# A LONGITUDINAL STATISTICAL NETWORK ANALYSIS OF THE ENVIRONMENTAL LITIGATION AND ALLIANCES IN THE UNITED STATES, 1970-2001


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## Abstract

This dissertation investigates the structural dynamics of the inter-organizational (litigation, alliance) relations in the environmental movement sector (EMS) in the United States, 1970-2001. Particularly, it focuses on the litigative and alliance ties between the environmental organizations (EORGs) including both environmental movement organizations (EMOs) and environmental government agencies (EGAs), and explaining the processes by which the contemporary inter-EORG structure has emerged over time. The methods used in analysis include (balance, structural) partitioning, p-star logit, and categorical data analysis in statistical network analysis. The data analyzed were collected from various sources including *LexisNexis* and *Guide Star* and include both organizational attributes and relations. To explicate the dynamic processes by which the contemporary inter-EORG structure has emerged, this dissertation investigates the formation of dyadic, triadic, and network structure with regard to litigative and alliance ties, respectively. Selected fundamental models of network dynamics (transitive dominance, strategic actor, and social balance) help explain the empirical inter-organizational (litigation, alliance) relations in later chapters. The theoretical and empirical findings help better understand the structural and dynamic issues in the study of the environment, social movement, complex organizations, and network evolution.

# Table of Contents

# List of Tables

# List of Figures

# Acknowledgements


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## 0.2 Dedication

To my parents, Young Ju Park and Yang Ja Wie who understand that life takes challenge.

# Part I

# Introduction

# Chapter 1

# Introduction

The introduction of the "environment" as an object of sociological inquiry was not until recently in the United States (see Fisher, 1967; Catton and Dunlap, 1979; Sallee, 1979; Buttel, 1987; Lamm, 1992). The sociological inquiry of the environment has varied in relation to, but is not limited, the following central topics in the discipline: state, policy, development, media, industry, management, globalization, science, culture, and religion. The inquiry has addressed varied problems that plagued the society such as substandard housing, energy consumption, work conditions, gender inequality, poverty, crime, health inequity, and injustice.

While noticing the arguable differences in movement characteristics between the social movement with regard to the environment and the conventional (labor, human rights) movements, scholars studying the environment and social movements have labeled the collective behavior with regard to the environment "new social movement" (NSM) (Gamson, 1989).[1] Although this dissertation research does not intend to assess the characteristics of the "newness" of the collective activities regarding the environment, it

[1] Other NSMs include peace/anti-war, feminist movements, etc. The debate has been fierce with regard to, among other topics, the questions of "newness" of the new social movements and whether the new social movements are a product of the shift to a postindustrial economy (for an overview, see Pichardo, 1997). While being productive, the debate will not come to an end until we have more evidence to support varying theorization of the contemporary social movements. In addition, as scholars have pointed out, comparative study of varying social movements in different movement sectors will be a necessity before we can fully evaluate the nature of contemporary social movements (see Canel, 1992; Klandermans, 1986; Klandermans and Tarrow, 1986).

considers as noticeable the emergence of the contemporary movement as characterized by the active contentious relations and alliances between the organizations over the past decades. While assuming that the movement structure composed of both contentious and alliance relations will characterize the structural organization of the environmental movement sector (EMS), which constrains (or facilitates) movement activities, this dissertation addresses how the contemporary movement structure has emerged in the United States since 1970.

This dissertation research answers the grand question of “what has generated the contemporary movement structure in the environmental movement sector (EMS) in the United States since 1970?” While aiming to answer the grand research question above, this dissertation research pursues two goals: (*a*) explicating the structural dynamics of the EMS in the United States over the period, 1970-2001 that have brought about the contemporary movement structure and (*b*) developing a theoretical and methodological framework for analyzing complex network structure and its dynamics. Recent advances in social network analysis and organization theory will help, to a great extent, achieve those goals thereby help better understand the contemporary movement structure in the EMS from a multidisciplinary perspective. This first chapter introduces what (empirical) problems are to be solved, what theoretical questions motivated the study, and what structural processural foundations are needed for the discussions in the chapters that will follow.

## 1.1 The Problem

The literature of social movements has discussed how social movements emerge, develop, and dissolve in varied contexts. It included discussions of what preconditions social movements (cycles), how social movements present movement agenda, how social movements organize movement activities, how social movements mobilize resources (labor, finance, time, etc.), how social movements (do not) achieve movement outcomes, how social movements dissolve, and finally how social movement outcomes result. In fact, the studies of social movements since the 1960s have considerably extended our knowledge so that we have a comprehensive understanding of the topics involving social movements.

While the studies of social movements have covered a wide range of topics of social movements, not many have attempted an explanation of the processes by which the contemporary movement structure has evolved. It appears that many studies have been satisfied with the narratives of the movement dynamics by simply describing the processes (including incidental episodes) by which the contemporary movement structure came into existence. This holds true in most social movement sectors. We need a systemic understanding of the structural dynamics with regard to how the contemporary complex movement structure has emerged from its simplest form by utilizing systemic methods. Without it, our understanding of varied movement activities that are constrained (or facilitated) by the movement dynamics would be limited.

In fact, there have been attempts to explain the structural dynamics of the movement sectors. However, they did not give deserved attention to the structural-relational dimension of the movement sectors (for an exception, see Diani and McAdam, 2003). Even if they did, the consideration of the structural-relational dimension was "metaphoric", not "substantive" (Berkowitz and Wellman, 1983). Accordingly, analysis did not aim to investigate which movement element is linked to which movement element through which relation (Meyer, 2004).

This dissertation focuses on the structural dynamics of the environmental movement sector since the 1970 in particular thereby the contemporary movement structure has emerged. Unlike other social movements, the environmental movement in the United States has developed relatively recently in its modern form through dynamic trajectories that are not yet fully understood. Investigation of the movement structure and its trajectories would help us to better characterize the contemporary environmental movement in the United States, which may signify the future movement that will have to solve unprecedented environmental problems.

## 1.2 Theoretical Motivation

This dissertation research–particularly, an empirical investigation of the EMS in chapters 6, 7, and 8–was motivated by intellectual efforts to answer a set of theoretical questions that were relevant in the multidisciplinary area involving social movement/collective action, complex organizations, and network-structural dynamics.[2] The specific theoretical inquiries, which will be presented in this section with corresponding hypotheses, are concerned with the generative-structural processes thereby development of dyadic and triadic (litigative, alliance) ties leads to the emergence of the contemporary

[2] This dissertation research assumes that the outcomes in environmentalism are, to some extent, contingent on the inter-EMO relations, which makes indispensable study of the "networks" of EMOs. A succinct but useful definition of network can be "a set of actors and the relations defined over them" (Doreian and Stokman, 1997). Thus, studying inter-EMO relations from a network perspective requires, first, identification of a set of EMOs and the explicit ties between them and, second, investigation of the structural properties (e.g., hierarchy) of the EMO networks–processes of tie formation that "generate" the structural properties of the networks that, in turn, facilitates (or constrains) organizational behavior (Fararo and Butts, 1999).

environmental movement structure. Of varied structural-theoretical approaches, this dissertation research benefits from recent advances in social balance models, E-state structuralism, and strategic actor models in appropriate chapters.

This dissertation research was, first, motivated by the premise that organizations do not form and maintain ties with other organizations randomly. Rather, they are conscious or purposive in determining who their partners or enemies and the formation of basic dyadic (litigative, alliance) ties, along with the formation of triadic ties, can be thought to have generated the contemporary movement structure in the EMS in the United States. Under this assumption that the formations of litigation and alliances are not random, the first line of inquiry asks, first, if the environmental organizations (EORGs) that are specialized in modern strategies of litigation and lobbying have tended to use litigation as a movement strategy [Q1a] and, second, if the EORGs with similar organizational characteristics–in particular, action areas and strategies–have tended to cooperate with each other [Q1b]. Thus, it is hypothesized that the EORGs that have been active in the formation of litigation and in the formation of alliances have had different organizational characteristics, respectively [H1a] [H1b].

**Question 1a.** "In what ways have the organizational characteristics been associated with lawsuit formation in the environmental movement sector (EMS) in the United States since 1970?" [Q1a]

**Hypothesis 1a.** "The environmental movement organizations (EMOs) that are specialized in modern strategies of litigation and lobbying have used litigation as a movement strategy against movement opponents in the environmental movement sector (EMS) in the United States since 1970." [H1a]

**Question 1b.** "In what ways have the organizational characteristics been associated with alliance formation in the environmental movement sector (EMS) in the United States since 1970?" [Q1b]

**Hypothesis 1b.** "The environmental movement organizations (EMOs) with similar organizational characteristics–in particular, action areas and strategies–have cooperated with each other for litigation in the environmental movement sector (EMS) in the United States since 1970." [H1b]

This dissertation research was also motivated by a structural-theoretical inquiry concerned with the processes thereby dyadic ties develop onto triadic (litigative, alliance) structures over time. That is, triadic dominance structures and alliance structures emerge by three dyadic ties are closed in certain principles or mechanism(s) of structural dynamics. The second line of inquiry asks under what conditions triadic dominance and collaborative movement structures emerged in the EMS in the United States. A few basic models of network dynamics that include triadic completion processes such as E-state structuralism (Berger, Wagner, and Zelditch, 1985; Fararo and Skvoretz, 1986) and strategic actor models (Burt, 1992; Doreian, 2006) help the investigation. It is hypothesized that the transitive dominance mechanism as in Hypothesis 2a [H2a] will appear and the strategic actor mechanism as in Hypothesis 2b [H2b] will appear in the generative-structural processes in the EMS.

**Question 2a.** "Under what conditions have triadic dominant movement structures been formed in the environmental movement sector (EMS) in the United States since 1970?" [Q2a]

**Hypothesis 2a.** "The litigation structure has been transitive ($x \rightarrow y \rightarrow z$ then, $x \rightarrow z$) in the environmental movement sector (EMS) in the United States since 1970, i.e., an environmental organization (EORG) ($x$) that filed a lawsuit against EORG ($y$) that filed a lawsuit against EORG ($z$) has been more likely than others to file a lawsuit against EORG ($z$)." [H2a]

**Question 2b.** "Under what conditions have triadic collaborative movement structure haves been formed in the environmental movement sector (EMS) in the United States since 1970?" [Q2b]

**Hypothesis 2b.** "The environmental movement organizations (EMOs) located in the positions that are strategically disadvantageous have been more likely than others to cooperate with other EMOs in the environmental movement sector (EMS) in the United States since 1970." [H2b]

Comparable with the second inquiry, the third inquiry deals with the structural dynamics when the two distinct types of (litigative, alliance) ties are combined. In contrast to the mechanisms above, the dynamic here is due to structural tensions rather than benefits or control. The second line of inquiry asks under what conditions triadic signed structures have been balanced in the environmental movement sector (EMS) in the United States. Although social balance models as a triadic completion model help the investigation, this dissertation research also considers the characteristics of the EORGs involved in structural dynamics. Thus, it is hypothesized that the EGAs in imbalanced structures have been more likely than the EMOs to make the structures balanced in the EMS in the United States [H3a]. Partitioning a signed network into a set of equivalent positions also help investigate the structural dynamics. The EORGs located in equivalent positions within and between plus-sets are expected to play similar roles in the alliance structure in the EMS in the United States [H3b].

