The tendency of similar alters to facilitate each other's delivery of resources.
    (b) Dissimilarity: The diversity of alters in a network.
(10) *Network Structure:* The structure of interpersonal relations that:
    (a) Information Flows: Disseminate knowledge about ego's needs and resources
    (b) Social Control: Facilitate or constrain the provision of resources.

[3] Although we have tried to produce an inclusive list of the aspects of network capital, our analysis does not dwell equally on all of them.

(11) Indirect Ties: Ties to people outside the network that provide access to additional resources.

The Usefulness of a Multi-Level Approach

Until now, studies of network capital have been constrained by their methodological inability to integrate analytic levels into a comprehensive analysis. Methodological weakness has led to constrained analysis. Technical incompatibilities (and disciplinary preoccupations; see Milardo and Wellman 1992) have largely led individual, tie, network, and interactive analyses to develop separately until now. Quantitative analysts have examined separately the effects of *either* individual characteristics, ties, *or* the ego-centered, personal community networks in which they are embedded. No quantitative analysis has been done of interactive effects.

Because many statistical techniques assume independence between units of analysis, they cannot focus simultaneously on different units of analysis. Yet the availability of network capital may well be affected by individual "agency" (self-organized actions on one's own behalf), ties dancing interpersonal duets, *and* the constraints and opportunities provided by networks with different sorts of structure and composition.[4] Not only do people need – and want – to know which kinds of people (an *individual-level analysis*) and relationships (a *tie-level analysis*) are apt to provide different kinds of support, they also need and want to know the extent to which their social networks as a whole can support them (a *network-level analysis*).

Although scholars "know" that individuals and ties are affected by their environing networks, and they "know" that the effects of networks usually occur through the concrete behavior of individual actors in specific interpersonal ties, it is one thing to state this knowledge metaphorically or in theory and quite another to specify how the contingent effects of individual, tie and network characteristics actually play out. There is the danger of reification: of seeing findings at only one analytic level – individual, tie or network – as the only truth rather than taking into account the comprehensive interplay of multiple levels.[5]

Multi-Level Models for Ties Nested in Ego-Centered Networks

Research Approach

This chapter goes beyond an *either/or* analysis to a form of *multi-level analysis* (Bryk and Raudenbush 1992; DiPrete and Forristal 1994; Longford 1995; Snijders and Bosker 1995; Snijders, Spreen and Zwaagstra 1999). Multi-level analysis is just starting to be used in sociology to integrate "nested data" into a single statistical model, such as occurs with residents in neighborhoods, children in schools, nation-states in world-systems, or, as here, individuals and ties in personal networks (e.g., Sampson, Morenoff and Earls 1999; Thomése and van Tilburg 1998, 2000; van Duijn, van Busschbach and Snijders 1999). As van Duijn, van Busschbach and Snijders (1999) state:

> Multilevel or hierarchical linear models explicitly take into account the nested data and the related dependency structure by incorporating unexplained variables between ties . . . and also between egos (van (p. 188). Ignoring the nested structure of the data can lead to two kinds of analysis. First, ignoring the nesting completely by treating the data as independent observations [as earlier tie-level analyses had done]. Second, eliminating the dependency by averaging [tie data in each personal network]. The first method . . . [produces] biased standard errors, underestimation of standard errors, and possibly . . . false conclusions. The second method is statistically correct, but suffers from loss of information [and lessened analytic power] (p. 205).

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[4]There are also the effects of the environing society, but that is beyond our analytic scope here.

[5]Like the chicken and egg, it is not clear which came first, ties or networks. To be sure, ties constitute a network, and on that grounds, one might give ties precedence. But as Simmel (1908) pointed out, networks can endure while ties come and go within them. So a network may have precedence over any tie currently in it.

Along with van Duijn, van Busschbach and Snijders, we pioneer here the integration of individual, tie and network-level analyses in a single statistical model to see how the provision of support in ties is a joint product of the characteristics of people, ties and networks. Each tie and the person (or "alter") at the end of that tie is nested in each personal network and the person (or "ego") to which that network belongs. The nature of ego-centered networks means that we take individual-level analyses into account in two ways. First, because each ego possesses a personal community network, for the purposes of empirical analysis there is a 1:1 mapping between egos and such networks. An individual-level social characteristic, such as the ego's gender, is as much a property of the network as is the density or size of this network, or if you like, the density of the network is a property of the ego. This means that network characteristics and ego characteristics can be analyzed at the same network level of analysis. Second, there is a similar mapping between the characteristics of ties (e.g., tie strength, provision of social support) and the characteristics of alters (e.g., gender, marital status) at the other ends of these ties with egos. Hence an alter's gender is as much a property of the tie as is the strength of the tie. This means that the characteristics of ties and alters can be analyzed at the same tie level of analysis

As we go beyond a single focus on the effects of either individual, tie, *or* network properties on behavior, we encounter the basic social scientific question of *emergent properties.* We ask if the provision of support is related only to the characteristics of individuals or ties, or is it also related to the characteristics of the personal networks in which they are embedded? Does one also have to take into account the characteristics of all network members – will women be more supportive in networks filled with women? – and the social structures in which their ties are embedded – will people be more supportive in densely-knit networks? We suspect that all levels of analysis are contingently important. If so, multi-level analysis can contribute to theory, as well as to method and substance.

In particular, we tease out the extent to which the provision of social support is associated with the effects of:

(1) The social characteristics of the ego who receives support (e.g., the gender of the individual)
(2) The ego's personal network (e.g., the size of the network; the general level of access ego has to alters);
(3) The social characteristics of the alters in these networks (e.g., the gender of the alter);
(4) The characteristics of the ties that connect egos and alters (e.g., membership in a common organization);
(5) Combinations of ego and alter characteristics which characterize the tie (e.g., the access of the alter);
(6) Interactions of ego/network characteristics with alter/tie characteristics.

This multi-level approach has two advantages. First, it provides estimates of the effects of variables at the individual, tie and network levels while controlling for effects at the other levels. Where it had been easy to mis-attribute tie effects to network effects (and vice-versa), the multi-level approach enables us to identify the relative strength of individual, tie and network effects on the provision of social support.

Second, it captures elusive interactive effects of network capital by examining how the composition and structure of networks affect individual and tie supportiveness. This test for emergent properties is captured in multi-level analysis by crossing tie-level effects (the characteristics of the tie) and network-level effects (of the composition and structure of the network). Moreover, multi-level statistical models can be more carefully specified by aligning the tie and network level effects to be crossed. For example, the effects of network capital among kin can be observed by crossing the parent/child effect with the extent to which ego's network generally contains kin.

To assess the analytic power of our approach, we compare our results to earlier baseline analyses of the same data that analyzed individual, tie, and network characteristics separately: Effects (1) and (2) are at the ego/network level, effects (3), (4), and (5) are at the alter/tie level, and effect (6) is a cross of ego/network and alter/tie levels.

We define a basic model specified at the level of the dyadic tie comparable to the model estimated by Wellman (1979) – whose data we use. For example, define *everyday support*$_{ij}$ to take a value of 1 if person *j* receives everyday support from her *i*th tie, and 0 if person *j* does not receive support from her *i*th tie. As in Wellman and Wortley (1990), we employ the logistic transformation of the probability that a dichotomous outcome takes a value of 1 or 0 (this defines a logit model). In this example, our model includes effects of the characteristic of the *j*th alter (e.g., *alter's gender*$_{ij}$) , and two characteristics of the tie (e.g., the tie's access – *access*$_{ij}$ – and if the tie is a parent/adult child relationship – *parent/child*$_{ij}$):

$$\log\left[\frac{P(everyday\ support_{ij}=1)}{1-P(everyday\ support_{ij}=1)}\right]=\beta_0+\beta_1 alter's\ gender_{ij}+\beta_2 access_{ij}+\beta_3\ parent/child_{ij} \quad . \quad (1)$$

Model (1) does not account for the unique effects of individual egos. That is, there may be some people who are particularly likely to engender support. If such people are also likely to have ties with women, parents and children, or to have highly accessible ties, we will not be able to differentiate the effect of the person from the effects of the types of ties.

