

Social Network Analysis: Recent Achievements and Current Controversies

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Network analysis has grown rapidly over the past two decades, but criticisms of the approach have increased as well. This article focuses on several accomplishments and unresolved problems of the network approach. In the first section, I illustrate the value of the network model in several substantive areas, focusing on studies of centrality and power, network subgroups, and interorganizational relations. I then discuss three issues over which the approach has provoked controversy: the relation between network analysis and rational choice theory; the role of norms and culture, and the question of human agency. I conclude with some examples of how network theorists are addressing these problems.

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1. Introduction

Network analysis has gained an increasing number of adherents over the past twenty years. Research suggesting that social networks influence the behavior of individuals and groups continues to multiply. As its popularity has increased, criticisms of network analysis have also proliferated. My purposes in this article are twofold. First, I provide brief overviews of the network literature in three important areas: centrality and power; network subgroups; and interorganizational relations. The purpose of this discussion is to demonstrate the rapid progress that has been made in these areas during the past decade. Second, I discuss three issues that are the sources of current theoretical controversies: the relation between network analysis and rational choice theory; the role of norms and culture; and the question of human agency. I conclude with a brief discussion of future prospects for network analysis.

2. Background

Network analysis has its roots in several theoretical perspectives. Some have traced

it to psychiatrist J. L. Moreno (1934), who developed an approach known as sociometry, in which interpersonal relations were represented pictorially. Others have traced the approach to the work of British anthropologists John Barnes (1954), Elizabeth Bott (1957), and J. Clyde Mitchell (1969). And others (Berkowitz 1982) have even viewed network analysis as an outgrowth of the French structuralism of Claude Levi-Strauss (1969).

Network analysis can also be viewed as a subtype within the general framework of structural sociology (Wellman 1988). Structural sociology is an approach in which social structures, constraints and opportunities are viewed as having a more pronounced effect on human behavior than do cultural norms or other subjective states. The classical roots of structural sociology can be found in Durkheim, Marx, and (especially) Simmel. Simmel's influence on structural sociology stems from his concern with the formal properties of social life. For Simmel, social relations of particular types followed patterns that took on similar characteristics in a wide range of contexts. In any three-actor situation, for example,

one actor will be successful to the extent that it can exploit a conflict between the other two. This pattern may occur among people, organizations or even countries. For Simmel, the forms and patterns of social relations were more important than their content. As Blau (1982: 276) put it, structural sociologists are more concerned with 'the proportion of isolates in a group [than] whether they are Jack and Jim or Jill or Joan.'

Although differences exist among versions of structural sociology, most structural sociologists agree that objective factors are more significant determinants of behavior than are subjective ones. Network analysis is a type of structural sociology based on an explicit notion of the effects of social relations on individual and group behavior.

3. Principles and methods of network analysis

The primary tenet of network analysis is that the structure of social relations determines the content of those relations. Network theorists reject the notion that people are combinations of attributes or that institutions are fixed entities with clearly defined boundaries. Sociologists frequently use the terms 'society', 'government', and 'economy' and refer to individuals in terms such as 'lower middle class white Protestants who live in inner city areas and vote Democrat' (White, Boorman & Breiger 1976: 733). But these terms and categories obscure what for network theorists is the primary 'stuff' of social life: the concrete webs of social relations that both embody and transcend conventional organizations and institutions. Government, for example, is not a fixed, unitary institution but a number of subunits, often working at cross-purposes, whose members develop coalitions and disputes not only within and across agencies but also with various actors outside the state (Martin 1991). Understanding the social relations among actors both inside and outside state agencies would be necessary in order to explain the development of government policy, for example.

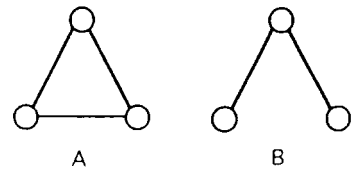


Figure 1. *Two types of triads*

Simmel's discussion of dyads and triads [1917] (1950) illustrates the principle of how the structure of social relations affects their content. Not only does the entry of a third person into a two-person encounter alter the nature of the relation between the first two people, but the nature of the triad itself is significant. In a completely connected triad, illustrated in panel A of Figure 1, each actor interacts with both other actors. In a hierarchical triad, such as that in panel B of Figure 1, the central actor is in a brokerage position with respect to the other two, both of whom must deal with the broker in order to communicate with the other. These two structures, according to network theory, create very different forms of interaction among group members. The potential for brokerage allows the central actor in the triad to extract benefits from any situation in which the remaining two actors attempt to communicate (Freeman 1979; Cook 1982; Marsden 1982; Gould & Fernandez 1989).