**Question 3a.** "Under what conditions have triadic signed structures been balanced in the environmental movement sector (EMS) in the United States since 1970?" [Q3a]

**Hypothesis 3a.** "The environmental government agencies (EGAs) in imbalanced structures have been more likely than the environmental movement organizations (EMOs) to make the structures balanced in the environmental movement sector (EMS) in the United States since 1970." [H3a]

**Question 3b.** "Have the environmental organizations (EORGs) located in equivalent positions in signed structures behaved in a similar fashion in the environmental movement sector (EMS) in the United States since 1970?" [Q3b]

**Hypothesis 3b.** "The EORGs located in equivalent positions within and between plus-sets have been more likely than others to form (litigative, alliance) ties in a similar fashion in the environmental movement sector (EMS) in the United States since 1970." [H3b]

Finally, this dissertation research was motivated by the inquiry of what structural characteristics have emerged in the EMS in the United States given the principles of the formation of the dyadic and triadic structures investigated thus far. The structural characteristics that interest this dissertation research include several network-structural properties such as "connectedness," "balance," and "hierarchy." Naturally, the current inquiry directs attention to the trajectory of the dynamic movement structure through time and thus the generative-structural mechanism(s) that has generated the contemporary environmental movement structure (Hedstrom and Swedberg, 1998; Fararo and Butts, 1999). Basic models of network dynamics focusing on triadic completion processes discussed above help study the generative-structural processes. Investigating the structural properties of the contemporary environmental movement structure that has emerged will suggest how the organizational behavior of the EORGs embedded in the movement structure will be constrained or facilitated depending on the positions that they are occupying.

**Question 4.** "What are the structural characteristics (e.g., connectedness, balance, and hierarchy) of the contemporary movement structure that has emerged in the environmental movement sector (EMS) in the United States since 1970?" [Q4]

**Hypothesis 4.** "The contemporary movement structure in the environmental movement sector (EMS) in the United States can be characterized as disconnected, decentralized, and yet balanced." [H4]

## 1.3 Processural Foundations

This section introduces briefly the fundamental conceptions of statistical network analysis for investigating the structural dynamics of the environmental movement structure in the following chapters: network structure, network evolution, and estimation of tie probability. First introduced is the conception of “network structure” and, particularly, partition structures–both cohesive and equivalent subsets. Second, the section introduces the conception of “network evolution”. To discuss fundamental models of network evolution in the following chapter, it focuses on the triadic (completion) models in which dyadic ties are assumed to be dependent on each other while generating the complex movement structure through the generative-structural processes. Finally, this section introduces an exponential random graph model (ERGM) to estimate the probability of whether or not there is a relational tie between two distinct actors.

### 1.3.1 Structure and Dynamics

**Network Structure.** As Doreian and Stokman (1997) succinctly define, network structure is “a set of nodes and relations defined over them.” Formally, a network structure is summarized $G(V, A, E)$ where $G$ represents a graph, $V$ a vertex set, $A$ a set of arcs, and $E$ a set of edges given $A \cap E = \emptyset$.[3] Although there are multiple ways to investigate the network structure, the researcher may focus on one or more of differing layers of network structure. That is, the researcher may examine the characteristics of the

[3] In this dissertation, vertices and nodes to indicate the points in graphs are used interchangeably as in other network studies. The same is true for edges and arcs to indicate the relations although edges are used in non-directed graphs while arcs in directed graphs or simply digraphs.

network structure by focusing on the individual or *local* level characteristics such as measures of degree centrality (Freeman, 1979) or the whole or *global* level characteristics such as centralization and density. Alternatively, the researcher may want to consider sub-structures such as cliques, *k*-cores, or positions depending on the theoretical and empirical interests. The network structure may also be of different modes: one-mode, two-mode, or multiple-mode. While conventional research has analyzed one-mode or two-mode networks only, a scheme to represent (particularly visually) multiple-mode network has been developed (Carley, 2001).[4]

**Network Partitions.** A network structure may be partitioned into several sub-structures. The methods to partition the network are varied and represent different approaches: relational or position approach. A relational approach is concerned with viewing the network structure as a collection of nodes joining adjacent neighbors. By examining the ways in which nodes are tied to adjacent neighbors, the researcher attempts to detect cohesive subgroups or regions (e.g., cliques, core/periphery, *k*-core) (Wasserman and Faust, 1994). For example, a network routine, "cliques" is used to detect a maximally complete subgraph in which every node is linked directly to every other node. Similarly, "core/periphery" identifies which nodes belong in the core and which belong in the periphery. From a slightly different perspective, "*k*-core" finds all *k*-cores for every possible value of *k*. A *k*-core in an undirected graph is a connected maximal induced subgraph which has minimum degree greater than or equal to *k*. These

[4] While network theory and methods have been confined to one-mode or two-mode relations, Kathleen M. Carley and associates have developed the meta-network framework (and subsequently computer packages) to represent and analyze the interdependence of substructures in the macrostructure in which multiple types of entities are linked through multiplex relations (Krackhardt and Carley, 1998; Carley and Hill, 2001).

procedures from a relational approach partition the network structure into subgroups or regions in which nodes have similar attributes (e.g., attitudes, motivation).

In contrast, a positional approach is concerned with viewing the network structure as a collection of nodes occupying potentially equivalent positions. Thus, the researcher attempts to partition the network structure into equivalent positions that may signify similar roles (Lorrain and White, 1971; White, Boorman, and Breiger, 1976). In search of equivalent nodes in a network structure, there are two approaches: structural equivalence and regular equivalence. Two nodes are structurally equivalent if they are equally related to and from all other nodes (Lorrain and White, 1971) while they are regularly equivalent if they are equally related to equivalent others (Borgatti and Everett, 1989, 1993). Despite a slight difference in algorithm, these procedures partition the network structure into positions in which nodes play similar roles. Recently, network theorists introduced blockmodeling technique to partition a network into pre-defined block types and permutate the network to calculate the fit (White, Boorman, and Breiger, 1976; Doreian et al., 2005a, 2005b).

While the network partitions have been searched mainly in one-mode networks, advances in the methods have involved partitioning two-mode networks as well. Batagelj (2003) developed an algorithm to blockmodel two-mode network data by local optimization. Further, Doreian et al (2005a, 2005b) presented a generalized blockmodeling of two-mode network data. In principle, they treated rows and columns of a two-mode network separate entities and thus partition them separately. The two-mode network data are permutated and compared with pre-defined block types to calculate the fit. The advances in the methods to deal with two-mode network data have been useful in social network analysis in that social sciences often deal with affiliative relations such as membership or participation. This dissertation research will also investigate some two-mode networks and thus benefit from these techniques.

Finally, given the signed network data, network partitions are searched in a completely different manner. In a signed network, the relations are positive (+), negative (–), or null. The partitioning method (i.e., “balance partition”) in a signed network partitions the nodes into plus-sets so that the nodes within the plus-sets are joined by positive ties while the nodes between the plus-sets negative. The methods to measure the (im)balance of a signed network have included consideration of cycle (or semi-cycle) (Cartwright and Harary, 1956), weighting (Hummon and Fararo, 1995), and line index (Harary, 1959; Harary et al., 1965; Doreian and Mrvar, 1996). A revival of interest in social balance theory has allowed advances in studies of mechanisms to explain network dynamics theoretically (Doreian and Krackhardt, 2001; Hummon and Doreian, 2003) and conflictual relations in social worlds empirically (Moore, 1979).

**Network Evolution.** Network evolution is an ordered process of a network structure with a trajectory through time. Study of network evolution has been done in varied approaches since social balance theory (Heider, 1946; 1958) and social exchange theory (Homans, 1950; Blau, 1964; Kapferer, 1972). In an effort to discover processual mechanisms in network evolution, several models have been presented. This dissertation research notices models with the two different properties as follows because they are thought to generate network structures that cannot be reduced to lower level properties: (*a*) dependence of dyadic ties and (*b*) generative-structuralism. Following the two properties, this dissertation focuses on the following three models of network evolution:

(*a*) social balance models (Heider, 1946, 1958), (*b*) E-state structuralism models (Skvoretz et al., 1996), and (*c*) rational choice models (Jackson and Wolinsky, 1996; Hummon, 2000; Doreian, 2006).

Formally, network evolution can be expressed as follows: when a network structure is summarized $G$ ($V$, $E$) where $G$ represents graph, $V$ vertex, and $E$ edge, we let $X(t)$ denote the network state at time $t$. Here, $X(t)$ can be a $g$ x $g$ adjacency matrix with entries $x_{ij}$(t). A sequence of matrices, $X(t_1)$, …, $X(t_n)$ is called a trajectory of the network.

$$X_{ij}(t) = \begin{cases} 1 & \text{an edge runs from node } i \text{ to node } j \text{ at time } t \\ 0 & \text{otherwise} \end{cases}$$

**Dyadic Dependence.** Network structure evolves by two distinct nodes creating dyadic ties given a fixed set of nodes. Network evolution can be modeled in a different fashion depending on the assumption of the (in)dependence of dyadic ties: creation of dyadic ties can be either dependent or independent. For example, while assuming dyadic independence, the principle of "homophily" proposes that nodes with similar attributes tend to create a tie with each other, which can add up to a network structure (McPherson and Smith-Lovin, 1987). Holland and Leinhardt (1979), on the other hand, argue that any network in which higher level properties can be modeled adequately using only properties of nodes and dyads has no social structure. While the conditions that they assumed generate 'random' networks without significant structural properties, this dissertation is concerned with the conditions that generate "biased" networks. Thus, it focuses on the models that assume dyadic dependence and particularly basic triadic completion models including the three examples mentioned above.

**Generative Processes.** Fararo and Butts (1999) define generative or generative-structural processes as the processes by which complex system level properties emerge from simple local level changes. Recent decades have seen advances in theoretical development and (simulation) modeling in social sciences (Chomsky, 1957; Bourdieu, 1990; Fararo and Butts, 1999; Epstein and Axtell, 1997). In parallel, network theorists have modeled the same processes to discover (generative) mechanisms to explain network evolution in which complex network properties emerge from changes in dyadic ties. Here, I introduce some examples of generative mechanisms discovered by network theorists. In commonality, they attempt to explicate the trajectories in which triadic relations are closed while assuming that a series of dyad creation is dependent on each other. They include balance mechanism, bystander mechanism, and, so to speak, utility mechanism. Each mechanism explains generative process by which particular social structure (e.g., hierarchy) emerges.

### 1.3.2 Tie Probability

**Choice of Model.** Over the past decades, there have been remarkable advances in statistical network analysis in developing models to estimate the probability of existence (or absence) of a relational tie in network structure. Initially, the *p* family models assumed the independence of dyads (Holland and Leinhardt, 1977; Fienberg and Wasserman, 1981; Holland and Leinhardt, 1981) and yet later (*p*-star) did not (Frank and Strauss, 1986; Strauss and Ikeda, 1990; Wasserman and Pattison, 1996; Pattison and Wasserman, 1998; see also Rennolls, 1995). The biggest advance in these models, compared to conventional statistical models to deal with categorical outcomes, is that these models include relational properties (e.g., transitivity) of the network as well as attributes of the actors. Given the empirical network data, the relational effects are estimated and compared with structural properties of the baseline random graph.

# Chapter 2

# Literature: Movement Dynamics

The rise of modern social movements/collective action in the United States dates back to the 1950s. Since then, contemporary social movements have developed while covering various areas such as civil rights, labor, women, peace, the environment, and so forth. As Zald and McCarthy (1987) pointed out, however, the literature on social movements/collective action has surprisingly been lacking systematic analysis of the interaction of social movement organizations (SMOs) (for exceptions see Zald and Ash, 1966; Gusfield, 1966; Wilson, 1973; Nelson, 1974). The same holds true for the environmental movement in the United States on which this dissertation research will focus. The existing literature on American environmental movement has tended to focus on the deployment of the environmental movement without due attention to the structural and dynamic characteristics of the inter-organizational relations in the movement that may constrain or facilitate its deployment and thus are equally important as the specific topics are.

While there were general narratives of the structure and changes in the contemporary environmental movement sector (EMS) in the United States (Liroff, 1976; Trubek, 1978; Fox, 1981; Andrews, 1999, Brulle, 2000; see also a journalistic account by Shabecoff, 2000; 2003 and others), in common, scholars have noticed structural changes in the contemporary EMS as follows: (*a*) growth and professionalization of EMOs operating at the national level (Mitchell, Mertig, and Dunlap, 1991),[5] [6] (*b*) heavy dependence on large private foundations for funding opportunities (Jenkins and Halcli, 1999; Brulle and Caniglia, 1999), (*c*) expansion of alliances for both mobilization and protest, (*d*) prevalent use of lobbying and litigation that are non-traditional strategies (Handler, 1978; Pellow, 1999), (*e*) growing conflicts between ideological camps forming conflictual relations within the sector (Edwards, 1995), and (*f*) increase in right-wing conservative movement and countermovement and consequent ideological diversification (Gale, 1986; Pichardo, 1997; Shabecoff, 2000).