Therefore, we extend (1) by incorporating the unique effect of each ego, assigning the subscript *j* to β_0:

$$\log\left[\frac{P(everyday\ support_{ij}=1)}{1-P(everyday\ support_{ij}=1)}\right]=\beta_{0j}+\beta_1 alter's\ gender_{ij}+\beta_2 access_{ij}+\beta_3\ parent/child_{ij} \quad .$$

Here the subscript *j* indicates that there is one β_0 that accounts for each ego *j*'s effect on the likelihood of receiving support. While we could obtain estimates of each of the *J* egos using a fixed effects model (such as through the use of dummy variables or an ANOVA-like framework), this would tax our degrees of freedom, distracting from the focus of the model. Moreover, the egos are merely a sample from a larger set of persons. Therefore, we treat the β_{0j} as random effects, distributed normally, with variance σ^2. Thus we need only estimate one extra parameter, σ^2, which represents the variation in ego's tendencies to attract support.

Further, we might hypothesize that the extent to which a given person is supported is a function of some characteristics of the ego such as his/her age or gender. In order to estimate the effect of an ego's gender on everyday support we model the term β_{0j} which represents the baseline extent to which ego *j* receives support. This is the key to multi-level models (Burnstein 1980), as β_{0j} is used as an outcome in a "level two" model:

$$\beta_{0j}=\gamma_{00}+\gamma_{01} ego's\ gender_j+u_{0j} \quad . \quad (3)$$

This model can be reinterpreted as a typical regression model. There is an outcome representing the extent to which a given ego is likely to receive support from a given tie (β_{0j}), an intercept (γ_{00}), an effect of the ego's gender (γ_{01}), and an error term (u_{0j}).[6]

Without the multi-level model defined by (2) and (3), we fail to account for effects of each ego and network on the multiple ties in which each ego engages. That is, there are dependencies among the observations of the multiple ties nested within each ego. If ignored, these dependencies have negative implications for statistical estimation and hypothesis testing (Bryk and Raudenbush 1992). By contrast, the multi-level model captures the sampling design of the data, namely the nesting of ties within egos. Therefore we observe at the first level effects of the alter and tie – such as the effect of *access*, and we observe at the second level effects of the ego or network – such as the effect of *ego's gender*.

The multi-level model also facilitates the differentiation of effects at the tie level from corresponding effects based on aggregate characteristics at the ego/network level. For example, though we hypothesize that people may be more likely to receive support from more accessible ties, there may also be a compositional effect. Egos who in general have more accessible ties may receive more support. To differentiate the two effects of tie and ego/network, we first "center" the tie level (level one) predictor, $access_{ij}$, around the mean level of accessibility of ego's ties (this is accomplished by creating a new predictor: $access^{*}_{ij} = access_{ij} - \bar{access}_{j}$). This new term captures the accessibility of a tie *relative to* the general level of accessibility of ego's ties. Next, we include the general level of the accessibility of ego's ties in the ego level (level two) model:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}\bar{access}_{j} + u_{0j} \quad . \qquad \textbf{(4)}$$

Thus γ_{01} represents the compositional effect of ego's general access to ties.

Multi-level models also facilitate specification of effects produced by crossing characteristics at each level. In particular, the theory of network capital suggests that those ties which are embedded in homophilous networks (containing ties and alters with similar characteristics) are more likely to be supportive than those which are not (Lazarsfeld and Merton 1954; Marsden 1988; Wellman and Gulia 1999b). In our case, this can be tested by assessing the effect of ego's mean access on β_2, the effect of access at the tie level. We expect that ties who have high access to ego will be more likely to be supportive if ego in general has high access to ties, because in such a case the accessible alter is committed not only to ego, but to the accessible network of ties in which ego and alter are both embedded. This effect can be tested by modeling β_{2j}, the effect of the accessibility of the tie on the likelihood of support for ego *j*, as a function of the general level of accessibility of the ties of ego *j*:

$$\beta_{2j} = \gamma_{20} + \gamma_{21}\bar{access}_{j} + u_{2j} \quad . \qquad \textbf{(5)}$$

[6] Note that now it is the *errors* in (3), the u_{0j}, that are assumed normally distributed (with variance σ^2). In estimating σ^2, multi-level software accounts for unreliability in the estimation of each β_{0j} due to small and varying sample sizes. In particular, the estimates are "shrunk" to a conditional mean (based on the characteristics of ego modeled at level 2) using an Empirical Bayes approach. While these procedures have been available for over a decade (see Bryk and Raudenbush 1988), they have only recently been extended to models with dichotomous outcomes (Raudenbush 1995). Such models pose special difficulties for obtaining maximum likelihood estimates. We use here Yang's (1998) extension of the penalized-quasi-likelihood to obtain estimates based on an extremely precise approximation to the likelihood.

Here, γ_{21} represents the extent to which the effect of access to a particular tie is accentuated (or attenuated) when ego's ties generally tend to be accessible. Technically, the effect associated with γ_{21} is an interaction effect, resulting from the multiplication of the level 1 ($access_{ij}$) and level 2 ($\overline{access}_{.j}$) predictors[7].

The differences in the effects associated with γ_{01}, γ_{20}, and γ_{21} are represented in the two hypothetical networks shown in Figure 1. The distance between ego and alter represents accessibility, and a line connects the two if the tie is supportive. The effect of the tie level is shown as: for each ego, the closer the tie (relative to ego's other ties), the more likely the tie is to provide support (the effect associated with γ_{20}). Also, the effect at the network level is shown as: ego A, who has more close ties, in general receives more support than ego B. (This effect is associated with γ_{01}). But note that the effect of the tie accessibility is greater for ego A than for ego B. The more accessible alters for ego A are 200% more likely to offer support than the less accessible alters (all six of the more accessible alters offer support whereas only three of the less accessible alters offer support). By contrast, the more accessible alters for ego B are only 50% more likely to offer support as the less accessible alters (three versus two). This interaction effect is associated with γ_{21}.

> Insert Figure 1 About Here <

We can explore similar effects with regard to a tie being with a parent or an adult child. The main effect of a *parent/child* tie may be that such ties are more supportive at the tie level. At the network level there may be an additional effect of egos who have many ties with parents and adult children. But without testing the interaction effect we do not know if the extra support for such egos actually comes from the parents and children. By estimating a parameter similar to γ_{21} for the *parent/child* effect we can learn whether the effect of parent/child ties is heightened when ego is embedded in a network with several parent/child alters. If such were true it would suggest that the commitment of the parent/child tie is accentuated when embedded in a familial context. This would be consistent with the argument that the commitment is as much to the family as to the individual.

Studying the Network Sources of Support

Data Collection

Our data come from a random sample survey of 845 adult (18+) Torontonians residing in the Borough of East York in 1968, with interpretation supplemented by lengthy interviews a decade later with a small subsample of the original respondents. East York, with a population of about 100,000, is an integral part of the transportation and communication networks of Metropolitan Toronto (population = 3 million +). It is located about six miles east of Toronto's central business district, a half-hour subway ride or drive. When the survey and interviews were conducted, its small private homes and apartments housed a settled, predominantly British-Canadian working- to middle-class population (Gillies and Wellman 1968; Wellman 1982). East York has had a long tradition of active social service agencies and voluntary organizations.

The in-person, closed-ended survey asked respondents/egos to provide information about each of their socially-closest, intimate ties outside of their household up to a maximum of six ties.[8] They reported about a total of 3,930 intimate ties (mean = 4.7). Most networks were a low-density mixture (mean density = 0.33) of friends and relatives, and most ties stretched beyond the neighborhood to elsewhere in Metropolitan Toronto. One-quarter were beyond the metropolitan boundaries. The data provided systematic information about each intimate and information about each network's composition and structure. Thus our study provides information about the strong ties that supply much social support and ignores the many weaker ties important

[7]When we report main effects at the network or tie level we do so based on models that do not include these interaction terms. We then estimate separate models which include the interaction terms.

[8]The question was "I'd like to ask you a few questions about the people outside your home that you feel closest to; these could be friends, neighbours or relatives."

for acquaintanceship, obtaining information, and integrating social systems. Despite the vintage of the data, its findings have proven consistent with more contemporary studies (Wellman 1999a).