Network analysis is in theory applicable to virtually any substantive topic. Although network analysts have addressed a wide range of topics, three areas that have received particular attention, because of their theoretical salience, are the effects of actor centrality on behavior, the identification of network subgroups, and the nature of relations among organizations.

3.1. Network and actor centrality

During the 1950s and 1960s, a series of experiments, beginning at MIT under the direction of Bavelas (1950; Leavitt 1951; subsequently Hopkins 1964; Faucheux & Mackenzie 1966; Mackenzie 1976), found considerable differences in the character of group problem-solving activities across

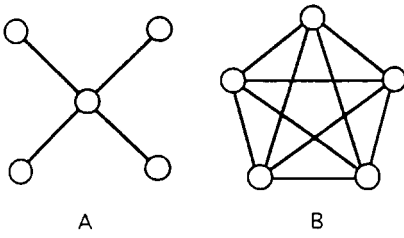


Figure 2. Hierarchical and non-hierarchical structures

various communication structures. Of particular concern was the relation between an actor's centrality and his or her influence within the group. Leavitt (1951), for example, showed, using several types of communication structures, that the differences in influence between the most central and least central actor increased with the growing hierarchy of each structure. Figure 2 presents examples of classic hierarchical and non-hierarchical five-actor structures. In the hierarchical structure, known as the 'wheel' (panel A), the central actor controls the flow of information between any other pair of actors. In the non-hierarchical structure (panel B), which in this case is a 'maximal complete subgraph', in which all possible ties exist, any member of the group can communicate directly with any other member. Freeman (1979) has developed a measure of the centralization of a network, based on the difference between the centrality of the most central unit and the other units.¹ Freeman shows that using this measure, the hierarchical network in Figure 2 has a centralization score of 1 (the highest possible) while the non-hierarchical network in Figure 2 has a score of 0 (the lowest possible).

The rapid development of network analysis in recent years has led to the resurgence of both experimental and non-experimental research on the relation between the centrality and power of social actors. Marsden (1982), Cook et al. (1983), Markovsky, Willer & Patton (1988), and the articles in the September/December, 1992 special

issue of *Social Networks* provide examples of experimental and simulation work. Galaskiewicz (1979), Mizruchi (1982), Mintz & Schwartz (1985), and Laumann & Knoke (1987) provide examples of non-experimental work, all of which operate at the interorganizational level of analysis. Astley & Zajac (1990), Brass & Burkhardt (1992), and Krackhardt (1992) present examples of the role of centrality within organizations. Scott (1991), Cook & Whitmeyer (1992), and Mizruchi & Galaskiewicz (1993) provide reviews of this literature.

Although several of these studies have demonstrated a positive association between centrality and power, the association between the two is more complex than the earlier studies had suggested. Simulations and experimental results by Marsden (1982, 1987), Cook et al. (1983), and Markovsky et al. (1988) have found that in certain types of structures (such as the restricted access structure presented in Figure 3), actors with high 'local' centrality (Nieminen 1974), such as 7, 8, and 9, may be more powerful than actors with high 'global' centrality, such as actor 10.² In some situations, high centrality might actually be a liability. In a study of the US electrical equipment industry price fixing conspiracy of the early 1960s, Baker & Faulkner (1993) found that central actors were the most likely to be found guilty of

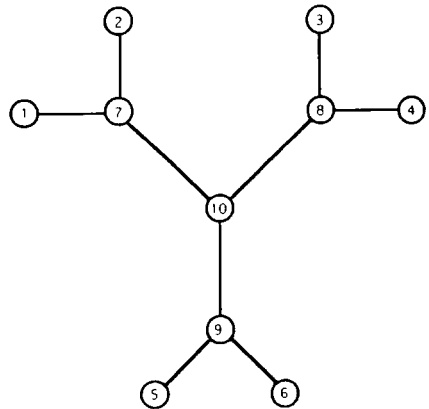


Figure 3. Ten-actor restricted access network

crimes, presumably because their central locations in communication networks made them more vulnerable to detection. Bonacich (1987) has noted that an actor's power may be greater if its ties are to relatively peripheral actors, who must then deal with the focal actor. In most measures of centrality, actors with ties to peripheral actors will be less central than those with ties to central actors, however. This may explain some situations in which centrality and power are not highly correlated. Studies by Cook et al. (1983) and Marsden (1987) have suggested that the centrality-power relation is affected by whether the networks are 'positively' or 'negatively' connected; in negatively connected networks, a tie between actors A and B precludes a tie between A and C. This corresponds to the situation described by Bonacich, and it is in negatively connected networks that Cook et al. fail to produce the expected association between centrality and power. In Cook et al.'s networks, actors with high local centrality are more powerful than those with higher levels of global centrality. Marsden (1987) shows that the relative power of actors with high global centrality depends on the extent to which central actors are able to form coalitions.