Given the structural changes in the contemporary EMS in the United States, this chapter will review the literature on how the relations between the environmental organizations (EORGs), which are thought to represent the structure of the EMS, have evolved along the changes in the social movement sector (SMS) in the United States since the late 1960s.[7] [8] Particularly, the focus will be placed on both the inter-EORG

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[5] In this chapter, "national EMOs" or "EMOs operating at the national level" are defined as the EMOs with membership in more than two states.

[6] For a discussion of professionalization in other social movements, see Jenkins and Eckert (1986), Staggenborg (1988), and others.

[7] Network conceptions have been useful in representing and studying the intra- and inter-organizational structures. Brass (1984) and Krackhardt (1990) focused on the intra-organizational structure as a network. Krackhardt (1994) employs graph theory to measure the structure of informal organizations. Krackhardt and Brass (1994) studied organizational behavior (i.e., motivation, leadership, job design, turnover/absenteeism, work attitudes, and power) based on network theory. Powell (1990) studied network forms of organizations in craft and high-technology industries. Importantly, he contrasts networks with market and hierarchical governance structures. He stated, "[S]uch an arrangement is neither a market transaction nor a hierarchical governance structure, but a separate, different mode of exchange, one with its own logic, a network … Basic assumption of network relationships is that one party is dependent on resources controlled by another, and that there are gains to be had by the pooling of resources."

[8] Following Zald and McCarthy (2002), all the EMOs in the environmental social movement can be thought of as an environmental movement industry (EMI). The EMOs within an EMI cooperate, compete, and sometimes engage in conflict with each other (Edwards, 1995). They come together for some shared purposes either of protest or of collective representation. They compete for resources from sympathizers and adherents, and they conflict over leadership of the movement as a whole. DiMaggio and Powell (1983) introduced "organizational field" (EOF).

conflicts and alliances.[9] The first section will review the literature on the dynamic movement conflicts while the second section, dynamic movement alliances. Those sections will focus on, first, how the two major types of relationships that have constituted the EMS have been studied and, second, what has been known regarding the dynamics of the movement sector due to the relationships. The final section will review the literature on the approaches to structural dynamics in social movements/collective action. The literature on complex organizations and social networks will also be reviewed with a discussion of the principles and fundamental models of network dynamics.

## 2.1 Movement Dynamics: Conflicts

Just as conflicts and tension have been unavoidable elements in social world, so have they been in contemporary social movements. They have been one of the central topics in sociological inquiry in general and in the Marxist/critical inquiry in particular. In the study of social movements, scholars have focused on the contention between the movement and the movement opponents while leaving behind the contention within the movement itself. This intellectual negligence of the within-movement conflicts or tensions has left the study of contemporary social movements both incomplete and inaccurate. In fact, the growth of modern American environmentalism has been in

[9] Early organizational theorists including March and Simon (1958), Blau and Scott (1962) among others perceived organizations as "rational systems" that "oriented to the pursuit of relatively specific goals and exhibiting relatively highly formalized social structures." It is noticeable that this definition focused not only on the distinctive characteristics of organizations but also on their normative structure. Later organizational theorists (Gouldner 1959; Gould 1979) understood organizations as "natural systems" whose participants share a common interest in the survival of the system and engage in collective activities, informally structured, to secure this end. Still other theorists viewed organizations as "open systems" in which "interdependent activities linking shifting coalitions of participants". The systems are thought to be embedded in–dependent on continuing exchanges with and constituted by–the environments in which they operate (Hirsch, 1972, 1985; Hannan and Freeman, 1977, 1989; Aldrich, 1979; Galaskiewitz, 1979; McKelvey, 1982; DiMaggio and Powell, 1983; Meyer and Scott, 1983).

parallel with the growth of conflicts within the EMS. The literature on social movements has noted an increase of tensions and conflicts between the SMOs (Zald and McCarthy, 1987), and between the movement and countermovement (Zald and Useem, 1987) within the SMS–thus, transition from "consensus movement" to "conflict movement."[10]

The literature on the movement dynamics, therefore, caution that it is naïve to assume that SMOs all share a common goal and have little interest in competition and conflict. As Zald and McCarthy (1987) pointed out, the naïve assumption of the inter-SMO relations has kept scholars from investigating such central processes. The literature on competition and conflicts within the movement sector further presents the conditions under which inter-SMO competition turns into conflicts. First, conflicts occur when there are limited numbers of institutional funders. Second, conflicts occur when organizational survival is at stake. The conflicts emerge to achieve the outcomes as follows: First, conflicts emerge for obtaining the legitimacy of representation of constituency or over exclusive membership. Second, conflicts emerge for obtaining the symbolic dominance, i.e., defining the terms of social movement action (Zald and McCarthy, 1987).

Zald and Useem (1987) presents interesting triadic models of the conflictual relations possible between the movement parties in social movements. While their original template includes all parties–social movement (SM), countermovement (CM), and authority, Figure 2.1 selects a few models of triadic relations between the social movement and the authority, which will be relevant for this dissertation research.

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[10] Earlier work on right-wing movements and more recent work on conservative countermovements shed light on the latent conflicts between the movement/countermovement conflicts (see Bell, 1964; Lipset and Raab, 1970 for earlier work) (see Conover and Gray, 1983, Useem, 1984; Luker, 1984 and Useem and Zald, 1987 for case studies; and see Mottl, 1980; Gale, 1982 and Lo, 1982 for more general treatments).

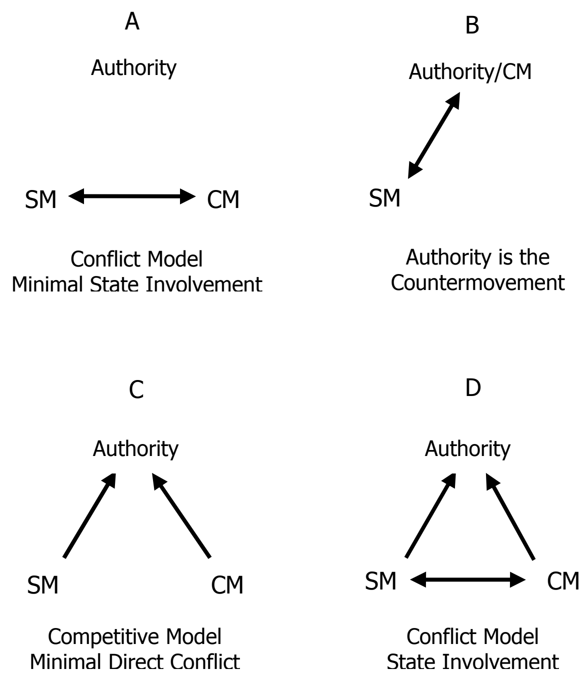


Figure 2.1: Models of SM-CM-Authority Relations

Note: Borrowed and modified from Zald and Useem (1987)

Model A represents the conflictual structure of movement organizations with authorities minimally involved. That is, SMOs battle for resources such as members with little attempt to change laws or gain state support. Model B represents the conflictual structure in which movement organizations directly attack authorities. As movement organizations are not sufficiently stable to implement major changes in society, they attempt to shift the cost of achieving change from themselves to the government and polity at large. Model C places the authorities at the center of the conflictual relations between movement organizations. Since distinct movement organizations attempt to convince authorities of their position and demonstrate their strength, the triadic structure is left "open." Finally, the "closed" triplet of Model D suggests that movement organizations seek to both make demands on the government and damage the other movement.

The literature also notices that a wide range of forms of conflicts have existed in environmental movements: verbal claims, direct confrontation, lobbying authorities, speaking disparate audiences, litigation, and so on. Of those conflictual relations, most highly structured type of antagonistic encounter may be the litigation (Handler, 1978; Barkin, 1979; Epp, 1990; Morag-Levine, 2003). While litigation may be a form of the most antagonistic relationships between SMOs, it has gained more and more popularity as an effective movement strategy since the 1970s (Zald and Berger, 1978; Barkan, 1979; Mueller and Judd, 1981; Balser, 1997; McCright and Dunlap, 2000). The next section will discuss in detail how scholars have studied litigation as a movement strategy in environmental movement in the United States.

### 2.1.1 Litigation, A Movement Strategy

Handler (1978) notes that it was from the late 1950s on that litigation has been widely used as an instrument of social reform so that it can be called a movement. Most notable has been the work of civil rights groups, particularly the litigation activities of the National Association for the Advancement of Colored People (NAACP) and the NAACP Legal Defense and Education Fund, Inc. (LDF).[11] The apparent successes in civil rights litigation and the receptivity of the Supreme Court and the lower federal courts encouraged other movement groups and organizations to adopt the same strategy. Since

[11] This dissertation research focuses on "environmental" litigation only. See Vose (1972), McCloskey (1972), Horowitz (1977), and others for further information on court activity in relation to other subject areas.

then, the movement witnessed three interrelated phenomena: (*a*) a period of judicial activism that stimulated and encouraged the use of litigation as a tool of social reform, (*b*) a growth in the number of client groups turning to lawyers and the courts including racial/ethnic minorities, the poor, environmentalists, consumers, women, etc.,[12] [13] and (*c*) a rise in lawyer organizations interested in law reform, that is, test-case litigation.

Most legal activities by the SMOs were directed at the government. The SMOs have sought to have existing laws enforced or new laws enacted and enforced.[14] Besides these purposes, nonetheless, litigation has been used for achieving various purposes.[15] As a nontraditional movement strategy, litigation has been used for various purposes including political leverage, publicity, fund raising, consciousness-raising, and legitimacy. The section below discusses the use of litigation in environmental movement in particular.

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[12] The decades since 1970 have seen the foundation-supported legal defense firms or public interest law firms. They were known primarily for representing environmentalists and consumers, but they also represent many other interests–the physically and mentally ill, children, women, juveniles, and TV viewers.

[13] Discussion of other types of organizations involved in the legal system is beyond the scope of this dissertation research. However, critics argue that interest groups have been taken into alliance with government and have become "institutionalized." Instead of competition among groups vying for government benefits, there is consensus politics. Government deals with the most powerful, best-organized interests in society and tends to sanction and support bargains already struck, which further strengthens the entrenched groups. Thus, the alliance system fails to take into account unarticulated interests or weak and poorly organized groups (Lowi, 1971; Connolly, 1969).

[14] Legal defense firms (or public interest law firms) favor litigation and, in some situations, this can be very useful for SMOs. Litigation and administrative proceedings for technical and complex matters can be lengthy and expensive, and even the largest SMOs have to be very selective in picking causes. But when problems are long-term, or complex, or require extensive changes in field-level discretion, more effective change may be brought about through lobbying.

[15] Defining organizational success is a difficult problem. Scholars have pointed out that there is a difference between the stated or official goals of an organization and its operative goals, the goals that are actually pursued. Moreover, as noted, organizations often have multiple goals that can be inconsistent and which, in fact, require multiple indicators of success. Legitimacy was one of the criteria that Gamson (1975) uses to measure success; he defines legitimacy as whether a challenging group is accepted by antagonists as speaking for its constituency. By acceptance, Gamson means consultation, negotiation, formal recognition, or inclusion in the antagonists' organizational structure.