Independent Variables

For reliability and comparability, our variable definitions are largely based on previous tie and network-level analyses of these data. We provide more rationale in this section for those constructs that are relatively new.[9]

Tie Strength: Are Stronger Ties More Likely to be Supportive? Egos/respondents' ranking of the *strength* of their ties with three to six *alters* to whom they feel close.[10] Such *"intimate"* ties usually provide much of the support in a network (Erickson, Radkewycz and Nosanchuk 1988).

Work and Organizational Ties: Are Socially-Close Workmates and Fellow Organizational Members More Likely to be Supportive? "Modernization" arguments suggest a shift from kinship and neighborhood-based ties to those based on working together or participating in voluntary organizations (e.g., Parsons 1943; Inkeles and Smith 1974; Wireman 1984). Therefore, we use a dichotomous variable at the tie level to represent whether ego and alter are socially close at work or in voluntary organizations.

Mutual Ties: Are Members of Transitive Triads More Likely to be Supportive? Our Simmelian (1922) argument suggests that those alters who are tied to many of ego's other alters would be more likely to be supportive. Thus we measure the number of mutual ties shared by ego and alter.[11]

Accessibility*: *Are Accessible Ties in Accessible Networks More Likely to be Supportive? Our measure of accessibility derives from three equally-weighted, correlated, log-transformed, and standardized variables: Frequency of Face-to-Face Contact, Frequency of Telephone Contact, and Residential Distance. These three variables are combined with the percentage of alters who live in Metropolitan Toronto to form a single accessibility measure.[12]

Kinship*: *Are Immediate Kin More Likely to be Supportive? Many scholars have found kin more likely to be supportive, especially parents, adult children, and siblings. However, some scholars have found ties with extended kin – cousins, aunts, uncles and grandparents – to be less supportive than other network ties.[13] Therefore we use three dichotomous variables to explore the three types of kin: parents/adult children, siblings, and extended kin. We report only on effects for parents/children as there were no significant effects for siblings or extended kin.

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[9]Individual characteristics are analyzed in Wellman 1985, 1992a, Wellman and Wellman 1992; tie characteristics in Wellman 1979, 1996; Wellman, Carrington and Hall 1988; Wellman and Wortley 1989; 1990; and network characteristics in Wellman, Carrington and Hall 1988; Wellman and Gulia 1999b; Wellman and Potter 1999b.

[10]Rank = 6 for the highest ranked (strongest) tie; Rank = 1 for the lowest ranked tie.

[11] Data on ties between alters were based on reports from egos. Network analysts and graph theorists often refer to the number of mutual ties as "degree centrality" (Wasserman and Faust 1994), and this independent variable would be part of the set in the recent p* models (Wasserman & Pattison 1996).

[12]We logged_{10} contact and distance data because, for example, a one day increase of contact at higher values (e.g., from 364 to 365 days) is less socially meaningful than an increase at lower values (e.g., from 1 to 2 days). We used percentage living in Metropolitan Toronto rather than the percentage living in the same neighborhood, because previous research has shown that alters living outside the neighborhood but elsewhere in Metropolitan Toronto have about as frequent contact and are as supportive as those living locally (Wellman and Tindall 1993; Wellman and Wortley 1990).

[13]E.g., Allan 1979; Cicirelli, 1995; Farber 1981; Goetting, 1986; Schneider 1984; Willmott 1986; Beverly Wellman 2001. Information about extended kin are in Stokowski and Lee 1991; Degenne, Lebeaux and Lemel 1998; Wellman and Wortley 1989.

Reciprocity*: *Are Alters More Likely to Provide Support to Egos Who Have Helped Them? Support may be given as part of tit-for-tat *reciprocity transactions* (Portes and Sensenbrenner, 1993). Egos reported dichotomously if they had or had not provided emergency support to each alter. (Alas, a similar question about everyday support was not asked.)

Network Size: Are Alters in Larger Networks More Likely to be Supportive? The number of alters in the network.[14]

Gender of Ego and Alter: Are Women More Likely to Give and Receive Support? Both earlier analyses of our data and other research have shown that women are more apt to provide support to others.[15] Women often bear a "*triple-load"* of domestic work, paid work and supportive *"net work*." Their *"network-keeping"* is an extension of their historic role as the kinkeepers of western society (Rosenthal 1985). Women may also receive more support than men, as women's everyday practices have become the focus of privatized, domesticated community networks. We code female *egos* and *alters* as 1 and men as 0.

Aggregate of Tie/Alter Level Measures: Does Network Composition Affect Extent of Support Provided? For each tie/alter level characteristic, we calculated the mean of the characteristic across all alters for each ego. This provides measures of mean tie strength, mean access to alters, and percentages of each of the dichotomous variables, such as the percentage of women in each network.

Interaction of Tie and Network Characteristics: Are Ties Embedded in a Network of Ties with Similar Characteristics More Likely to be Supportive? Are the tie-level effects of parent/child and accessible relationships accentuated if an ego is embedded in a network in which such ties predominate? When the tie is embedded in a network of similar ties the support coming from the tie is likely to be stronger because of commitment to the network of ties as much as to the specific ego. Exploring a similar argument, we also test the interaction of *reciprocity* in emergency support with each ego's general level of supporting alters in emergencies. We wonder if tie-level reciprocity would be less important in dense networks of support. These cross-level interaction effects are represented in multi-level analysis by using a characteristic of the ego/network level to model the *effect of* a characteristic at the tie/alter level (see model 5).

Measuring Social Support

As this survey was one of the earliest to inquire about social support (Wellman 1979, 1982, 1993), the differentiated nature of social support was not appreciated at that time. Hence, respondents/egos were only asked two broad questions about whether each person they felt socially close to provided social support. The "yes/no" answers to these questions are our dependent variables, and their dichotomous nature calls for logistic regression in tie-level analyses.

- "*Which of these do you rely on for help in everyday matters?"* Respondents/egos report that 23% of their socially-close, intimate ties provide such everyday support.
- *"Which of these do you rely on for help in an emergency?"* Respondents/egos report that 30% of their socially-close, intimate ties provide such emergency support.

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[14] As preliminary analyses did not show any association between support and network density, heterogeneity or range, they were removed from the final models. Although network density was found to be significant in an earlier study that only looked at the network level (Wellman and Gulia 1999b), the multi-level approach used here removes the impact of possibly confounding tie-level phenomena from our analyses here. For example, it enables us to answer the question of whether a high level of parent-child support is based on their bond or on the kinds of densely-knit networks in which such supportive parent-child ties reside. The answer, as we shall see, is that it is the parent-child tie, and not the densely-knit network, that facilitates the provision of support.

[15] See Vaux 1985; Cancian 1987; Perlman and Fehr 1987; Sherrod 1989; Wright 1989; Wellman and Wortley 1990; Bly 1990; Wellman 1992a; Canary and Emmers-Sommer 1997.

These two forms of support differentiate effects that require the large and immediate contribution of resources in emergencies from smaller, frequent, less immediate acts of everyday support. Thus, the different forms of support tap different levels of commitment and processes. Although the percentages for each form of support are small, 60% of egos indicate that they can draw on at least one intimate for everyday support, and 80% indicate that they can draw on at least one intimate for emergency support. Thus, from the perspective of most egos, their *networks* typically provide support.

Not all people need the same amount of support, and not all forms of support are equally variable across people. The multi-level approach allows us to account for variation in the odds that egos receive support from a given alter. (The estimate of this variation is referred to as $\hat{\sigma}^2$ and is defined by the variation of the u_{0j} in a level 2 model that contains only intercepts in the level 1 and level 2 models.) Egos vary more in the extent to which they received everyday support from an alter ($\hat{\sigma}^2$=1.69) than in the extent to which they received emergency support ($\hat{\sigma}^2$= .74). The relative lack of variation in the provision of emergency support reflects both floor and ceiling effects: *Floor:* There is more of an interpersonal and humanitarian obligation to provide emergency support when needed. *Ceiling:* Emergency support is rarely needed and can be demanding to provide.