Despite the variety of findings on the relation between centrality and power, most studies have revealed at least some substantively meaningful association. They are thus consistent with a key tenet of network theory: that an actor's position in a social structure has a significant impact on its behavior and well-being.

3.2. Network subgroups

A second major area within network analysis is the identification of network subgroups. Most analyses have operated within two broad traditions, which Burt (1982) has labelled 'relational' and 'positional'. Relational models are based primarily on graph-theoretic techniques (Harary, Norman & Cartwright 1965). Their focus is on the identification of cliques, densely connected regions of networks in which all or most actors are directly tied to one another, as in the non-hierarchical structure in Figure 2 (Alba 1973). Positional models are based primarily on matrix algebraic tech-

niques (Lorrain & White 1971). Their focus is on the identification of structurally equivalent actors, pairs of actors with ties to the same third parties. The most prominent of these techniques is blockmodeling, developed by Harrison White and his students (White, Boorman & Breiger 1976; see the June 1992 special issue of *Social Networks* for an overview of recent advances). Blockmodels are binary representations of relation matrices among actors in a network, permuted so that structurally equivalent actors are clustered into square submatrices, or 'blocks'. Blocks are identified as either 'zeroblocks' or 'oneblocks', depending on the density of the ties among the actors within them. In practice, a certain density cutoff point is used to distinguish zeroblocks from oneblocks. For example, in White et al.'s blockmodel of a biomedical research network, the authors found that a cutoff density in the range of .10 to .50 yielded similar results. The representations of structures can be reduced further through clustering of structurally equivalent blocks into two by two matrices. The patterns of blocks identify different types of social structures (White et al. 1976). Consider, for example, a model in which the raw data are friendship choices, so that actors may name particular others as friends but the ties may or may not be reciprocated. If the matrix, when reduced to a 2 x 2 blockmodel, contains a zeroblock in the second column of the first row and oneblocks in the other cells, as in the following representation,

1 0

1 1

it would represent a hierarchical structure, in which ties go from lower to higher-status actors but not vice versa (White et al. 1976: 742). In this example, the high-status actors (row 1) choose other high-status actors (column 1) but do not choose low-status actors (column 2). The low-status actors (row 2), on the other hand, choose both high-status and other low-status actors (columns 1 and 2 respectively). Blockmodels are not the only techniques that employ structural equivalence as a basis for clustering. Other widely used techniques, such as factor

analysis (Allen 1978), multidimensional scaling (Levine 1972; Laumann & Pappi 1976), and the non-discrete structural equivalence clustering techniques employed by Burt (1982), often yield clusters similar to those produced by blockmodels (see Breiger, Boorman & Arabie 1975 on blockmodels versus multidimensional scaling).

Proponents of virtually all clustering techniques agree that members of particular cliques or clusters should display similar attitudes and behavior. But since the graph-theoretic cliques are based on direct ties among actors, while blocks and other positional clusters are based on structural equivalence, the two models lead to different predictions about the sources of interpersonal influence and similarity. Relations in cliques are based on cohesive ties between actors. In the cohesion models, which have been the most widely used by network analysts, those who interact directly will tend to influence one another. The structural equivalence models lead to two possible interpretations. One, presented by Friedkin (1984) and Mizuchi (1993), suggests that structurally equivalent actors are likely to behave similarly because they have several common sources of direct influence. An alternative argument, presented by Burt (1987), suggests that structurally equivalent actors, because they jointly occupy the same positions in social structures, compete for the favor of occupants of other positions. Because of this competition, actors are likely to mimic actions taken by their structurally equivalent peers.

Both the cohesion and structural equivalence models have received considerable support in the literature. A few of the many examples that support the cohesion model are studies by Moore (1979), Friedkin (1984), and Laumann & Knoke (1987). Studies supporting the structural equivalence model include those by Burt (1987), Johnson (1986), and Galaskiewicz & Burt (1991). Some studies have found support for both approaches (Mizuchi 1992, 1993).