### 2.1.2 Environmental Litigation

It was in the early 1960s when the EMOs began attacking government agencies for failure to take account of environmental considerations in approving projects (Handler, 1978).[16] One of the most significant early battles centered on the efforts of Consolidated Edison of New York to build the Storm King pumped storage facility on the Hudson River. The utility applied to the Federal Power Commission for the necessary permits and licenses, which were granted routinely. However, an EMO contested that decision, and in one of the first important environmental cases, *Scenic Hudson Preservation Commission* v. *Federal Power Commission* (1965), the court held that the agency must take into account environmental and aesthetic considerations in decisions on power plant sites. To implement this principle, the agency had to grant those who had a special interest in these matters (i.e., the EMOs) an opportunity to be heard.[17]

The modern environmental movement in the United States started in the years immediately following the *Scenic Hudson* decision.[18] The Environmental Defense Fund was organized in 1967 and began attacking the use of the pesticide DDT. That litigation was used to launch a nationwide campaign that was able to attract large sums of money through contributions, membership drives, and form foundations. At the same time, law-

[16] In the late 1960s, there was also ferment in the Congress. Several congressional hearings and reports expressed concern about the way that federal agencies handled natural resources and the environment. The impact of the federal government on the environment was significant, but individual agencies were either unconcerned about the environment or were relatively insensitive to broader environmental concerns. What emerged from Congress's concern was the National Environmental Policy Act of 1969 (NEPA).

[17] Another example might be the proposed construction of the Trans-Alaskan Pipeline (TAP), which was halted for failure to file a proper impact statement. Theses decisions came as shocks to government and business. Environmental groups and their lawyers were using litigation apparently to great advantage.

[18] Shabecoff (2000) calls the movement since the first Earth Day (April 22, 1970) the "second wave" while the movement launched by John Muir, Gifford Pinchot, and Theodore Roosevelt may be described as the "first wave" of the modern American environmentalism. In this period, unlike the older conservation groups, their focus was not on land and wildlife preservation but on pollution and toxic substances in the environment and their effects on human health.

reform organizations (e.g., defense firms) devoted to environmental causes grew. For example, the Sierra Club organized the Sierra Club Legal Defense Fund with a central staff office coordinating and lending technical assistance to the legal activities of the various Sierra Club chapters throughout the country. In 1970, a group of lawyers and environmentalists who had been engaged in the Scenic Hudson litigation formed the Natural Resources Defense Counsel (NRDC). Many other law-reform organizations pursued several different causes, but included environmental issues as major areas of concern.

The National Environmental Policy Act (NEPA) announced the policy of the federal government to create and maintain conditions of “productive harmony” between man and nature by assuring “safe, healthful, productive, and aesthetically and culturally pleasing surroundings.”[19] To back up this pledge, the act required that all major federal projects significantly affecting the environment be accompanied by a statement detailing the environmental impact of the proposed action. Earth Day was celebrated four months after the passage of NEPA, and that event signaled the emergence of the environmental movement as a mass political force.

As with the use of litigation in other social movements, litigation has been used successfully for extrajudicial purposes such as gaining time, publicity, harassment, embarrassment, increasing costs, and mobilizing political opposition, which has allowed the EMOs to employ means other than litigation to pursue their goals. Handler (1978) noted that arguably extrajudicial uses of the litigation might have been the most important accomplishment of the environmentalists to date.

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[19] 42 U.S.C. §4331(a), (6), (2), (3), (1970), Pub. L. No. 91-190, Tit. I, §101 (January 1, 1970) 83 Stat. 852.

## 2.2 Movement Dynamics: Alliances

In social sciences, scholars have studied alliances in relation to varied topics including general theory, innovation, culture, collective action, management, uncertainty, and so on. As far as organizations are concerned, they have been studied in both the intra-organizational and the inter-organizational context.

Scholars who focused on the inter-organizational alliances were those who emphasized the organization-environment interface in network terms (Rogers 1974; Stern 1979; Boje and Whetten 1981). Studies of the inter-organizational alliances include the following examples: While focusing on the exchange relations and exchange networks, Cook (1977) developed an extension of the exchange model for the analysis of inter-organizational relations. As an alternative to the dominant adaptation perspective, Hannan and Freeman (1977, 1989) proposed a population ecology perspective on organization-environment relations. Pfeffer and Salancik (1978), in an effort to understand the behavior of an organization in relation to the ecology of organizations, argue that organizations survive to the extent that they are effective. Mizruchi and Galaskiewicz (1993) reviewed the literature on inter-organizational relations over the past years and organize it into three theoretical traditions: resource dependence model, social class framework, and institutional model.

### 2.2.1 Environmental Alliances

By definition, organizational environment refers to the interface or interconnections between organizations and their environments–resources, organizational population, institutions, technological uncertainty, and so on.[20] Organizations have been involved in alliances with other organizations in the environment to overcome unfavorable conditions and effectively mobilize resources. That is, in achieving the judicial and extrajudicial purposes, alliances have been widespread between the EMOs that were relatively disadvantaged. As discussed above, Handler (1978) notes that there have been a number of factors that serve to facilitate alliances among EMOs: task specialization (i.e., similar conceptions of goals and tactics), external social control (e.g., norms, resources), overlapping constituents (i.e., interlocking boards, memberships), and elite/third-party constraints.

## 2.3 Movement Dynamics: Approaches

This final section reviews dominant approaches that have existed to studying the structural dynamics in social movements. In particular, this section comprises two parts: a review of approaches to structural dynamics in the social movement literature and a review of approaches to structural dynamics in the social network literature. The approaches in social movement center on the "resource mobilization" (RM) approach and the "political process" (or "political opportunity") (PP) approach. A review of other still

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[20] In fact, there are various ways to identify organizational environments. Scott (1992) identifies the social psychological, the structural, and the ecological levels. At the ecological level, organizational environments include four sublevels: organizational sets, organizational populations, areal organizational fields, and functional organizational fields. He also identifies two types of organizational environments: technical and institutional. "Technical environments" are those in which organizations produce a product or service that is exchanged in a market such that they are rewarded for effective and efficient performance. For example, Stinchcombe (1990) demonstrated the interconnectedness of organizational structures with uncertainties of environments. By contrast, "institutional environments" are characterized by the elaboration of rules and requirements to which individual organizations must conform in order to receive legitimacy and support. Thus, institutional environments refer to the symbolic aspects of environments and the symbolic elements of interest include both normative and cognitive systems. Of organizations, the state, professional occupations, unions, and trade associations are among the most important sources of institutional structures in the modern world. DiMaggio and Powell's (1983) work was the first with respect to the institutional environment to focus explicitly on interorganizational fields as networks.

important approaches that emphasize culture, identity, and agency will be left untouched for the current dissertation research (e.g., Snow and Benford, 1988, 1992; Offe, 1985; Goodwin, 1997). For the network approaches, this section will include a few fundamental models of network evolution based on the principles of dyadic dependence and generativity.

### 2.3.1 Mobilization or Opportunity?

First, the existing approaches to social movements/collective action have tended not to clearly specify movement boundaries including movement elements and the ties between them. For example, the RM approach has not considered the movement elements in the wider context in which social movements rise, deploy, and decay, which resulted in insufficient explanatory conditions that may become part of the movement at any time. Similarly, the PP approach has not been explicit about which dimensions of political opportunity explain which dependent variables (McAdam, 1996). That is, the approach has not evolved far enough to explain in what ways the contextual conditions are structurally organized beyond identifying contextual variables. Accordingly, it was sometimes unclear *which* movement element relates to *which* movement element through *what* relation (Meyer, 2004).

Second, as a result, the previous studies of social movements/collective action have been weak in explain the structural properties of the movement that facilitates or constraint movement activities. In fact, the literature has emphasized the structure that facilitates social movements to occur. For example, scholars who have focused on how social movements emerge within the political contexts have emphasized "opportunity structure," i.e., the ways in which particular political opportunities are structurally organized at a particular time and space (McAdam, 1982; Meyer and Whittier, 1994; also see others).[21] On the other hand, those who have focused on how resources are mobilized in social movements emphasize "mobilization structure" (McCarthy and Zald, 1973; 1977; Zald and McCarthy, 1987). As Meyer (2004) put it, they turned the questions of *why* to those of *how* and explain the processes by which cooperating or competing SMOs mobilize collective action. Nonetheless, the ambiguous consideration of the explicit movement elements and the relations between them has made the dominant approaches weak in explicating the movement structure that facilitates or constraint movement activities.

Moreover, the existing studies of the social movements/collective action have tended to be weak in explaining movement dynamics, i.e., how the complicated movement structure emerge from simple movement activities. For example, the RM approach has been primarily concerned with the structure in which resources are mobilized. The PP approach has been better in explaining the structural processes by which movement activities are generated through time in relation to the large movement contexts.

## 2.3.2 Network Approach

In comparison, the network approach complements the existing approaches by allowing the researcher to identify movement elements from movement contexts, activities, and outcomes, and further investigate explicit relations between those movement elements

[21] Movement activities (e.g., advancing claims) are "context-dependent" (Meyer, 2004) and the political contexts can be broadly defined including political cleavages and institutional openness.

(see Diani and McAdam, 2003). In studying movement dynamics in particular, a network approach complements the two approaches by developing theoretical and methodological frameworks to explicate the structural mechanisms thereby the movement structure evolves over time.

While the conception of network was widely considered as a metaphor, more and more scholars are using it as substance to represent structure of the relational patterns of varying societal units (Scott, 1992).[22] For example, an intra-organizational structure can be represented as a network of nodes and ties between them and, in the same way, an inter-organizational structure, too. As Fararo (2000) put it, the metaphor of "structure as network" was, though widely employed informally in sociology, transformed into a mode of model building and analysis through a convergence of ideas and techniques from several traditions including sociometry (Moreno 1934), balance theory, and the analysis of structures of kinship (White 1963). He noted, social network analysis has become a mode of structural analysis with an extensive battery of formal techniques at its disposal (see also Scott, 1992; Wasserman and Faust, 1994).

Moreover, the network approach is not limited to the traditional distinctions conventionally made in the study of social movements; for example, it can be applied to both traditional and contemporary (or "new") social movements, all forms of social movements (labor, environmental, peace, or women), all camps of ideological orientation (radical, mainstream, or conservative), and all levels of units (individuals, organizations, or nations). In addition, it can be used in comparison across the conventional distinctions to discuss whether the distinctions are meaningful; for example, it can compare the

[22] Following Goffman, Breiger (1974) presented that there were two types of social ties: membership and social relations. He referred to them as "membership network analysis" and "social relations network analysis," respectively.

findings from different movement sectors, from different time points, or from different geographic locations. The network approach in the study of social movements/collective action has already started achieving some goals, though the full-fledged paradigm has yet to come.

## 2.4 Network Evolution: Principles and Models

Lenski et al (1991) defines network evolution as "series of events with a definable outcome." Similarly, Doreian and Stokman (1997) defines network evolution as "series of events that create, sustain, and dissolve social structures." That is, network evolution is an ordered process of a network structure with a trajectory through time. In fact, there have been considerable efforts to develop models to explain network evolution in social network studies. Of varied theoretical efforts for network dynamics or evolution, this dissertation research is particularly interested in a few dynamic models that attempt to explain how complex structural properties emerge from simple dyadic processes while assuming the dependence of dyadic ties and the generative-structural processes (for agent-based models developing in social sciences, see Macy and Willer, 2002). These model properties are thought to generate structural properties that cannot be reduced to lower level properties.[23] The following two paragraphs will discuss the two distinct assumptions that the models reviewed are based on.

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[23] It is not to say that the models with a dyadic independence assumption are not important in studying network evolution. They have helped discover important principles of dyadic attachment in social world. Those that network theorists have found thus far include, but are not limted to, 'homophily' (McPherson and Smith-Lovin, 1987; McPherson et al., 2001), "accumulative advantage" or "power law" (Merton, 1973; Watts, 1999; Watts and Strogatz, 1998), "legitimacy" (DiMaggio and Powell, 1983), "multi-connectivity", and so on (see Powell et al., 2005 for applications of more dyadic conditions). However, it does not seem attractive to model network evolution as an aggregate of independent dyads because of the reasons as follows: (*a*) the models based on dyadic independence are, in essence, not structural in a Simmelian sense

**Dyadic Dependence**. First, the assumption of the dependence of dyadic ties refers to the basic property that the tie creation between two distinct nodes is not independent of tie creation in other parts in the network. Network structure evolves by two distinct nodes creating dyadic ties given a fixed set of nodes. Naturally, this assumption makes the researcher turn to triad completion models in which dyadic ties are dependent on each other. That is, explaining triad completion is an essential process in studying network evolution while the dyad is still a fundamental unit of analysis in social network analysis. Second, series of tie creation at the dyadic level "generate" structural properties at the network level.[24] Nevertheless, the structural properties cannot be understood as an aggregate of the dyadic ties. Each subsection discusses what these assumptions would imply for the trajectory of network evolution for each model.