Which Characteristics of Ties and Networks Affect Support

By taking into account the clustering of alters/ties into personal networks, multi-level models integrate the analysis of how both tie and network characteristics affect the provision of social support. In practice, this statistically more appropriate approach largely confirms the robustness of earlier single-level analyses that had looked separately at tie/alter and network/ego characteristics. We are gratified that more than twenty years of analyzing the Toronto data have not been wasted.

Despite these similarities, our multi-level results go beyond previous findings. Integration into a single statistical multi-level model:

(1) Disentangles identification of what are truly the effects of tie characteristics, network characteristics, or both. For example, if larger networks are more supportive, is this because they are just an aggregation of larger numbers of supportive ties or is there something about larger networks, *sui generis,* that is associated with more support?

(2) Allows the comparative weighing of tie, network and interaction effects. For example, which is more important for the provision of support: a kinship relationship or having any sort of relationship in a network composed predominantly of kin?

(3) Shows the interaction of tie and network characteristics. By computing statistics that cross levels, we identify interactions between individual, tie and network characteristics. For example, while alters who are in frequent contact tend to be supportive, they are especially supportive when they are in networks where most people are in frequent contact.[16]

We present our findings here, based on the statistics reported in Table 1, as supplemented by information gathered in detailed interviews. **Column 1a** presents the main effects of tie and network characteristics for *everyday support*, and **Column 2a** presents the main effects for *emergency support.* Columns 1b and 2b include effects generated by crossing variables from the tie and network levels. We follow Bryk and Raudenbush's (1992) convention for presenting multi-level models. We present effects on the intercept at the ego level ("level 2" in multi-level analysis terms) at the top of the table. Terms in bold below represent

[16]In general, the partitioning of variances between levels is an important aspect of multilevel models. But in this case our level 1 model (the tie/alter level) is based on a logistic regression. As such, we do not estimate a variance at level 1, discuss variance explained at level 1, nor do we partition variances between level 1 and level 2.

alter (level 1) slopes. Italicized terms represent cross-level effects. The final multi-level models for everyday and emergency support are presented in a Technical Appendix at the end of this chapter.

> Table 1 about here <

Tie Effects (Only)

Tie Strength*:* Although we only examine socially-close, strong ties here, some ties are closer than others. The data show that the stronger the tie, the more likely is a network member to provide everyday and emergency support. (The reverse is also true: Supportive ties are apt to become stronger [Wellman, et al.1997]). This replicates the findings of the first and second studies that tie strength is considerably associated with providing a wide variety of support. Because tie strength is relative to ego's other alters, tie strength is defined as a tie-level phenomenon only. Multilevel analysis shows that network characteristics do not affect the relationship of tie strength to support. In the loosely-coupled world of contemporary personal communities, strong ties function somewhat independently of the networks in which they are embedded.

Workmate Ties: The only other supportive phenomenon that is purely a tie characteristic is relationships with co-workers. The East Yorkers we studied rarely have socially-close ties with coworkers, but when they do, such "workmates" are especially apt to provide more everyday support (but not emergency support). They are in almost-daily physical contact, and are well-placed to learn about needs and provide help. Multi-level analysis demonstrates – in a way that earlier single-level analyses did not – that the everyday supportiveness of workmates goes beyond the supportiveness of other accessible ties. The interviews show that not only do workmates jointly cope with problems on the job, but their proximity and collaboration provide occasions for their helping each other in other routine ways such as lending small amounts of money or discussing problems.

The everyday supportiveness of workmates is more an outcome of their socially-close interpersonal relationship than it is a function of their common involvement in the same work organization. We infer this because socially-close members of the same voluntary organizations are not especially supportive. The few intimate ties with members of the same voluntary organizations (who are neither friends, kin nor workmates) tend to be relatively weak and to have a narrow focus that does not extend to domestic or community concerns (see also Wireman 1984). Although theories of social capital suggest a link between organizational membership and active ties (Putnam 1995, 2000), this may be more true at the macro-social level than in personal networks.

Network Effects (Only)

Mutual Ties: Pioneering network analyst John Barnes observed: "To discover how A, who is in touch with B and C, is affected by the relation between B and C . . . demands the use of the network concept" (1972: 3). Thus although we define *mutual ties* at the tie level, we interpret as a network as a network level phenomenon. Barnes' observation is borne out by the presence of network effects showing that a tie's supportiveness depends on more than the characteristics of the ego-alter tie alone. The data show that an alter who has many ties with other members of an ego's network is considerably more likely to provide everyday support to this ego and marginally more likely to provide emergency support.[17] The Simmelian (1908) argument applies: those that are connected to common others feel more of a bond to ego, and therefore are

[17]Although statistical analysis of mutual ties is done at the tie level, the substantive effect is at the network level. reciprocity effect may also be caused by the number of mutual ties – the more mutual ties, the more ego is likely to be supportive of an alter. Therefore it may not make sense to control for reciprocity before assessing the effect of mutual ties. The effect of mutual ties prior to controlling for reciprocity was stronger and significant at $p \leq .05$.

more likely to be supportive. This is a local phenomenon – ego-alter ties embedded in densely-knit clusters of ties – and not an outcome of whether an entire network is densely-knit

Network Size: As the size of a personal network increases, so does the number of alters who *might* give support. If the percentage of *actual* support providers does not vary with the size of the network, there would only be an effect of aggregating ties in larger or small networks. An independent network size effect would occur only if the percentage of supporters varies with different sizes of networks.

Our data show a network effect that is consistent with earlier network-only analyses. Egos who have a small number of intimates are more likely to receive both everyday and emergency support from each of them. This suggests that for the two to six intimates at the heart of a person's networks, quality compensates for quantity. Persons with smaller intimate networks may have more time to attend to each alter and hence would be more apt to evoke support from each of them.

We emphasize here that these findings refer only to intimates. The dynamics of support from intimates may be different from non-intimates. The second interview-based study, which analyzed both intimates and somewhat weaker *"active"* ties, found that active alters were more likely to be supportive when they were in networks containing many other active alters. It is possible that egos with more social skills are able to maintain non-intimate networks that are both larger and more supportive (see also Moore 1990; Parks and Eggert 1991; Riggio and Zimmerman 1991).

Tie Effects, Network Effects and Cross-Level Interactive Effects

***Kinship*:** Although exactly half of all intimate ties are with kin, kinship is no longer a solidary, supportive system. With one important exception, ties between kin are no more likely to be supportive than ties between unrelated people.

The exception is that the ties between parents and adult children (including in-laws) are especially likely to provide everyday and emergency support. We see remnants of the systemic nature of kinship in the 15% of all ties that are parent-child. The presence of more than one parent or adult child in the network makes it more likely that *each* tie between parent and adult children will be supportive (see the cross-level columns 1b and 2b of Table 1). The results are dramatic: The probability of each parent or adult child providing everyday support increases by about 60% if there is another parent or child in the network. While about 34% of parents and adult children provide everyday support, if there is an additional parent or adult child in the network, the probability of support from *each* parent or child increases to 54%.[18] Because each parent or adult child is more likely to be supportive in a network containing more than one parent or adult child, there is a high probability of getting support in such a network from at least one parent or adult child. Thus support is both a product of parent-child ties and a product of the composition of the networks in which these ties are embedded.

Accessibility: The impact of accessibility on support is *both* a tie and network phenomenon. Accessible alters (in frequent contact or living nearby) provide more everyday and emergency support. For example, although 23% of all ties provide everyday support, 37% of *moderately accessible* ties provide everyday support. (We define "moderately accessible" as one standard deviation above average.) This *tie-level* finding

[18]The overall probability of a parent-child tie providing support, 0.34, is associated with an odds ratio of .51. This means that the chance that a parent or adult child is supportive is about half the chance that the parent or adult child is not supportive. The odds that a parent or child provides everyday support increases by $e^{2.46 \times \%parents/children \times alter\ is\ parent\ or\ child}$ or about 11 as networks increase from containing no (0%) parents or adult children to containing all (100%) parents or children in the network. This translates to an increase in odds (or chances of support versus non support) of about 2/3 for each additional parent or child in ego's network. Starting with an odds of support of .51 for the average parent/child, the odds increases by 2/3 to .85 for the addition of one parent or child in ego's network, making the probability of support equal to .54. The effect is slightly stronger for emergency support.

supports analysts' contentions that the more contact, the more supportive the relationship. They argue that frequent contact fosters shared values, increases mutual awareness of needs and resources, mitigates feelings of loneliness, encourages reciprocal exchanges, and facilities the delivery of aid.[19]

Interviews suggest that the effect of accessibility is specialized. The coefficients in Table 1 show that accessibility is more important for everyday support. The heavier demands of emergency support partially override the handy availability of help from accessible alters. Frequent contact – or even just being physically available for contact – is vital for the delivery of goods and services such as child minding or the lending of household goods (see also Marsden and Campbell 1984; Espinoza 1999). Accessibility may also make it easier for people to deliver services when their relationships are not strong. For example, the interviews show that even non-intimate neighbors exchange services.