3.3. Network analysis and interorganizational relations

For many years, a frequently invoked criticism of network analysis was that its adher-

ents had been successful in presenting elegant mathematical descriptions of social structures but they had been less successful in demonstrating that those structures have actual behavioral consequences. In no area has this criticism been more prominent than in the study of interorganizational relations.

Although a few early studies had shown that centrality in interorganizational networks was associated with identifiable organizational outcomes, including an organization's likelihood of political success (Galaskiewicz 1979) and its investment strategies (Ratcliff 1980), there were few such demonstrations prior to the mid-1980s. Since that time, however, there has been a proliferation of studies suggesting that a firm's position in interfirm networks influences its behavior. Much of this work has appeared in business management publications and has been concerned with the effects of board of director composition on managerial strategies. Boards of directors are significant because a firm's directors often sit on the boards of other firms, creating what are called 'interlocking directorates'. Interlock networks are the most studied form of interorganizational relations. Although there are several competing views of the role that interlocks play, many theorists believe that they provide an indicator of interfirm social relations that, if the predictions of network theory are accurate, should influence the behavior of firms (see Pettigrew 1992; Mizuchi 1994 for reviews of these models).

Several studies of board composition within the business management literature focus on the role of outside directors. Because outside directors are usually affiliated with other corporations, this variable also provides an indicator of the extent to which a firm is integrated into interfirm networks. The organizational literature suggests that these ties have a significant impact on corporate strategies. In a study of the use of 'greenmail', the private repurchase of company stock, Kosnik (1987) found that firms that resisted greenmail had more outside directors and more directors who represented firms with which the focal firm had transactions than did firms that paid greenmail. Studies by Cochran, Wood & Jones (1985), Singh & Harianto (1989),

and Wade, O'Reilly & Chandratat (1990) found that the proportion of outside directors on a firm's board was positively associated with the existence of 'golden parachute' policies for the firm's top executives.³ Davis (1991), in a study of firms' adoption of takeover defenses (known as 'poison pills'), found that firms were more likely to adopt poison pills when they shared directors with firms that had already adopted. Baysinger, Kosnik & Turk (1991) found a negative association between the proportion of outside board members and firms' research and development expenditures. Clawson & Neustadt (1989) and Mizuchi (1992) found that director interlocks influenced corporate political strategies. Haunschild (1993), Fligstein & Markowitz (1993), and Palmer et al. (1993) found an association between interlocks and firms' participation in mergers and acquisitions. Boeker & Goodstein (1993) found that firms with a higher proportion of outsiders on their boards were more likely to appoint CEOs from outside the firm. And Stearns & Mizuchi (1993; Mizuchi & Stearns 1994) found that the presence of representatives of financial institutions on a firm's board influenced both the amount and type of financing the firm used.

What are the processes by which these networks are purported to influence firm behavior? One example is provided by a recent study of corporate political action (Mizuchi 1992). The concern of the study was the similarity of political behavior between pairs of large US manufacturing firms. Among the network variables expected to lead to similarity of behavior were the economic interdependence of the two firms, whether the firms' stock was held by the same institutional investors, and two types of director interlocks, those created by direct ties between the firms, and those in which the two firms each shared directors with the same third firm. Focusing on the interlock effects, the argument proceeded as follows: firms enter into a political situation with a set of both clear and uncertain preferences. Other things being equal, the leaders of interlocked firms are more likely to communicate with one another than are the leaders of non-interlocked firms. Among the ideas that may be communi-

cated is information about political candidates. Exposure to either positive or negative information from other firm representatives about candidates may affect a firm's decision-making. When two firms share interlocks with several additional firms (indirect ties, which I interpreted as an indicator of structural equivalence), they are exposed to several common sources of information. This further increases the likelihood that they will contribute to the same candidates. The findings from this study indicated that the presence of indirect ties between firms was more strongly associated with contributions to the same candidates than was the presence of direct ties. The simultaneous exposure to several common sources of information may be one explanation for this.

Even ordinary economic activities may be affected by interfirm relations. Uzzi (1993), for example, in a study of the garment industry in New York, found that firms that were about to relocate their facilities offshore warned their suppliers months in advance, despite the fact that such knowledge created an incentive for the suppliers to shirk on their orders. Uzzi attributed this apparently irrational behavior to the close social relations among members of the industry.