**Generativity:** Fararo and Butts (1999) define generative or generative-structural processes as the processes by which complex system level properties emerge from simple local level changes. Recent decades have seen advances in theoretical development and (simulation) modeling in social sciences (Chomsky, 1957; Bourdieu, 1990; Fararo and Butts, 1999; Epstein and Axtell, 1997). In parallel, network theorists have modeled the same processes to discover (generative) mechanisms to explain network evolution in which complex network properties emerge from changes in dyadic ties. An effort to explain generativity focuses on the final network structure (e.g., hierarchy) emerged from the generative processes. However, investigation of generativity requires, first, an identification of mechanism(s) (e.g., social balance) by which a network structure at time

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(1950), (*b*) they do not provide such generative mechanisms as the next section illustrates, and thus (*c*) they do not suggest an emergent social structure in a Holland and Leinhardt's sense (1979).

[24] Holland and Leinhardt (1979), on the other hand, argue that any network in which higher level properties can be modeled adequately using only properties of nodes and dyads has no social structure. The conditions that they assumed generate "random" networks without significant structural properties.

*t* evolves into a network structure at time *t*+1, and, second, an explication of the processes by which the mechanism(s) discovered generates a complex network structure that cannot be reduced to lower level properties.

In what follows, three fundamental models of network dynamics are reviewed: social balance models (Heider, 1946; 1958), E-state structuralism models (Skvoretz et al., 1996), and strategic actor models (Jackson and Wolinsky, 1996; Hummon, 2000; Doreian, 2006). Each approach presents different mechanisms: balance mechanism, bystander mechanism, and rational mechanism.[25] The first two models focus on triadic completion processes based on the assumption that dyad formation is dependent on each other while the third model focuses on general network processes. In commonality, they all assume that an aggregate of a series of dyadic ties interdependent on each other generates emergent structural properties. And yet, each model is unique in that it is based on differing assumptions of motivation, behavior, and equilibrium state. For example, social balance models that propose balance mechanism explain purposive behavior of tie formation by cognitive (and social) actors and series of the dyad creation arrives at balanced equilibrium. Table 2.1 summarizes the characteristics of the models reviewed in what follows.

[25] Beyond the three models introduced, there can be more dynamic models that assume dyadic dependence. For example, exchange (network) theory (Emerson, 1962, 1964, 1967a,b; Blau, 1964; Cook and Emerson, 1978) that developed some of the current network models is not included in the current discussion. However, the theory presents that the "power-balancing" mechanisms in power-imbalanced exchange networks can bring about network extension. That is, actors may engage in tie forming activities to alter the balance of power in the exchange network. In general, they were interested in how relatively stable exchange network structures emerge from unstable and less structured networks of exchange relations.

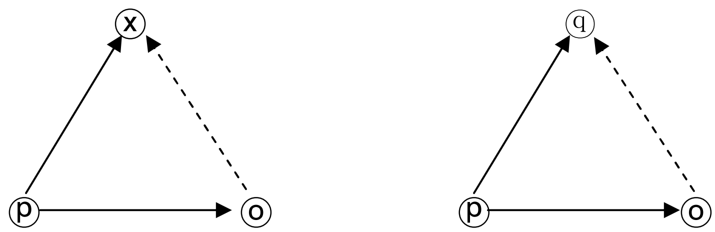
Table 2.1: Comparison of Model Properties

| Mechanism | Motivation | Behavior | Equilibrium |
|---|---|---|---|
| Balance Mechanism | Cognitive, Social | Purposive | Balance |
| Bystander Mechanism | Social | Non-Purposive | Hierarchy |
| Rational Mechanism | Economic | Purposive | (Maximum) Utility |

### 2.4.1 Social Balance Model

Since the first systematic formulation by Heider (1946, 1958), social balance theory has continued to develop despite the contradictory assessment of the theory (Davis, 1979; Opp, 1984; Manhardt, 1995). Further, social balance theory has provided social network theory with useful insights for the dynamics of network structure. To discuss social network models for network dynamics, this section focuses on the main tenets of social balance theory. In its original formulation of balance theory, Heider (1946, 1958) focused on the cognitive inconsistencies that exist in the minds of persons on dyads and triples. For example, in his *pox* triple $p$ is a focal person, $o$ another person and $x$ an object (which may be a third person). The tie $o \rightarrow q$ is $p$'s perception of the signed tie from $o$ to $q$. If there is a negative tie in the triple, the triple is imbalanced because there is a cognitive inconsistency, while if there is no negative tie or if there are two negative ties in the triple, it is balanced and there is no cognitive inconsistency. Figure 2.2 illustrates examples of imbalance triples.

Imbalanced triples are thought to be inherently unstable while balanced triples stable. Thus, cognitive inconsistencies or imbalance (tension, strain) that exist as a driving force in the minds of persons were thought to motivate rational persons to consider changes in signed relations in which they are involved to reduce the imbalance that they experience. Since the change was the sign relations in the minds of persons, rather than in the social relations, the Heider's theory explains mental affect processes but does not explain the processes in signed social relations and the aggregate outcomes in the macrostructure. That is, Heider's formulation was concerned with cognitive inconsistencies in 'unit-formation relations (*U*)' whereas Cartwright and Harary's (1956) and others, 'affect relations' (*R*) affective inconsistencies in a more generalized context.




(a) Imbalance (b) Cartwright and Hararian

Figure 2.2: Examples of Imbalanced Triples

Since the generalization of Cartwright and Harary (1956), however, balance has been studied in a more generalized context. The sign of a triple was defined as the product of the signs of the links in the triple. If the resulting sign is positive then the triple is balanced and if this sign is negative then the triple is imbalanced. The idea of the sign of a triple extends naturally to the sign of a semi-cycle of any length. Thus, a graph (network) is balanced if all of its semi-cycles are balanced. A balanced graph was viewed partitioned into two subsets (later, plus-sets) so that every positive arc joins vertices of the same subset and every negative arc joins vertices of different subsets (*Structure Theorem I*: Cartwright and Harary, 1956). In the Davis's (1967) *Structure Theorem II*, the subsets in a balanced graph were thought to be more than two (thus, $\kappa$-balanced for $\kappa \geq 2$). Still, imbalance was the driving force but balance processes were thought to operate in social relations at the group level. The Moore's (1979) application of balance theory to analyzing international relations is a good example.[26] The processes involve changes in signed relations and the (number and size of) partition structures to arrive at equilibrium.

A recent revival of interest in social balance theory has provided social balance models that emphasize balance mechanisms and measures of (im)balance at equilibrium. From a re-analysis of the Newcomb (1961) data, Doreian et al (1997) observes different time scales in reciprocity, transitivity, and balance theoretic mechanisms. Using the same dataset (Newcomb, 1961), Doreian and Krackhardt (2001) examines pre-transitive balance conditions ($i \to j$, $j \to k$) to find that their Fundamental Structural Balance Hypothesis (FSBH)–"signed human relations tend to be balanced over time"–was supported in general except for the triples with ($i \to j$) was negative and, importantly, signed relations were also concerned with actor attributes. This observation that the driving force of balance processes was found in actor attributes alerts that non-structural processes can be mistakenly interpreted as structural balance processes. They also suggest that there may be multiple balance mechanisms that may be switched on or off in given empirical contexts. Later, Doreian (2002) emphasizes "event sequences" as generators of network evolution and suggests that movement towards balance, if it exists, is neither simple nor direct.

In their simulation research, Hummon and Doreian (2003) proposed a theoretical model for social balance in the form of an agent based simulation (ABS) model that simulates distinct but interdependent social actors making positive and negative

[26] To introduce a few more empirical applications, Mower-White (1977, 1979) conducted experiments to test triadic balance hypotheses and found that balance is only one of the biases that affect subjects' responses. She also argued that social context influences balance outcomes. Epstein (1979), in an analysis of longitudinal survey data of friendship choices among secondary school students, found that friendship selections are not explained by "a single theory of balance". At a larger scale, Moore (1979) applied balance theory to international relations to examine whether balance could be attained with more than two subgroups. He concluded that the structural balance theory was valid for international relations.

selections of each other in efforts to reach balanced cognitive states.[27] From the reflection on the practices that one line of balance theory has based only on the ideas of Heider (1946, 1958) and the other based only on Cartwright and Harary (1956), they modeled a balance theoretic process with two levels. One is located in the minds of actors and is fully consistent with the initial (micro-level) formulation of Heider (1946, 1958) while the second (macro-level) is attentive to group level dynamics. At this group level, the simulations are consistent with the line of work by Cartwright and Harary (1956) where attention has been focused on the structure of small groups. They have coupled the two levels, by having a 'pure Heider' (micro) process and a 'pure Cartwright and Harary' (macro) process, which inform and constrain each other as they operate.

The design variables for the simulations are 'group size', 'degree of contentiousness of a group' and the 'mode of communicating choices' regarding the existence and sign of social ties. The outcome variables were the 'number of acts' that groups need to reach balance (or equilibrium), the 'number of actors' whose cognitive images of the network are balanced, the 'number of clusters' (plus-sets) at equilibrium, and the 'level of imbalance' at the group level. They found that the design variables have complicated impacts on the number of actor choices made to reach balance, the level of group imbalance, the number of actors with balanced images and the number of plus-sets formed. The simulation results suggested that, first, the initial contentiousness are relevant, second, the modes of communication is important for balance theoretic

[27] Recent decades have seen the emergence of social simulations as a tool to develop and test theory in social sciences (see the emergence of virtual experiments as a tool to develop social theory in Hummon and Fararo, 1994; Carley and Prietula, 1994). Virtual experiments allow researchers to test relationships of interest under specified parameterized conditions with or without empirical data. Recently, computational sociology and agent-based modeling (ABM) have been recognized useful in studying generative-structural processes in dynamic social systems (Macy, 1991; Macy and Skvoretz, 1998; Macy and Willer, 2002). Considering the difficulty of collecting reliable longitudinal signed data, studies of balance processes can also benefit from virtual experiments (Doreian, 2003).

dynamics, third, these dynamics are different in 'large' small groups compared to 'small' small groups, and, finally, there is a subtle relation between the number of plus-sets formed and the two types of balance realized by the model.

Overall, balance theory, as a fundamental model for network processes, focuses on imbalance as the driving force of network processes and yet balance processes are thought to operate at both mental and group levels. Further, balance processes result in the macrostructure of partition structures at equilibrium, of which imbalance can be measured by the line-index (Doreian and Mrvar, 1996). Figure 2.3 illustrates balance mechanism. The triple (b) is a triple that the triple (a) can evolve into.