More accessible *networks*, containing a high number of accessible ties, are apt to provide everyday and emergency support. Each tie in a generally accessible network is more likely to be supportive – even those ties that are not themselves accessible. Although this network effect of accessibility is not as strong as the tie-level effect, the high level of contact and supportiveness in accessible networks apparently increases the supportiveness of even the less accessible ties in these networks.

The likelihood that an accessible tie will be supportive is higher when it is in an accessible network. This is a potentiating, cross-level effect, similar to the one described above for ties between parents and adult children. In terms of parameter estimates, while only 23% of all alters provide everyday support, a substantially higher percentage (37%) of those alters who are moderately accessible provide everyday support. (We define "moderately accessible" as one standard deviation above average.) However, if the *network* (as well the alter) is moderately more accessible than average, the probability of everyday support from a moderately accessible alter in a moderately accessible network rises to 54% -- more than double the 23% baseline probability. Of course, the probability of at least one alter giving support is high in such an accessible network, filled as it is with accessible alters.[20]

Gender of Alter and Ego: For both egos and alters, gender is the only individual characteristic we studied that is related to the provision of support[21]. Women are more involved in exchanges of social support: female *alters* are more likely to provide emergency support, and female *egos* are more likely to receive everyday and emergency support from their networks. Multi-level analysis shows that *networks* with a high percentage of women are especially likely to provide everyday and emergency support. It appears that a high percentage of women in a network potentiates the entire network to be more supportive. Or, perhaps egos at the center of such networks have consciously organized their networks to provide more support.

The second East York study suggests that it is *emotional support* that women are especially likely to provide (Wellman and Wortley 1990; Wellman 1992a). There is also a cross-level effect: stronger ties are even more likely to provide everyday support if ego is a man. In other words, not only do women get more everyday support from intimates, this support is as likely to come without regard to the strength of the

[19]See Homans 1950, 1961; Clark and Gordon 1979; Galaskiewicz 1985; Connidis 1989, Bumpass 1990; Wellman 1999.

[20]The 23% of alters who provide everyday support are associated with an odds of 0.30 . If the alter is moderately accessible (0.49 above the mean), the odds doubles ($e^{1.4\times.49}=2$) to .6, which is associated with a probability of 0 .37. If, in addition, the network is moderately more accessible than average (one standard deviation, or .73, above the mean), the odds doubles again ($e^{1.083\times..73}=2.2$) to 1.2, associated with a probability of 0.54. The effect on the odds ratios is halved for emergency support.

[21]Preliminary analyses found that egos' and alters' socioeconomic status, age and family status were *not* associated with the provision of support at the tie or network levels.

intimate tie. By contrast, men receive their support disproportionately from their very closest intimates.[22] Our findings are basically congruent with the hypothesis *cum* empirical generalization that "women express, men repress," with women interacting "face-to-face" by exchanging emotional support while men interact "side by side" by exchanging goods and services (Perlman and Fehr 1987, p. 21; see also Moore 1990; Wright 1989).

Reciprocity: Egos are likely to receive emergency support from *alters* to whom they have provided emergency support. This is a *tie-level* manifestation of the Matthew (25:29) effect: those who have given also receive. When we interviewed egos a decade after the original survey, we found that those alters who had provided support were more likely to continue as active network members (Wellman et al. 1997).

Reciprocity operates as a network process even more than as a tie process. Egos who have provided emergency support to many alters are more likely to receive emergency support from a given alter. This may represent an effect in which egos and alters contribute to the general group, with reciprocity being from the group instead of the individual. In fact, the *cross-level interaction* effect of ego's general level of providing emergency support alters attenuates the reciprocity effect considerably. This suggests that reciprocity transactions between ties and enforceable trust in networks are interrelated forms of network capital that need not be employed concurrently (Portes and Sensenbrenner 1993; Frank and Yasumoto 1998). Where there is a commitment to a larger network, actors need not draw their network capital primarily in the form of tie-level reciprocity transactions. When the network owes support to ego, ego need not depend on ties with specific alters who owe reciprocity.

Toward a Multi-Level Theory of Network Capital

Comparing Multi-Level with Single-Level Findings

Just as the nature of social support is diversified, so are the processes that supply it:

- Attenuated Primordial Norms: Kinship, but only between Parent and Adult Child
- Sociobiological Forces: Women
- Handiness: Accessibility through In-Person and Phone Contact
- Structural Imperatives: Mutual Ties
- Self-Interested Politeness: Reciprocity/Social Capital

It is gratifying to veteran researchers to discover that twenty-plus years of single-level analyses are robust enough to hold up in multi-level models (Table 2). As before, we find that strong ties and central ties are more likely to provide most forms of support, parents and children are most likely to provide all forms of support except emotional support, and accessible ties are the pre-eminent providers of small services. Our findings are also consistent with previous network-level analyses that larger, more accessible networks, and networks with a higher percentage of women provide more support.

> Table 2 about here <

Yet the multi-level approach is more than a fancier way to confirm what we already know. It affords several distinct advantages that allow us to go beyond earlier analyses:

1. We can estimate the effects of variables at the tie and the network level more clearly and confidently, because the multi-level approach controls for effects at the other level and obtains more correct standard errors at each level. This enables us to discuss tie-level effects without the nagging suspicion that the non-

[22]Reading the coefficients in Table 1 is a bit tricky here. The basic gender effects for egos receiving support and alters providing support can be found in Columns 1a and 2a. The cross-level effect is found in Column 1b, but one should not use the estimates from columns 1b and 2b to described gender effects since these models contain cross-level interaction terms regarding gender.

random clustering of ties may have distorted analysis. It makes us more confident that the effects of tie strength and workmate relationships occur independently of any possible effects of the composition and structure of the networks in which the ties are situated.

2. It also allows us to discuss network-level effects without the nagging suspicion that they are only a pseudo-outcome of the aggregation of tie-level effects in each network. For example, highly accessible networks are more likely to provide support over and above the propensity of each accessible alter in the network to be supportive. Networks containing many women are more likely to provide support over and above the likelihood of each individual woman in that network to be supportive. Small networks have more ties that are apt to provide everyday support.

3. We can specify a wider range of models that represent and extend existing theory. This allows us to decompose effects previously conceptualized at the tie level into an effect of the tie as well as an effect of the aggregate of the tie characteristic. For example, the effect of accessibility is stronger at the tie level than at the network level for both everyday and emergency forms of support. This means that the supportiveness of accessibility is primarily an interpersonal, ego-alter, process that is heightened when accessible ties are in a network with other accessible ties.

4. We can examine interactive effects between tie/alter and network/ego characteristics. Many aggregate and all cross-level effects had not even considered in previous analyses, although they may have been hinted at in theory. For example, when we cross tie/alter and network/ego predictors we find that the already high likelihood of accessible alters to be supportive is greatly increased when they are members of especially accessible networks. Similarly, parent-child ties are more likely to be supportive when there is more than one parent-child tie in the network.

Capitalizing on Networks

Multi-level analysis has enabled us to elucidate the interplay between individual agency, dyadic dancing, and network facilitation. The characteristics of egos, ties and alters clearly affect the extent of support. But so does network composition, network structure, and cross level effects of composition and tie/alter characteristics. These are network capital in a deeper sense: It is the nature of the network that facilitates capitalization on potentially supportive ties.