Granovetter (1985) has provided a general theoretical model within which to account for such behavior. Departing from Oliver Williamson's (1975) version of transaction cost economics, Granovetter argues that the social relations that develop among customers and suppliers often mitigate, or completely nullify, the opportunism that, according to Williamson, characterizes market transactions. Williamson (1991) is able to account for non-opportunistic behavior with the concept of asset specificity, in which repeated transactions create incentives for maintaining the relations, despite the reduced opportunities for opportunistic behavior. But these situations are seen by Williamson as aberrations rather than as basic components of his model.

4. Structural sociology and rational choice theory

The contrast between the Granovetter and Williamson models of interfirm transactions

raises the issue of the relation between network models and economic models in general. Structural sociology developed in the United States during the 1970s as an alternative to the normative model that dominated the field during the 1950s and 1960s. This model, best characterized by the work of Talcott Parsons (1951), suggested that the basis of social order was in shared generalized beliefs (values) and expectations of behavior (norms). These values and norms, according to the model, were internalized, primarily through childhood socialization. To the extent that this socialization is successful, human action voluntarily proceeds according to the society's values and norms.⁴ Structural sociology, with its emphasis on the constraints and opportunities that influence behavior, tended to de-emphasize or discount entirely the role of internalized norms. People may behave according to norms not because they have internalized them, but because they fear the sanctions that could apply if they violate them.

Because structural sociology and network analysis can be viewed as alternatives to normative sociology, it would be worthwhile to consider the relation between structural sociology and another widely used alternative to normative sociology: rational choice theory. The rational choice critique of the normative perspective shares many similarities with the structural critique. Rational choice theorists are also concerned about the difficulty of distinguishing between internalization of norms and fear of sanctions. When we observe customers in a store paying for their goods (and refraining from stealing), we have no way of knowing whether they do this because they have internalized the norm that stealing is wrong or whether they simply fear the consequences should they be caught. Because it is impossible empirically to distinguish the two accounts, and because even normative theorists acknowledge that cases of the latter do occur, rational choice theorists tend to assume that fear of sanctions rather than internalization of norms drives normatively prescribed behavior. Rational choice theorists thus agree with structural theorists that in the absence of unambiguous evidence that

actors internalize norms, there is little analytical benefit in assuming that they do (Hechter 1987). Moreover, both models are concerned with the opportunities and constraints that actors face. Hedström's suggestion (1993: 167) that rational choice theory 'usually assumes that variations in individual behavior are explained by differences in the opportunity structures actors face, rather than by variations in the internal "makeup" of the actors' could be said of structural sociology as well.

Where structural sociology and rational choice theory diverge is in their analysis of the determinants of behavior. Rational choice theorists usually assume that individuals enter social situations with exogenously formed preferences (utility functions) that remain constant throughout the social encounter. This assumption has enabled rational choice theorists to develop powerful and rigorous models of social outcomes, but these models are often suspect empirically because of the simplifying assumptions necessary to generate them. Structural sociology has no built-in assumptions about the rationality of human actors. But there is nothing in the structural model that precludes the assumption of human rationality, and many structural sociologists have assumed, either implicitly or explicitly, a rational actor model (Burt 1982; Granovetter 1985; Mizuchi 1992). The primary differences between the structural model and the rational choice model are that in the structural model (1) human preferences are viewed as endogenous; that is, the formation of preferences is taken as something to be explained; and (2) human action is viewed as affected by explicitly defined social structures.

As an example of the differences between the two perspectives, I have presented a distinction between what I term 'individual' and 'structural' interests (Mizuchi, Allison & Potts, 1994; see also Burt 1982: ch. 5). Because network theorists argue that all interests are endogenous, I use the concept of individual interests primarily as an analytic tool. An individual interest is a preference that an actor holds in the absence of external constraints. A structural interest is a preference held by an actor subject to social constraints, which differs from what

the preference would be in the absence of those constraints. A firm that changes its position on a political issue to accommodate a powerful customer is revealing a structural interest. There is nothing in this model that prevents the firm from being viewed as a rational actor. But the firm's rational action is viewed as occurring within a system of constraints, identified by the social structures within which the firm is embedded.