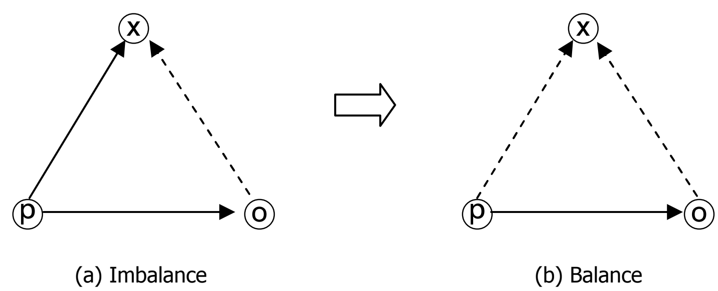



Figure 2.3: Balance Mechanism

### 2.4.2 E-State Structural Model

E-state structuralism (Skvoretz et al, 1996) proposes dynamic models by which dyadically based social psychological processes aggregate to produce stable power and prestige orders in groups of arbitrary size via the development of networks of ties among actors. It synthesizes concepts and ideas drawn from expectation states theory and from social network analysis. Expectation states theory developed from a concern with the emergence of power and prestige orders in task-oriented groups of arbitrary size. Much of the advance in expectation states theory came from studying subjects in a dyadic context in which the expectations vis-à-vis an alter have been manipulated via the introduction of diffuse status differences or differences in specific performance characteristics (Balkwell, 1991). However, this exclusive focus on behavior in dyads set aside the problem of how dyadic effects may or may not aggregate to yield coherent status effects in larger groups.

Compared to expectation states theory, E-state structuralism takes a more global view of the aggregation problem. The basic theoretical construct of E-state structuralism is the concept of an "E-state". This idea is abstracted from the core assumptions of the expectation states research program (Berger, Wagner, and Zelditch, 1985). The initial use of the term "E-state" in Fararo and Skvoretz (1986) occurs in an effort to model the formation of dominance structures in animal groups and adapts this type of construct to animal interactions. Fararo and Skvoretz (1986) also take the novel step of deploying the E-state construct in a social network context. By postulation, each actor has a relational E-state toward others in the network. The social network is a set of actors together with the configuration or pattern of relational E-states. This conception of social networks described in terms of relational E-states defines the general idea of "E-state structuralism".

The basic E-state model, constructed by Fararo and Skvoretz (1986) deals with the classical problem of dominance structure formation in the barnyard and the fact that the structures tend to be highly transitive (Mazur, 1973; Freeman, Freeman, and Romney, 1992). Conceptually, dominance ties refer to pairs of complementary E-states in which one organism expects to dominate another and the second expects to defer to the first. Such a tie may develop between two organisms, firstly if one attacks the other. This is a "victim" effect. The victim effect by itself, however, does not ensure high degrees of transitivity. A second mechanism, the “bystander” effect, is required. By virtue of this mechanism, ties may form between bystanders to an agonistic encounter and its participants. Bystanders form such E-states by mirroring what they observe: the model postulates that in observing an attack a bystander may form a deference orientation to the attacker (and the attacker, a dominance orientation to the bystander) and may form a dominance orientation to the victim (and the victim, a deference orientation to the bystander).[28]

According to Holland and Leinhardt (1979), any network in which higher level properties can be modeled adequately using only properties of nodes (actors) and dyads (pairs of actors) has no social structure. A biased network algorithm was presented in Skvoretz (1990); relative to a population of random graphs with the same indegree and outdegree distribution, the biased graph exhibits social structure. The question is: is the observed value of the property significantly greater or less than expected relative to an appropriately constructed population of random graphs? The specific conditional distribution provides a *baseline* against which properties of the observed graph are to be compared; “Do groups typically evolve into networks, represented by the absorbing states, that exhibit “interesting” structure in the precise sense defined in social network analysis?”

The network has evolved to an absorbing, equilibrium state in which further attacks may occur, but according to the axioms of the model, these attacks cannot alter the configuration of ties. They examined whether the probability of a complete hierarchy and the distribution of triad types in the evolved networks depart significantly from

[28] Formally, let *xNy* indicate that no tie exists between *x* and *y* and let *xDy* indicate that a dominance tie from *x* to *y* exists. The bystander effect in a transitive dominance structure explains that if *x* domantes *y* (*xDy*) and then a bystander (*z*) tends to dominate *y* (*zDy*) while the bystander defers *x* (*xDz*).

expectations derived from the baseline random graph distribution. They arrived at some conclusions: a) a completely transitive hierarchy of dominance relations only if the bystander effect is non-zero, b) the network evolves comparatively rapidly, c) most ties occur via bystander effects and few via the victim, i.e., without bystander effects, transitivity only occurs at chance levels, and d) events occurring in different dyads–attacks and the formation of ties–are not necessarily independent: attacks in one dyad can affect the outcome of tie formation in other dyads.

Advances in E-state structuralism include 'contingent complementarity E-state model', 'contingent complementarity model with parallelism', and 'E-state precedence model'. More content work on dominance structure formation has dropped some of the simplifying assumptions of the basic model (Fararo, Skvoretz, and Kosaka, 1994) and has extended the domain of the first model to task oriented discussion groups of humans (Skvoretz and Fararo, forthcoming). Figure 2.4 displays bystander mechanism.

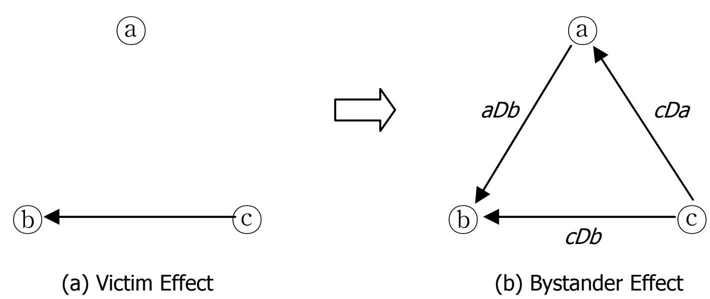



Figure 2.4: Bystander Mechanism

### 2.4.3 Strategic Actor Model

In fact, rational choice theory and social network theory have had conflicting assumptions of social action and social structure. While rational choice theorists have assumed that a social structure is an aggregate outcome of individual social action (a bottom-up approach), network theorists have assumed that a social structure facilitates or constrains individual social action (a top-down approach). Despite this fundamental difference in assumptions, they have been recently working together to develop an integrative approach to understanding network processes (e.g., the semi-conference of mathematical sociologists and network theorists, August, 2004. San Francisco, CA). Nonetheless, modeling rational or strategic actors is not new to social network theory. For example, Burt (1992) proposed the conception of 'structural holes' in which strategic actors benefit by virtue of being located in strategic positions in a network. Numerous others have studied resources (or 'social capital') embedded in networks to which social actors have access through network ties (Lin et al., 2001).

And yet, not much effort has been made to model strategic actors in explaining network evolution. In what follows, I introduce a few examples as such. Specifically, strategic actor models assume that actors (and networks, too) have calculus for the benefits from being located in a network position and the costs of maintaining the ties. Self-interest (i.e., calculation of costs and benefits) drives actors (not) to form a tie with other actors and the network structure is thought to evolve depending upon the choices that the strategic actors make. For example, Jackson and Wolinsky (1996), based on strategic actor models, specified the conditions under which certain equilibrium structures (null, star, and complete graphs) emerge. By parameterizing the costs and benefits, they derived the equilibrium structures under specified combinations of parameters where ties are formed by rational actors. Hummon (2000) was also concerned with the generation of ties and the nature of network processes over time when actors behave according to the calculus of the benefits and the costs. In his simulation model based on the Jackson and Wolinsky's work, however, Hummon identified other equilibrium structures not anticipated by Jackson and Wolinsky.

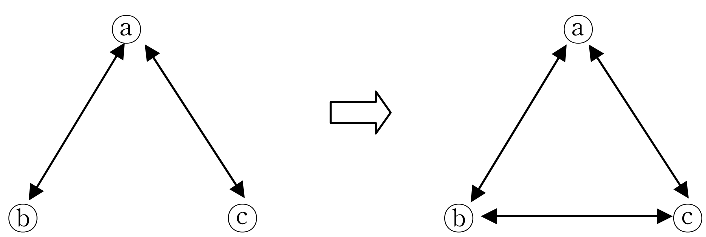
To resolve the discrepancy between the Jackson and Wolinsky's work and the Hummon's work, Doreian (2004) explored transitions between pairs of structures to see if it was possible to establish the conditions under which equilibrium structures were generated. Using networks with a fixed set of vertices and the Jackson and Wolinsky framework, he explored the transitions between networks on the lattice of all graphs through the addition and deletion of ties. That is, he attempted to establish the conditions under which structures not identified by Jackson and Wolinsky occurred and were still stable. An examination of these transitions revealed the equilibrium structures anticipated by Jackson and Wolinsky, the equilibrium structures located by the Hummon simulations, plus some other equilibria. He assumed that rational actors employed a bounded rationality (Simon, 1976) and sequenced the decisions by those boundedly rational actors. To introduce the formulas employed, the set of all edge graphs for $n$ vertices formed a lattice which identified the transitions between graphs when lines were added (or deleted) one at a time. The utility of a network, $G$, for $i$ can be written as:

$$u_i(G) = \omega_{ii} + \sum_{ij \in G} (\delta_{ij} \omega_{ij} - \gamma_{ij}) + \sum_{t_{ij} > 1} (\delta_{ij}^{t_{ij}} \omega_{ij})$$

where $\delta_{ij}$ and $\gamma_{ij}$ denote, respectively, the benefit for an actor, *i*, of the tie ($i \leftrightarrow j$), and the cost of maintaining that tie for *i* while $\omega_{ij}$ represents the value of actor *j* for actor *i* and $t_{ij}$ the geodesic distance of *j* from *i*. Further, the total utility from the network as a whole is given by:

$$U_T = U_T(G) = \sum_i u_{i \in G}(G)$$

In sum, strategic mechanism explains network processes by which network structure evolves into a structure in which the utilities for the actors and the network as a whole are maximized (Jackson and Wolinsky, 1996; Hummon, 2000; Doreian, 2006). Figure 2.5 displays strategic mechanism.




(a) Lower Utility (b) Higher Utility

Figure 2.5: Utility Mechanism

### 2.4.4 Comparisons of Models

Thus far, I have discussed two fundamental properties of network dynamic models (dyadic dependence, generative processes). As fundamental models of network evolution, three triad completion models (social balance, E-state structuralism, strategic actor/network) were considered with four more dyad-focused models. In reality, however, these organizing rules of network ties co-exist and thus it may not be possible to distinguish one from another. Furthermore, it cannot be assumed that one principle dominates at all time periods. That is, different organizing principles may be dominant at each stage in the formation of the network. Now, I compare the three models of network evolution and the mechanisms that they present to discuss the applicability for structural dynamics in organizational fields in general and the environmental organizational field in particular. Focus will be on model suitability, usefulness, expandability, and so on. Table 2.2 summarizes the comparison of the model properties.

First, social balance models are most versatile in terms of suitability (or expandability) of the models (and the mechanisms) to dealing with multiple types of nodes (i.e., multi-mode networks) and multiple types of (including signed) relations. In its initial formulation, Heider's (1946) *pox* triple was multi-modal because it included two people (*p*, *o*) and an object (*x*) although later models have dealt with networks of one-mode. Social balance models have not been multiplex although they deal with signed relations, i.e., two different types of relations. In contrast, E-state structuralism models have been limited to a single type of nodes, but it dealt with two distinct types of ties (dominance, deference) at the same time. Like social balance models, E-state structuralism models examined negative (dominance) ties in exchange of deference (positive) ties. Strategic actor models have been limited to one-mode networks of the same type of positive ties only. Thus, at the current stage of the model, strategic actor models are least versatile.

Second, in terms of network processes–how triads are created from a set of dyads and how generativity works, social balance models explain that social actors in socio-cognitive interests purposively form signed ties to achieve a balanced state. Accordingly, series of dependent dyadic ties generate multiple partition (plus-set) structures which may be oppositional. On the other hand, E-state structuralism models explain that social actors in social interests (non-)purposively create ties to achieve a hierarchical state: victim effect-purposive and bystander effect-nonpurposive. That is, series of dependent dyadic ties generate a dominance structure. According to the strategic actor models, social actors in economic interests purposively form ties to achieve a state of maximum utility. Series of dependent dyadic ties generate a maximum utility structure for both actors and the network at the same time. Table 2.1 above summarizes these model properties.