Consider the effect of mutual ties: When alter and ego are tied to common others, the alter is more likely than other alters to provide support. Technically, this is a dyadic effect, but it corresponds to standard sociological interpretations suggesting that the better norms, communication, and coordination of densely-knit kin-dominated *networks* make them more supportive (Durkheim 1897; Bott 1957; Kadushin 1983; Fischer 1982; Thoits 1982; Marsden and Hurlbert 1988; Pescosolido and Georgiana 1989).

A second form of network capital appears when particular types of ties operate in networks heavily composed of such ties. This is manifest in the effects of parent/child ties and accessible ties, the vestigial remnants of traditional kinship and neighborhood solidarities. Parents and adult children (including in-laws) are especially likely to provide support in networks composed of a relatively high number of parents and children, and accessible ties are especially apt to provide support when they are in networks filled with accessible ties. These effects cannot be attributed to the number of mutual ties between alter and ego, because we controlled for this. We believe that they are effects of the potentiating capacity of network capital, indicating that a particular tie is more likely to be activated when embedded in a network of similar ties. In such homophilous situations, a tie-level commitment between an ego and an alter is increased by the commitment of many similar alters in the network. There are several reasons why this may be so. For example, people with atypically high needs for support may have networks especially filled with immediate kin. These immediate kin may accentuate the norm of intra-family supportiveness. In the case of accessibility,

there may be a shared skill in cultivating accessible ties and cultivating support. Or, those who need support may attract support providers to live near them or move to live near those likely to provide support.[23]

A third form of network capital pertains to reciprocity. An ego is likely to receive support reciprocally from an alter whom this ego has supported. Although this support may come through obligations that occur in networks with strong ties or with parent-child bonds, it may also come with the obligation of reciprocity that operates independently of tie strength or immediate kinship. Thus, one calls on emergency support for this year's financial crisis from the intimates whom one has supported through a previous emergency. But the tie-level effect of reciprocity is reduced when ego has contributed extensive emergency support to a number of alters. Under these conditions, tie-level dynamics apparently are superseded by network-level dynamics: One need not turn to a specific alter whom one supported last year because one can rely on the network. Therefore, one may draw on network capital from the specific alter and from the network.

Dyadic Duets and Emergent Structural Properties

That a social network is more than the sum of its ties has been a fact since Cain dealt with both Abel and God, and a central assertion of social network analysis for at least thirty years. But the debate about the existence of emergent structural properties goes beyond social network analysis. It has been a longstanding core sociological controversy which we personify as a heavyweight match between George Homans (1961) – who argued that social phenomena were nothing more than the sum of two-person ties – versus Georg Simmel (1908) – who argued that the presence of third parties inherently affects the operation of two-person ties.

The struggle between Homans and Simmel is a toss up in our analysis. Favoring Homans is that tie dynamics predominate. Certain types of ties – strong ones, parent-child ones – are apt to be supportive regardless of what network they are in. Another argument for the primacy of tie-level dynamics is the relative supportiveness of ties deriving from direct interactions between egos and alters as compared to the relative unsupportiveness of ties whose existence derives from environing social systems. These include ties with workmates, fellow members of voluntary organizations, and extended kin (uncles, nieces, grandparents, etc.). The case of extended kin is particularly instructive. If kinship were a strong system, then all types of kin should be supportive. In fact, only immediate kin are especially supportive, operating as dyads or as members of quite small social systems.

Yet the data also support a Simmelian assertion of the importance of networks that cannot be reduced down to a mere summation of two-person relationships. The structural effect standardly applied to "density of a network" appears in our models in the form of the tie level effect of mutual ties between alter and ego. Emergent properties are important for obtaining network capital, although the emergent properties come from the composition of the networks rather than their structures: the percentage of parents and children in the networks, mean access to alters, reciprocal ties, and female alters. Cross-level effects show the oversimplified fallaciousness of ascribing support to only the tie or the network. Take the case of reciprocity. Small acts provided by immediate alters are likely to be reciprocated quickly. In the event of failed reciprocity, the losses are minimal. However, larger forms of support may not be directly or immediately reciprocated. Thus they occur in a context where the commitment is to the network – or some component of it – and the likely eventual benefit is derived through the network rather than through specific reciprocal acts between ego and alter. Thus, immediate family members provide multiple forms of support through a commitment to the family that is beyond a commitment to ego.

[23]By contrast, a Dutch study of the elderly finds the opposite: The greater availability of nearby ties decreases the instrumental support received from any given tie (Thomése and von Tilburg 1998, 2000). There may be a different dynamic working for the provision of support to those with high needs for assistance .

Living Networked in a Networked World

Since the 1950s, there has been a practical and analytic shift from seeing community as a kinship or neighborhood solidarity to seeing it as a personal community network (Wellman 1999). The shift in perspective from a solidary to a network view has probably lagged the shift in social structure. Although almost all people possess community ties of sociability and support, many of these ties are only weakly connected. They function as dyads and small clusters, and not as densely-knit groups. Hence the tie, not the network, may be the most important determinant of network capital. As the network is dominated by the tie, the individual persona becomes an even more active player of the network capital game, rather than sitting back passively and letting social support come from a group (Burt 1992; Wellman 1999). It is only at home that a person can expect a wide range of support to be provided (Wellman and Wellman 1992), and home – and the marital couple – are where the network capital game is played – obtaining support tie-by-tie.

Instead of total involvement in a single solidary community, the personal mobility and connectivity that are the hallmarks of the industrial and information ages have replaced solidarity with *networked individualism* (Barry Wellman 2001). People move through partial specialized involvements with multiple sets of network members. Interactions with network members are principally in duets, two couples, and informal get-togethers of friends and relatives. These are not simple, homogenous strictures but complex compositions and sparsely-knit structures. Most interactions are not in public places, but tucked away in private homes or telecommunications. Relationships are not permanent: Even socially-close ties are often replaced within a decade. Rather than each network member providing a broad spectrum of support, people get specialized support from a variety of ties.[24]

This means that within networks there is much possibility for individual *agency* and *autonomously acting ties* (White 1992; Emirbayer and Goodwin 1994). People and ties are affected by their networks, but only partially so. People maneuver to form relationships and find support from them, ties often operate without much constraint from their environing networks, and clusters of ties within networks operate privately in domestic spaces than collectively in public places (Oldenburg 1989; Lofland 1998). Husbands and wives spend evenings together. Couples operate their personal networks jointly, with wives more active in determining network membership and setting agendas (Wellman 1992a). Hence the characteristics of individuals, ties, and networks all can affect the supply of supportive resources.

Even though people no longer inhabit solidary groups, they do not function alone. Even though personal networks are fragmentary and loosely-coupled, support is given to clusters within a network as well as to an ego. Ties do not operate in isolation. Ties contribute to networks; networks encourage and potentiate ties. The supportive relationship is social in another sense. Support is often given for the general benefit of a household or a network rather than for the specific benefit of the individual (Wellman and Wellman 1992).

Just as investment is not only zero-sum but builds a fund of capital, one person's support of another may also contribute to the network of which both are members. The network's provision of supportive resources adds to the fund of network capital circulating in a community as well as benefiting the individual. Social support is rarely a zero-sum game. Companionship is usually a mutual benefit, while helping others increases one's own standing in the community. It gives the giver the *naches* of seeing oneself as a worthwhile contributor, and raises the level of overall supportiveness (Schweizer and White 1998). For example, providing others with emotional support often increases happiness and decreases stress levels (Pennebaker 1990). Not only does "it takes a village to raise a child" (Clinton 1996), the support provided increases the village's overall level of social capital and civic trust.

[24]For documentation and amplification, see Castells 1996; Craven and Wellman 1973; Fischer 1982, 1984; Hampton and Wellman 1999; Putnam 1995, 2000; Simmel 1922; Suitor, Wellman and Morgan 1997; Wellman 1990, 1992a, 1992b, 1999; Wellman and Gulia 1999a; Wellman and Leighton 1979; Wellman and Potter 1999; Wellman and Tindall 1993; Wellman, Wong, Tindall and Nazer 1997.