Consider a case taken from a current study of political decision-making (Mizuruchi, Allison & Potts 1994). Let us assume that an actor enters a political situation with a position on an issue and a level of salience, the latter based on how important the issue is to the actor. Let us also assume that the actor is embedded in a network of dependence relations, in which others on whom the actor depends may hold opposing political positions. If an actor determines that the need to maintain positive relations with others upon whom he or she depends exceeds the salience of the issue, he or she may decide to switch to the other actor's position. In the study cited above, we conduct a simulation that illustrates the extent to which political outcomes can be affected by even small levels of network dependence. Although the model contains certain rational choice elements of decision-making, the social structure alters the political outcomes in systematic ways. These outcomes cannot be understood without an examination of that structure. For related examples, see Marsden's (1982) modification of Coleman's (1990) model of power as well as Stokman and Van den Bos (1992).

5. Problems of network analysis and structural sociology

Structural sociology has revitalized several areas of sociology, including social movement theory, the study of social inequality, the sociology of development, and even research on attitude formation. The structural approach has forced researchers to consider aspects of the social world that had previously received insufficient attention,

but a single-minded focus on structural constraints renders our explanations incomplete in two areas: the origins and content of preferences and the effects of human agency. These areas have been a primary focus of recent criticisms of network analysis.

5.1. The role of norms

Despite the criticisms mentioned above, one advantage of the normative model is its explicit attempt to identify both the origins and the content of people's worldviews. Network theory can explain why, given that a person's friends are political liberals, the person is likely to hold liberal positions as well. As noted in the previous section, this endogeneity of preferences is an advantage of the structural model over the rational choice model. But the network approach cannot explain why particular groups of people hold liberal views in the first place. Suppose that an actor is a member of the working class in an industrialized nation. Members of the working class have historically tended to support labor or socialist parties. It is not always possible to determine whether an individual supports labor-oriented candidates because it is in his or her individual interest to do so (in other words, that this support would occur in the absence of influence by others), or whether the person supports such candidates because of influence by others. Some versions of the structural model can explain why an actor would have an interest in voting for labor or socialist candidates even if he or she were not directly influenced by others. In this case, one votes according to one's economic interest. But the network model cannot account for this support in the absence of influence by others, because it has no way of determining the content of one's preferences. [Even the assumption that is possible objectively to identify a voter's economic interest is problematic. One could argue, for example, that in the long run, protectionist trade measures might harm the economy, which might harm the workers whom the measures were designed to protect. This possibility might explain why in the United States a significant proportion of workers support conservative political candidates.]

It is possible to argue that everyone's preferences, no matter how isolated they appear, have been influenced by others at some point. But if a preference is the result of an earlier socialization experience, then the structural model loses much of its analytic advantage over the normative model, since the person's preference is guided by internalized norms rather than ongoing social relations. In the above example, the worker's support for the labor-backed party might have been cemented during his or her childhood socialization. Moreover, many structural arguments are viable only because of an implicit assumption of well-established norms, although it is not necessary for actors to internalize those norms, as long as they agree to abide by them (Sciulli 1992). Baker's (1984) study of price volatility on the floor of the Chicago stock exchange is a good example. Baker found that prices fluctuated more widely in large groups than in small groups because face-to-face interaction among traders was more difficult in the larger groups. But Baker's study works only if we assume that participants in the stock exchange agree on the rules of trading.

If it is possible to identify an actor's political preferences and if those preferences predict behavior even in the absence of clear interpersonal influence, then an actor's personal attributes, such as class or race, may generate accurate predictions. So we can predict that a member of the working class will support a labor party simply by noting that the person is a member of the working class. In such a case, a structural model may be useful, but a network model, in which the use of categories is eschewed, may be unnecessary. Even if categorical thinking often obscures the social processes by which preferences form and action occurs, it may also provide a predictive power that in some cases exceeds that of a network model.

This argument forms the basis of a recent critique of network analysis by Brint (1992). Focusing specifically on the work of White, Brint suggests that categories often form the basis of social identities and roles that have various normative dictates that provide bases for action. In his reply, White (1992a) does not deny that norms are nec-

essary for social structures to operate but argues that social structures are a necessary precondition for the generation of common normative frameworks. One reason that people from different groups within a particular society (urban youths versus middle-aged suburbanites, for example) have difficulty communicating is that their social isolation has given them little opportunity for common experiences and understandings.