Overall, those three fundamental models of network dynamics are applicable in varying degrees to organizational fields in general and the environmental organizational fields in particular. Social balance models are useful in explaining relations between organizations that are collaborating and conflictual at the same time such as contemporary socio-political organizations.[29] These models are also applicable to analyzing two-mode relations in organizational fields such as organizations around events that they (do not) support. Further, these models are perfect in explaining the oppositional structure in which groups of (social, political) organizations contend with each other. These models are applicable to both alliance and conflictual ties. E-state structuralism models, on the other hand, are useful in explaining a stable dominance (also deference) structure emerges between organizations that are competing over limited resources such as contemporary socio-political organizations. These models are also useful in explaining how a hierarchical structure of organizations emerges naturally even though not all organizations intend to do so. These models are applicable to both alliance and

[29] While almost all network studies have focused on positive ties (e.g., friendship, alliance, trade), few studies negative ties (e.g., Sampson, 1968). Doreian (2003, classnotes) finds the reasons behind the scarcity of the studies of negative ties from the lack of reliable signed data and cognitive discomfort involved.

conflictual ties. Finally, strategic actor models are useful in explaining how a stable structure is generated between organizations that are competing over limited resources such as information. These models are applicable to alliance relations.

Table 2.2: Comparison of Suitability of Models

| Models | Multi-Mode | Multiplex | Negative |
| --- | --- | --- | --- |
| Social Balance | Yes | No | Yes |
| E-state Structuralism | No | Yes | Yes |
| Strategic Actor | No | No | No |

Note: '(Yes)' indicates that future models might handle negative ties.

# Part II

# Measures, Estimation, and Data

# Chapter 3

# Methods: Tools and Measures

Since this dissertation research aims to explicate how the current environmental movement structure has emerged, statistical network methods are essential in this investigation. The methods used in the chapters 5, 6, and 7 are three fold: (*a*) describing tie distribution, (*b*) partitioning network structure, and (*c*) estimating tie probability. First, description of tie distribution focuses on revealing characteristics of the network structures and changes based on some relevant measures. Second, partitioning network structure classifies a network structure into several substructures for equivalence and balance. Finally, estimation of tie probability includes categorical data analysis and exponential random graph models (ERGM). The computer packages used include *SAS*, *Pajek*, *Ucinet*, and *Multinet*.

## 3.1 Describing Tie Distribution

First, description of tie distribution includes describing network structure and dynamics based on some relevant network measures. The description in this dissertation will focus on presenting how the individual, subset, and network properties change over time based on some network measures as follows: network size, density, centralization, clustering coefficient, imbalance, contentiousness, transitivity, and centrality.

### 3.1.1 Measures

**Network size, density, and centralization:** The **size** of a network is determined by the number of nodes and the number of ties between the nodes. When a network structure is summarized as $G(V, E)$, $| V |$ representing the vertices refers to the number of nodes and $| E |$ representing edge refers to the number of ties. The **density** of a binary network is the total number of ties divided by the total number of possible ties. For a valued network, it is the total of all values divided by the number of possible ties. In this case, the density gives the average value. For a given binary network with vertices $v_1....v_n$ and maximum degree centrality *cmax*, the network degree **centralization** measure is $S(cmax - c(v_i))$ divided by the maximum value possible, where $c(v_i)$ is the degree centrality of vertex $v_i$.

**Clustering Coefficient:** Clustering coefficient calculates the clustering coefficient of every node and the clustering and weighted clustering coefficient of the whole network (Watts, 1999). The clustering coefficient of a node is the density of its open neighborhood. The overall clustering coefficient is the mean of the clustering coefficient of all the nodes. The weighted overall clustering coefficient is the weighted mean of the clustering coefficient of all the nodes each one weighted by its degree. This last figure is exactly the same as the transitivity index of each transitive triple expressed as a percentage of the triples in which there is a path from $i$ to $j$.

**Imbalance:** The measures of imbalance, literally, measure the level of imbalance in signed networks (Harary, 1959; Doreian and Mrvar, 1996). Doreian and Mrvar (1996) developed an algorithm based on the (negation or deletion) line-index based on Harary (1959). The line-index measure considers inconsistencies in balance partitions that take one of two forms: negative ties within plus-sets ("negative inconsistencies") or positive ties between pairs of plus-sets ("positive inconsistencies"). Formally, letting $N$ be the total number of negative ties within plus-sets and $P$ be the total number of positive ties between plus-sets, the criterion function is defined as in Equation (1). In this formulation, the two types of inconsistencies are treated as being equally important: the criterion function is simply the count of all inconsistencies regardless of their types. In an alternative formula, the positive and negative inconsistencies can be weighted as follows: $P(C) = \alpha N + (1-\alpha)P$, where $0 \leq \alpha \leq 1$.

$$P(C) = N + P \qquad \text{Equation (1)}$$

**Contentiousness:** As in the measures of imbalance, the measure of contentiousness measures the level of contentiousness in signed networks. It calculates the number of negative ties relative to the total number of ties in signed networks–the ratio of the number of negative ties to the number of total ties (Hummon and Doreian, 2003). Formally, the measure of contentiousness can be expressed as in Equation (2). The level of contentiousness does not reflect the level of imbalance in signed networks because multiple plus-sets can be linked via a number of negative ties in perfect balance in which case the level of contentiousness is high but the level of imbalance is zero.

$$C = \frac{\text{Number of Negative Ties } (N)}{\text{Number of All Ties } (A)} \qquad \text{Equation (2)}$$

**Transitivity:** While the measure of transitivity is essential in triadic analysis, it calculates the density of transitive triples in a network. The density of transitive triples is the number of triples which are transitive divided by the number of paths of length 2, i.e. the number of triples which have the potential to be transitive. In graph-theoretic terms, three vertices *u*, *v*, *w* taken from a directed graph are transitive if whenever vertex *u* is connected to vertex *v* and vertex *v* is connected to vertex *w* then vertex *u* is connected to vertex *w*. This definition can be extended to valued data. Strong transitivity occurs only if the final edge is stronger than the two in the original path. This can be relaxed so that the user can define the minimum value of the final edge (weak transitivity). For distances, transitivity can be defined in terms of the number of triples satisfying the triangle inequality, and for probabilities in terms of the product of probabilities of the edges.

**Centrality:** The measures of centrality calculate the centrality scores of vertices in a network depending on the defined criteria. The centrality measures are varied and thus have to be selected before use according to the phenomena of interest. The examples include degree, closeness, reach, betweenness, flow betweenness, eigenvector, power, information, and influence. This dissertation considers "degree" centrality to measure the centrality scores (Freeman, 1979) of the EORGs based on their activities (e.g., lawsuit, alliance) and identify central EORGs. The degree centrality is calculated as follows: the number of vertices adjacent to a given vertex in a symmetric graph is the degree of that vertex. For non-symmetric data, the in-degree of a vertex *u* is the number of ties received by *u* and the out-degree is the number of ties initiated by *u*. In addition, if the data are valued, then the (in- and out-) degrees will consist of the sums of the values of the ties. The normalized degree centrality is the degree divided by the maximum possible degree expressed as a percentage. The normalized values should only be used for binary data. For valued data, the non-normalized values should be used and the degree centralization should be ignored.

## 3.2 Partitioning Techniques

Partitioning network structure classifies a network structure into several substructures depending on the defined criteria. This dissertation attempts at a synthesized method to partition the movement network structures into a set of plus-sets and a set of equivalent positions in a sequential manner in signed networks. That is, a synthesized method partitions a signed structure into plus-sets and equivalent positions in sequence so that equivalent positions can be detected within and between plus-sets. A temporal observation of the equivalent positions within and between plus-sets through time may suggest structural mechanisms thereby balance-structurally equivalent actors, while developing similar attributes, play similar roles in the structural dynamics.

### 3.2.1 Balance Partition

In a signed network, the relations are positive (+), negative (–), or null. The balance partitioning of the signed network partitions the nodes into plus-sets so that every positive arc joins vertices of the same subset and every negative arc joins vertices of different subsets (Cartwright and Harary, 1956; Davis, 1967). In balance partitioning, the inconsistencies are the negative ties within plus-sets (i.e., “negative inconsistencies”) and positive ties between plus-sets (i.e., “positive inconsistencies”). The two structural theorems in balance theory introduced below state that, first, a signed network is balanced if and only if the set of vertices can be partitioned into two or more plus-sets and, second, the signed network is κ-balanced for $\kappa \geq 2$ if and only if the set of $V$ can be partitioned into κ subsets, called plus-sets. The first theorem is concerned with balance partition itself and resulting plus-sets while the second the number of plus-sets:

***Structure Theorem I****: A signed graph (G, σ) is balanced if and only if the set of vertices V can be partitioned into two subsets so that every positive arc joins vertices of the same subset and every negative arc joins vertices of different subsets (Cartwright and Harary, 1956).*

***Structure Theorem II****: A signed graph (G, σ) is κ-balanced for κ ≥ 2 if and only if the set of V can be partitioned into κ subsets, called plus-sets, so that every positive arcs joins vertices of the same subset and every negative arc joins vertices of different subsets (Davis, 1967).*

The methods to measure the (im)balance of a signed network have included consideration of the signs of a cycle (or semi-cycle) (Cartwright and Harary, 1956), weighting (Hummon and Fararo, 1995), and line index (Harary, 1959; Harary et al., 1965; Doreian and Mrvar, 1996). A recent advance in the line index by Doreian and Mrvar (1996) proposes the use of an algorithm (based on the two structure theorems above) that provides a description of the partition structure(s) of the graph and a measure of imbalance, which was the line index (negation or deletion) proposed by Harary (1959). Formally, as in Equation (3), they sought to determine the clustering(s) $C$* for which:

$$P(C^*) = \min_{C \in \phi} P(C) \qquad \text{Equation (3)}$$

where $C$ is the clustering of a given set of vertices $V$, and $\Phi$ is the set of all possible clustering and $P$: $\Phi \rightarrow \Re$ is a criterion function. The criterion function is constructed from (negative and positive) inconsistencies with a balanced structure and then minimized by using a relocation algorithm. Letting $N$ be the total number of negative ties within plus-sets and $P$ be the total number of positive ties between plus-sets, the criterion function is defined as in Equation (1):

$$P(C) = N + P \quad \text{Equation (1)}$$

### 3.2.2 Structural Partition

In search of equivalent nodes in a network structure, there are two approaches: structural equivalence and regular equivalence. Two nodes are structurally equivalent if they are equally related to and from all other nodes (Lorrain and White, 1971) while they are regularly equivalent if they are equally related to equivalent others (Borgatti and Everett, 1989, 1993). Despite a slight difference in algorithm, these procedures partition the network structure into positions in which nodes located in equivalent positions play similar roles.[30] Given a signed network partitioned into plus-sets, the signed network can further be partitioned into equivalent positions from a positional approach (Lorrain and White, 1971; White, Boorman, and Breiger, 1976). That is, the synthetic approach allows us to find the nodes occupying equivalent positions within and between the plus-sets.

Table 3.1 summarizes structurally unique positions that can be detected from these partitioning methods employed in sequence. The equivalent nodes within the same plus-sets can be considered "competitors" because they belong to the same group but play similar roles. The nodes that are not equivalent within the same plus-sets can be considered "allies" because they belong to the same group but play different roles. On the

[30] Recently, network analysts have seen a series of advances in network partitioning: First, network theorists introduced generalized blockmodeling technique to partition a network into pre-defined block types and permutate the network to calculate the fit (Doreian et al., 2005a, 2005b). Second, network theorists have developed methods to partition two-mode networks. Batagelj (2003) developed an algorithm to blockmodel two-mode network data by local optimization. Further, Doreian et al (2005a, 2005b) presented a generalized blockmodeling of two-mode network data. In principle, they treated rows and columns of a two-mode network separate entities and thus partition them separately. The two-mode network data are permutated and compared with pre-defined block types to calculate the fit. The advances in the methods to deal with two-mode network data have been useful in social network analysis in that social sciences often deal with affiliative relations such as membership or participation.

other hand, the equivalent nodes across distinct plus-sets can be considered "contenders" because they belong to different groups but play similar roles. The vertices that are not equivalent across distinct plus-sets can be considered "others" because they belong to different groups and play different roles. The idea can be applied to all network elements that are competing or contending in the same network structure: individuals, groups, or organizations.