In such personal communities, network capital is inherently multi-level, affected by individual agency and specific ties, as well as by the organizational and normative effects of the networks in which individuals and ties are lightly linked. While people dance to their own tunes and in step with their alters, their movements take place within the network ensemble. Hence the structure of the networks is important as a background factor: for its sparse interconnections, allowing people to participate in many worlds. In these communities of shared interest, networks provide contexts for similar people to act similarly and to observe each other acting similarly. It is the composition of these networks which is important, often connecting similar alters who have experienced similar life events and have similar interests (see also Suitor, Pillemer and Bohanon 1993). The *"cultural convoys"* of similar network members potentiate the supportiveness that any one tie can provide.

It is time to stop trying to view the present through the lens of the past. It is time to stop seeing networks as nascent groups. The pervasiveness of ties and the ability of such ties to link distinct social circles provide abundant network capital (Laumann 1973; Granovetter 1982; Ferrand, Mounier and Degenne 1999). The interplay of tie, network and individual characteristics strongly affects where such network capital will flow. At a larger scale, the transformation of national and global societies into "network societies" (Wellman 1988, 1997; Castells 1996) suggests the usefulness of thinking of social capital as a product of personal community networks as well as of formally institutionalized groups.

We have reversed the precept of Research Design 100: We have gone from method toward theory by way of substance. As van Duijn et al (1999) noted, multilevel models provide a powerful new way to study ties and networks (or other nested phenomena). But here we also draw on the fact that multilevel models are an epistemologically more accurate way for representing the contemporary network world in which phenomena are inherently multi-level. Our findings fit the nature of loosely-coupled "liberated" communities (and possibly organizations with similar characteristics). Such communities are not enveloping, binding solidarities. People are members of multiple networks, and they enact specific ties and networks on an hourly, daily, monthly and yearly basis. They can – and do – change ties and networks in response to opportunities, difficulties and changes in their personal and household situations (Wellman, et al. 1997). Under these circumstances, network phenomena can only be facilitating and partially constraining – and rarely dominating or controlling. To understand the place of network capital more fully, we need to know more about how people think about and operate their networks:

(1) Can we move beyond regression coefficients and understand how the multi-level potentiation of ties by networks actually works?

(2) The handful of strong alters/ties we have studied are only the core constellation in a person's network universe, typically containing more than 1,000 alters. Do the many other weaker ties exhibit the same tendencies we have discovered here? As weaker ties may be less densely connected by mutual ties to the egos at the centers of these universes, this might lead to more individual agency and independent tie dynamics in the behavior of each ego and alter. Yet this same weakness in the ties may require the structuring and potentiating capacity of densely-knit clusters of ties to transmute the ordinary behavior of ego and alter into truly supportive exchanges.

(3) How do compositional effects work as network processes? If many network members do not know each other, are similarities in their supportiveness the consequence of status similarity or of assortative mating (Smith and Stevens 1999): "belonging" to the same ego who may through force of circumstance or planning have gathered a particular set of alters?

(4) Under what circumstances do people think and act in relational, network, or group terms (Freeman 1992; White 1992)? Can there be a collective group identity and individual sense of belonging, if people are

heavily involved in individual agency and dancing dyadic duets rather than nesting in encompassing networks?

(5) To what extent is network capital an outcome of a normative, reference group process or an outcome of information flows and structural coordination?

(6) Is the network potentiation of supportive ties, so apparent for parent-child and accessible relationships, in part a result of people consciously constructing their networks to fit their needs? What is the empirical reality of "networking"? Are people "cultural dopes" in Harold Garfinkel's sense (1967): passively allowing ties, networks and support to happen to them? Or are they steely-eyed practitioners of Ron Burt's craft (1992): actively amassing network capital by forging (and dropping) their ties and (re-)shaping their networks?

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Table 1: Multilevel Effects on Everyday and Emergency Support

Variables	Everyday Support (1a)	Everyday with *Cross-Level* Effects (1b)	Emergency Support (2a)	Emergency with *Cross-Level* Effects (2b)
Intercept	-1.458** (.372)	-1.463** (.382)	-.341 (.250)	-.358 (.252)
% Parents/Children in the Network	-.260 (.403)	-.350 (.410)	-.034 (.241)	-.041 (.244)
Mean Access to Alters	1.077** (.180)	1.257** (.185)	.379** (.117)	.419** (.118)
% Alters who are Women	1.272** (.341)	1.278** (.348)	.944** (.229)	.955** (.231)
Ego is a Woman	.450* (.212)	.380[a] (.216)	.282* (.143)	.286* (.144)
Network Size	-.193** (.071)	-.199** (.072)	-.224** (.046)	-.227** (.046)
% Alters to Whom Ego Has Provided Emergency Support			2.536** (.154)	2.589** (.157)
Alter is a Parent/ Child	.713** (.145)	.315 (.232)	.654** (.134)	.204 (.220)
% Parents/Children in the Network		2.460* (1.102)		2.826* (1.099)
Extent of Access to Alter	1.372** (.096)	1.411** (.099)	.791** (.084)	.794** (.085)
Mean Access to Alters		1.083** (.220)		.592** (.194)
Alter is a Woman	.196 (.121)	.165 (.123)	.905** (.111)	.885** (.111)
Strength of Tie	.462** (.037)	.396** (.052)	.333** (.031)	.338** (.031)
Ego is a Woman		-.148** (.065)		
Number of Mutual Ties between Ego and Alter	.139** (.050)	.147** (.050)	.071[a] (.037)	.077* (.038)
Alter is a Workmate	1.300** (.196)	1.302** (.199)		
Ego Provided Emergency Support to Alter			1.642** (.101)	1.603** (.104)
% Alters to whom Ego Provided Emergency Support				-1.578* (.618)

Network/ego predictors are in ordinary font**; tie/alter** predictors are in bold; *cross-level* predictors in italic.

[a] → p ≤ .10; * → p ≤ .05; ** → p ≤ .01.

Table 2: Comparison of Estimates from Multi-Level and Single Level Models

Variables	Everyday Support		Emergency Support	
	Tie Level	**Multi-Level**	**Tie Level**	**Multi-Level**
% Parents/Children in the Network	NC	0	NC	0
Mean Access to Alters	NC	+	NC	+
% Alters Who are Women	NC	+	NC	+
Ego is a Woman	NC	+	NC	+
Network Size	NC	-	NC	-
% Alters to whom Ego has Provided Emergency Support	0	0	NC	+
Alter is a Parent/Child	Indirect Effect	+	+	+
% Parents/Children in the Network	NC	+	NC	+
Extent of Access to Alter	+	+	+	+
Mean Access to Alters	NC	+	NC	+
Alter is Female	0	+	0	+
Strength of Tie with Alter	+	+	+	+
Ego is Female	NC	-	0	0
Number of Mutual Ties Between Ego and Alter	NC	+	NC	0[a]
Alter is a Workmate	Indirect Effect	-	0	0
Ego provided Emergency Support to Alter	0	0	0	+
% of Alters to whom Ego Provided Emergency Support	0	0	NC	-

Tie level data from Wellman (1979)