The concept of structural equivalence in fact was first developed to capture the concept of a role. It was later discovered that the mathematical representation of structural equivalence was unable to do this because structural equivalence was defined in terms of ties to the same particular actors (so that two fathers could be structurally equivalent only if they had the same children; see Winship [1973] 1988). Network theorists have developed the concept of role equivalence to deal with this issue. Role-equivalent actors need not be tied to the same other actors but instead need only be involved in similar types of relations with similar types of actors (see, in addition to Winship's article, Sailer 1978; White & Reitz 1983; Burt 1990; Borgatti & Everett 1992; Mizuchi 1993). The concept of role equivalence and its variants (including automorphic and regular equivalence) acknowledge the fact that social roles are likely to be accompanied by normative prescriptions. The significant point is that these roles are defined in terms of one's position in a social structure.

The debate between network theorists and proponents of the Brint position is unlikely to be resolved soon but the volume of dialogue has increased significantly in the past five years. Those who emphasize the role of culture frequently acknowledge the importance of social structure. And network analysts increasingly acknowledge the existence of gaps in structural explanations that may require cultural or normative accounts to fill. Still, even if proponents of a particular position admit that the alternative has something to offer, the debate continues to raise an issue of analytical strategy: that is, which approach, which starting-point, provides more explanatory leverage? This question also remains open.

What can be said is that as a research strategy, network analysis has demonstrated considerable analytic power.⁵

5.2. The role of agency

A second problem shared by both network analysis and structural sociology in general is their treatment of human agency. [The normative model often fares no better on this score, but that is irrelevant here.] Structural theorists emphasize the extent to which human actions are affected by constraints and opportunities. But they have failed to develop a comprehensive model of human agency.

The claim that structural models often have underdeveloped conceptions of human agency has been raised by several theorists (Giddens 1984; Haines 1988; Cohen 1989; Brint 1992). One explicit early attempt to include agency in a structural theory was presented by Burt (1982). In Burt's model, social structure affects action, both indirectly (through its effect on actor interests) and directly. Action is then viewed as potentially modifying the social structure itself (*ibid.*: 9). Critics (Haines 1988; Cohen 1989) have argued, however, that even Burt fails to develop an explicit model of exactly how social action modifies social structures. Haines (1988), drawing on Giddens, has emphasized the recursive nature of human action, in which actions simultaneously are affected by and recreate social structures. Several recent works by network theorists have moved us closer to a theoretically rigorous model of agency. Two works in particular, those by Burt (1992) and White (1992b), have dealt explicitly with the issue.⁶

Burt is concerned with how actors identify and take advantage of opportunities in social systems, vacancies that he refers to as 'structural holes'. This attention to vacancies in social structures has been a significant component of White's work (1970, 1992a; White, Boorman & Breiger 1976). By filling a hole, an actor increases his or her likelihood of upward mobility but he/she also alters the structure so that a hole no longer exists in the same position. Burt shows how actors who are skilled at filling structural holes and in maximizing the efficiency of their social ties (by mini-

mizing redundant contacts, for example), have greater upward mobility within an organization than do actors who are less successful at both using and altering the social structure.

White (1992b) has attempted to reconceptualize human action in terms of identities seeking control. Identities are any form of activity to which we can attribute meaning. Persons exist only as 'ensembles of identities' (White 1992a: 210). Identities exist only to the extent that actors are able to differentiate themselves from others. Human action is a constant search for niches within which to sustain identities. Through the quest for control, actors continuously create and recreate social structures. In his earlier work on markets, for example, White (1988; Leifer & White 1987) argued that rather than consisting of a series of similar firms producing a similar product, markets consist of a variety of producers differentiated by the volume and quality of their products. White demonstrates mathematically that markets can reproduce themselves only to the extent that producers are able to carve out unique niches for themselves.

6. Conclusion

Structural sociology and network analysis, with their emphasis on objective, observable social forces and their ability to generate falsifiable hypotheses, have provided an improvement over some of the problematic aspects of traditional normative models. But structural models have been limited by their inability to handle the cultural content of social action as well as by their underdeveloped conception of human agency. The above discussion suggests that network analysis holds particular promise for dealing with the issues of culture and human agency that have posed problems for structural sociology in general. With its emphasis on concrete social relations rather than categories, network analysis presents a more dynamic conception of social action than do either the traditional normative or structural models.

It is important to recognize that network analysis can complement as well as supplant existing perspectives. A good example of how network analysis can extend the ana-

lytic power of an alternative theory is its relation to what is perhaps the most widely held sociological model of organizations: institutional theory. Institutional theory is based on the premise that organizations, rather than providing rational solutions to well-defined problems, are equally likely to reinforce societal symbols, or 'myths' (Meyer & Rowan 1977; Powell and DiMaggio, 1991). As part of this reinforcement, organizations continually seek legitimacy from their external environments. Rather than a quest for an objective notion of efficiency, organizational behavior becomes a quest for legitimacy. An important statement of this model has been presented by DiMaggio & Powell (1983). DiMaggio and Powell argue that organizational forms in modern societies come to resemble one another, not because these forms are necessarily the most efficient, but rather because the need for legitimacy requires them. DiMaggio and Powell identify three types of this 'isomorphism': coercive, in which organizations develop structures to conform to the expectations of other organizations on which they depend; mimetic, in which organizations, under conditions of uncertainty, simply adopt the structures of their peers; and normative, in which similar socialization experiences lead to worldviews that generate similar types of prescribed solutions to organizational problems. What the DiMaggio and Powell model lacks, and what network analysis can provide, is a detailed conception of the processes by which this isomorphism is transmitted. Coercive isomorphism is likely to occur in situations of direct, cohesive relations among organizations. Mimetic isomorphism is likely to occur when organizations observe and try to keep pace with their structurally equivalent or role equivalent peers. Network theory cannot tell us why there are particular symbols and myths that organizations strive to reinforce. But it can explain why certain forms as opposed to others are adopted, regardless of whether they are objectively more efficient. In that sense, although network theory may require an institutional or similar perspective to completely account for a phenomenon, institutional theory may require network theory as well. The latter

can render institutional concepts both more concrete and more rigorous.

In fact, its versatility is one of the great strengths of network analysis. Not only can network analysis be employed in conjunction with institutional theory but it is compatible with and capable of extending the population ecology and transaction cost models as well. The population ecology notion of an organizational niche has been reconceptualized within the terms of structural equivalence by DiMaggio (1986; see also Burt 1992). And the concept of transaction costs has been formalized in analyses of brokerage (Marsden 1982) and broadened in Granovetter's (1985) discussion of embeddedness. The connection between network analysis and the resource dependence model is already well established and need not be repeated here (Burt 1983; Pfeffer 1987; Mizruchi 1992).

Although network analysts continue to grapple with the theoretical problems discussed above, there is reason for optimism. Increased attention to the issue of agency has led to significant advances within the past five years. As theorists take advantage of the stochastic assumptions behind network models, progress on the agency-structure dilemma seems imminent. Greater efforts to acknowledge the importance of culture have also proven encouraging [see, for example, White's recent (1993) work on art]. As White has demonstrated, network analysis can be valuable in examining the contexts through which culture is transmitted.

Network analysis is one of the fastest growing approaches in the social sciences. The evidence that human action is affected by the social relations within which actors are embedded continues to mount. I have presented only a small piece of that evidence here. The size of the pie will continue to grow.

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Notes

¹ This measure has three variations, based on Freeman's three conceptions of centrality discussed below. The basic computation involves summing the differences between the centrality of the most central unit and all other units and then dividing this sum by the maximum possible sum of differences for a network of that size.

² Although there have been several advances in recent years, the most comprehensive theoretical statement on centrality remains Freeman's (1979) work. Freeman distinguished three types of centrality, based on *degree*, *closeness*, and *betweenness*. Degree refers to the number of direct ties between an actor and other actors in a network. Closeness refers to the extent to which an actor can reach a large number of other actors in a small number of steps. And betweenness refers to the extent to which an actor creates a unique path between other actors, so that the latter must deal with the former if they are to communicate. The definition of centrality presented by Bonacich (1972), and elaborated and modified in (1987) has also been highly influential. See also Mizuchi et al. (1986), Stephenson & Zelen (1989), and Friedkin (1991).

³ Golden parachute agreements are lucrative severance packages that are guaranteed to chief executives in the event they are fired. These plans proliferated in the US business world during the 1980s.

⁴ Of course, the model was far more complex and varied than this brief account suggests. But it did place a major emphasis on the role of learned norms in influencing behavior.

⁵ It is necessary to consider the role of culture to understand the content of normative prescriptions associated with social relations. One conception of culture that could be useful for structural sociology has been presented by Swidler (1986). Swidler argues that culture can best be understood as a system of learned behaviors that actors use to negotiate their daily activities. These behaviors are learned in specific social contexts and must be continuously reinforced in those contexts. What is valuable about this model is the view that norms are not necessarily part of a generalized value system but rather develop in specific behavioral contexts.

⁶ See also the articles in Weesie & Flap (1990), which include discussions of methods for handling changes in networks over time.

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