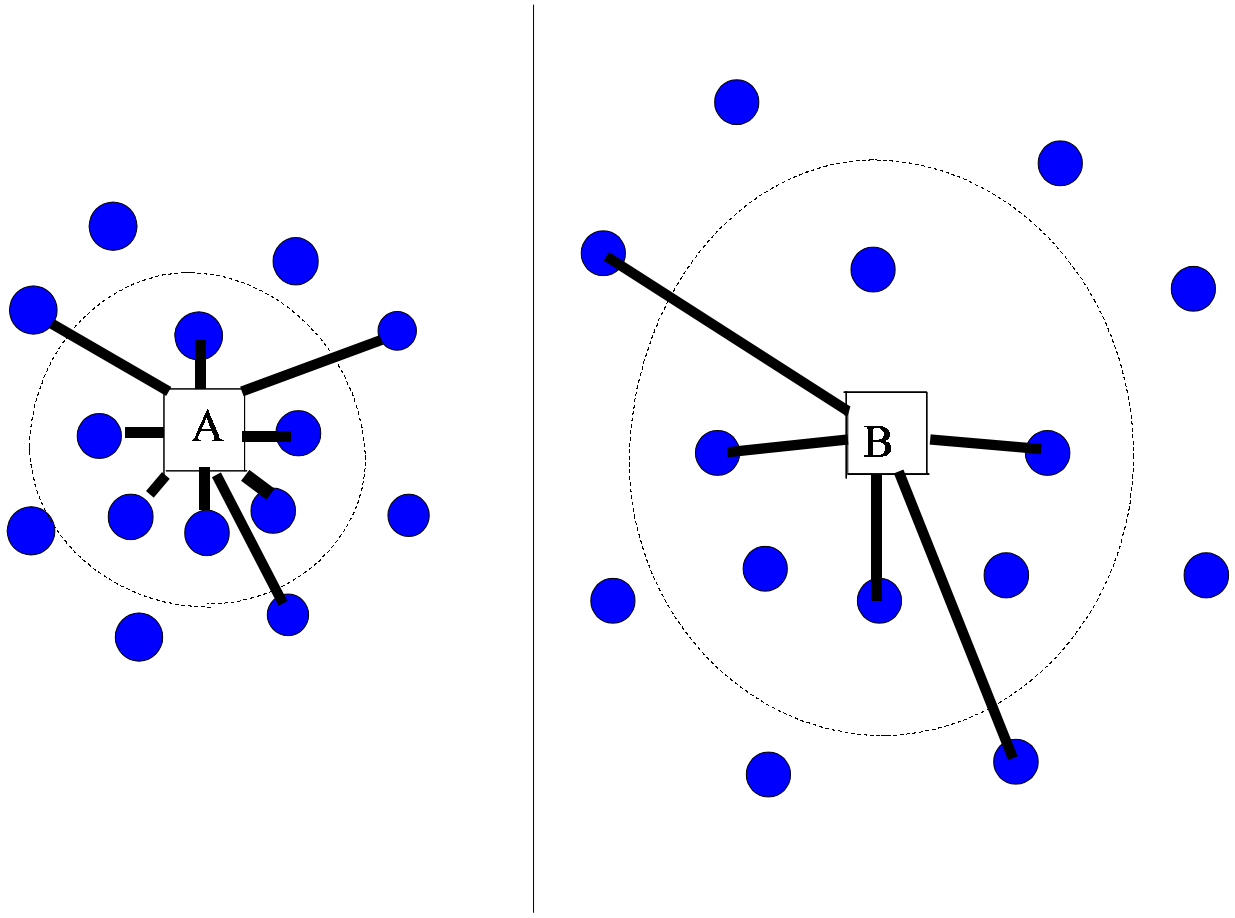
Tie or alter predictors are in bold; network or ego predictors are in ordinary font; *cross-level* predictors in italic.

+ indicates positive effect, - indicates negative effect, 0 indicates effect not significantly different from zero, 0[a] indicates effect significant at $p \leq .10$.

NC=Not Considered when only tie level models were employed. Although such effects could have been specified in a single level framework, they are more likely to emerge when one considers a multilevel model.

Figure 1

Effects of Accesibility on Support in a Multilevel Framework



Egos are in squares, alters represented by circles.

Distance between ego and alter indicates accessibility.

A line that indicates alter supports ego.

Technical Appendix

The final multi-level model for everyday support for alter *i* for ego *j* is:

Level 1 [*Tie/Alter level*]:

$$\log\left[\frac{P(Everyday\ Support_{ij}=1)}{1-P(Everyday\ Support_{ij}=1)}\right] = \beta_{0j} + \beta_{1j} Alter\ is\ Parent/Child_{ij} + \beta_{2j} Extent\ of\ Access\ to\ Alter_{ij}$$
$$+ \beta_{3j}\ Alter\ is\ a\ Woman_{ij} + \beta_{4j}\ Strength\ of\ Tie_{ij}$$
$$+ \beta_{5j}\ Number\ of\ Mutual\ Ties\ Between\ i\ and\ j + \beta_{6j} Alter\ is\ a\ Workmate_{ij}$$

Level 2 [*Ego/Network level*]:

[*Overall Support intercept*] $\beta_{0j} = \gamma_{00} + \gamma_{01}\%Parents/Children\ in\ the\ Network_j + \gamma_{02} Mean\ Access\ to\ Alters_j$ **(6)**
$$+ \gamma_{03}\%Alters\ who\ are\ Women_j + \gamma_{04} Ego\ is\ a\ Woman_j + \gamma_{05} Network\ Size_j + u_{0j}\ ,$$

[*Parent/Child slope*] $\beta_{1j} = \gamma_{10} + \gamma_{11}\%Parents/Children\ in\ the\ Network_j\ ,$

[*Extent of Access slope*] $\beta_{2j} = \gamma_{20} + \gamma_{21} Mean\ Access\ to\ Alters_j\ ,$

[*Alter is Woman slope*] $\beta_{3j} = \gamma_{30}\ ,$

[*Strength of tie slope*] $\beta_{4j} = \gamma_{40} + \gamma_{41} Ego\ is\ a\ Woman_j\ ,$

[*Number Mutual Ties slope*] $\beta_{5j} = \gamma_{50}$, *and*

[*Alter is Workmate slope*] $\beta_{6j} = \gamma_{60}$.

All tie/alter level 1 predictors were centered around their group means except for *Number of Mutual Ties.* Thus if this were a linear model β_{0j} would represent the predicted value for an average alter with whom ego has zero mutual ties. The interpretation is not as exact for non-linear models, such as in the logistic regression at level 1.

All ego/network level 2 predictors were centered around their grand means except for *Ego is a Woman* and *Network Size*. Note that only the intercept is associated with a random term; the residual variances of all other level 1 slopes are set to zero, as these were not the focus of our models.

The final multi-level model for emergency support is:

Level 1 [*Tie/Alter level*]:

$$\log\left[\frac{P(\textit{Emergency Support}_{ij}=1)}{1-P(\textit{Emergency Support}_{ij}=1)}\right] = \beta_{0j} + \beta_{1j}\textit{Alter is Parent/Child}_{ij} + \beta_{2j}\textit{Extent of Access to Alter}_{ij}$$
$$+ \beta_{3j}\ \textit{Alter is a Woman}_{ij} + \beta_4\ \textit{Strength of Tie}_{ij}$$
$$+ \beta_{5j}\ \textit{Number of Mutual Ties Between i and j}$$
$$+ \beta_{6j}\textit{Ego Provided Emergency Support to Alter}_{ij}$$

Level 2 [*Ego/Network level*]:

[*Overall Support intercept*] $\beta_{0j} = \gamma_{00} + \gamma_{01}\%\textit{Parents/Children in the Network}_j + \gamma_{02}\textit{Mean Access to Alters}_j$ (7)
$$+ \gamma_{03}\%\textit{Alters who are Women}_j + \gamma_{04}\textit{Ego is a Woman}_j + \gamma_{05}\textit{Network Size}_j$$
$$+ \gamma_{06}\%\textit{Alters to Whom Ego Has Provided Emergency Support}_j + u_{0j}\ ,$$

[*Parent/Child slope*] $\beta_{1j} = \gamma_{10} + \gamma_{11}\%\textit{Parents/Children in the Network}_j\ ,$

[*Extent of Access slope*] $\beta_{2j} = \gamma_{20} + \gamma_{21}\textit{Mean Access to Alters}_j\ ,$

[*Alter is Woman slope*] $\beta_{3j} = \gamma_{30}\ ,$

[*Strength of tie slope*] $\beta_{4j} = \gamma_{40}\ ,$

[*Number Mutual Ties slope*] $\beta_{5j} = \gamma_{50}\ ,$ *and*

[*Ego Provided Support slope*] $\beta_{6j} = \gamma_{60} + \gamma_{61}\%\textit{Alters to Whom Ego Has Provided Emergency Support}_j\ .$

All tie/alter level 1 predictors were centered around their group means except for *Number of Mutual Ties.* Thus if this were a linear model β_{0j} would represent the predicted value for an average alter with whom ego has zero mutual ties. The interpretation is not as exact for non-linear models, such as in the logistic regression at level 1.

All ego/network level 2 predictors were centered around their grand means except for *Ego is a Woman* and *Network Size*. Note that only the intercept is associated with a random term; the residual variances of all other level 1 slopes are set to zero, as these were not the focus of our models.