Table 3.1: Partitioning: Balance and Equivalence

| | | Equivalence | |
|---|---|---|---|
| | | Same Position | Different Position |
| Balance | Within Plus-set | Competitors | Allies |
| | Between Plus-set | Contenders | Others |

## 3.3 Estimating Tie Probability

One of the fundamental questions in statistical network analysis is that under what conditions two distinct nodes will create a tie with each other. The assumption of dyadic dependence in the construction of network structure discussed in the previous chapter makes this inquiry much more interesting than that of dyadic independence does because it can explain the creation of dyadic ties conditional on the rest of the network structure. To explain the existence (or absence) of a relational tie, there are several models that can be used: categorical data analysis models, conditional logit models (McFadden, 1973, 1981), and exponential random graph models (ERGM). While conventional categorical data analysis models can explain whether or not there is a (incoming, outgoing) tie between two distinct actors, they consider only actors' attributes as explanatory variables. As an extended form, conditional logit models are useful in that they consider both attributes and relational characteristics such as measures of centrality. Recent advances in exponential random graph models (ERGM) or p-star family models, which do not assume dyadic independence, allow the researcher to estimate the tie probability (Holland and Leinhardt, 1977, 1981; Wasserman, 1987; Wasserman and Iacobucci, 1988; Wasserman and Pattison, 1996; Pattison and Wasserman, 1998).

### 3.3.1 Exponential Random Graph Models (ERGM)

Until 1980s, p family of models had been used to estimate tie probability in statistical network analysis (Holland and Leinhardt, 1977, 1981; see also others), which were quite limiting because they had independence assumptions on interacting actors in a network. In contrast, the models for random graphs developed by Frank and Strauss (1986) and Strauss and Ikeda (1990) made the limiting assumptions no longer necessary and allowed the development of logit p* models that do not make severe independence assumptions on dyads (Wasserman and Pattison, 1996; Pattison and Wasserman, 1998; see also Rennolls, 1995). In the formulation presented by Wasserman and Pattison (1996), the response variable is a logit, or log odds of the probability that a relational tie is present and the explanatory variables can be quite general. The primary effects that were found so far useful are those corresponding to various dyadic configurations (e.g., choice, mutuality, expansiveness, attractiveness), triadic configurations (e.g., transitivity, cyclicity), subgroup effects (e.g., age groups), and network centralization. The family of models p* contains the Markov random graphs of Frank and Strauss (1986) as a special case, as well as the dyadic interaction model $p_1$ of Holland and Leinhardt (1977) (Holland and Leinhardt, 1981; Fienberg and Wasserman, 1981). Thus, the basic log linear model (i.e., p*) is:

$$\Pr (X = x) = \frac{\exp \{\theta' z(x)\}}{\kappa (\theta)} = \frac{\exp \{\theta_1 z_1(x) + \ldots + \theta_1 z_1(x)\}}{\kappa (\theta)} \qquad \text{(Model 1: p*)}$$

where $\theta$ is a vector of the model parameters, $z(x)$ is the vector of the explanatory variables, and $\kappa$ is the normalizing constant that ensures that the probabilities sum to unity.

The alternative version of model 1 that does not depend on κ is a logit model. In a logit or logistic regression model, the response variable is dichotomous and is coded as a binary variable (for example, $Y^* = 1$ or 0), which is often assumed to have a binomial distribution. Given the nature of this response variable, it is natural to model probabilities, $\Pr (Y^* = 1)$. Probabilities are modeled as a function of a linear combination or a linear predictor of the explanatory variables (for example, $\beta_0 + \beta_1 y_1 + \ldots + \beta_r y_r$, where the $Y$'s are explanatory variables and the $\beta$'s are regression coefficients). Since probabilities must be between 0 and 1 and the linear predictor can (theoretically) equal any value between $-\infty$ and $+\infty$, probabilities are transformed into logits before equating them to the linear predictor. A logit is the logarithm of the odds that an 'event' occurs (for example, $Y^* = 1$). Setting the transformed probabilities or logits equal to the linear predictor gives us:

$$\text{logit} (Y^*) = \log \frac{\Pr(Y^* = 1)}{\Pr(Y^* = 0)} = \beta_0 + \beta_1 y_1 + \ldots + \beta_r y_r \qquad \text{(Model 2: logit p*)}$$

The approach to simplify the p* family of models so that model parameters can be estimated was first described by Strauss and Ikeda (1990). The basic random variable, $X_{ij}$, reflecting the presence or absence of a relational tie from *i* to *j*, is dichotomous. Hence, we can consider the odds that this tie is present – the ratio of $\Pr(X_{ij} = 1)$ or $\Pr(X_{ij} = 0)$. Thus, we define the conditional odds as:

$$\exp\{\omega_{ij}\} = \frac{\Pr(X_{ij} = 1|X_{ij}^c)}{\Pr(X_{ij} = 0|X_{ij}^c)} \qquad \text{(conditional odds)}$$

where we statistically condition our probabilities on the complement relation which contains all the other ties in the network. This approach has the advantage of yielding a model not dependent on the normalizing constant. The odds defined above simplifies p* substantially. Using the two other relations, $X_{ij}^+$, formed from *X* where the tie from *i* to *j* is forced to be present, and $X_{ij}^-$, where the tie from *i* to *j* is forced to be absent, we have:

$$\frac{\Pr(X_{ij} = 1|X_{ij}^c)}{\Pr(X_{ij} = 0|X_{ij}^c)} = \frac{\exp\{\theta' z(X_{ij}^+)\}}{\exp\{\theta' z(X_{ij}^-)\}} = \exp\{\theta'[z(X_{ij}^+) - z(X_{ij}^-)]\} \qquad \text{(simplified odds)}$$

From this result, we obtain the logit version of p* by taking the logarithm of the odds:

$$\omega_{ij} = \log \frac{\Pr(X_{ij} = 1|X_{ij}^c)}{\Pr(X_{ij} = 0|X_{ij}^c)} = \theta'[z(X_{ij}^+) - z(X_{ij}^-)] \quad \text{(Model 3: simplified logit p*)}$$

If we define $d_{ij}(z) = [z(X_{ij}^+) - z(X_{ij}^-)]$, then the logit Model 3 simplifies succinctly to $\omega_{ij} = \theta' d_{ij}(z)$. The expression $d_{ij}(z)$ is the collection of explanatory variables used to fit the logit version of p*. The elements of $d_{ij}(z)$ are changes in the measurements on the original network explanatory variables that arise when $x_{ij}$ changes from 1 to 0. One takes the set of explanatory variables $z(x)$, and records the values of the statistics when $x_{ij} = 1$ and when $x_{ij} = 0$. The differences in the statistics are the elements of $d_{ij}(z)$. This version of the model, in which a log odds is equated to a linear function of the components of $d_{ij}(z)$, is referred to as the logit p* family of models. These models can include actor-attribute explanatory variables, such as the form of the actors. We can allow model parameters to depend on the attributes; for example, we can study the effect of the form of the actors on tendencies toward mutuality or transitivity. In general, the models have used dyadic configurations (e.g., choice, mutuality, expansiveness, attractiveness), triadic configurations (e.g., transitivity, cyclicity), subgroup effects, and network centralization for relational variables while the attributes of the partners and those of the partners' partners for attribute variables.

In studying signed networks, exponential random graph models (ERGM), as in the categorical data analysis, may be used once the networks of positive and negative relations are separated. That is, to investigate the presence (or absence) of a relational tie in a signed network, the signed network has to be separated into a network of positive ties and a network of negative ties as they represent different qualities of relations. Once the networks are separated, estimation can be done in the same way in each network structure as introduced above. It would be worthwhile to investigate whether or not the same conditions contribute to the presence (or absence) of tie probability differently in positive and negative networks.

**Maximum (Pseudo-)Likelihood Estimation:** Fitting the logit p* family of models are done by adopting a pseudo-likelihood estimation strategy that assumes that the logits $\omega_{ij}$ of the conditional probabilities defined in Equation (1) are statistically independent. Maximizing this pseudo-likelihood (MPL) function is equivalent to fitting a logistic regression model to the logits $\omega_{ij}$. To assess the statistical importance of a particular variable, one can fit two models: one with the variable and another without it (while the other variables must remain the same). The difference in pseudo-likelihood ratio statistics ($G_{PL}^2$) can be evaluated approximately by referring the value to a $X^2$ distribution with degrees of freedom equal to the number of parameters associated with the variable in question (Wasserman and Pattison, 1996; Pattison and Wasserman, 1998). In addition to $G_{PL}^2$, one can also examine the ratios of parameter estimates or linear functions of parameter estimates, to their approximate standard errors. The square of such ratios are known as Wald statistic (Agresti, 1990) and labeled here as $\text{Wald}_{\text{PL}}$ for our pseudo-likelihood estimated parameters.

## 3.4 Computer Packages

The data analyses have been done in various computer packages including *SAS* (2003), *Pajek* (2006), *Ucinet* (2006) and *Multinet* (2005). *SAS* is one of the most popular statistical packages developed by the SAS Institute. While meaning “spider” in Slovene, *Pajek* is a network program for large network analysis developed by Vladimir Batagelj and Andrej Mrvar. Developed by Steven P. Borgatti, Martin G. Everett, and Linton C. Freeman, *Ucinet* may be the most user-friendly network package. Finally, *Multinet* is a package for statistical network analysis developed by William D. Richards and Andrew J. Seary.

# Chapter 4

# Description of Data

To investigate the emerging movement structure introduced in the prior chapters, I have collected data to represent and analyze the environmental movement structure composed of the EORGs operating at the national level including both environmental movement organizations (EMOs) and environmental government agencies (EGAs) and the inter-EORG relations including both lawsuit and alliance ties in the United States for the period, 1970-2001. This chapter introduces the sources and nature of the data to be analyzed in the following chapters and discusses the issues and challenges that faced the coding of each variable. While the data sources are indicated below, the nature of the data is of four different kinds: (*a*) organizational attributes, (*b*) organizational relations, (*c*) network configurations, and (*d*) yearly statistics. The data were longitudinal collected for the period from 1970 to 2001.

## 4.1 Data: Sources

The data were collected from various sources including *LexisNexis*, *FindLaw*, *Guide Star*, legal defense firms, annual reports, and websites. On the one hand, the primary sources of litigation were *LexisNexis*, *FindLaw*, and legal defense firms that had records on environmental litigation at all levels of the courts. Particularly, *LexisNexis* had detailed records of legal activities at all levels of the courts by the EORGs at all local, regional, and national levels. For example, the data set provided the plaintiff(s), defender(s), case number, court name, charges, and so forth. The annual reports and the websites of the EORGs were used to supplement and verify the data. Table 4.1 below summarizes the variables used in analysis. The final column of the table indicates the main data sources for each variable. The two response variables (*lawsuit*, *alliance*) came from mostly *LexisNexis* and *FindLaw* as the main data sources. That is, dyadic information on environmental lawsuits was used for the first response variable, *lawsuit* and the dyadic partnership relations between the organizations that cooperated for joint lawsuits was used for the second response variable, *alliance*. Other relational variables in the table such as "out-lawsuit" were also created from the dyadic litigation and alliance ties.

On the other hand, the data on organizational characteristics were collected from *Guide Star* and mission statements from the annual reports and websites of the organizations. First, *Guide Star* was an excellent source of data on non-profit organizations such as social movement organizations and foundations.[31] It provided general information (year of foundation, etc.), mission statements, board of directors, forms 990, financial records, and so forth. Of the variables summarized in Table 4.1, the information from *Guide Star* was used to generate the following organizational variables: organizational type, age, size, location, orientation, strategy, and area.

Second, the mission statements from the annual reports and the websites of the organizations also provided detailed information on those organizations comparable to

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[31] *Guide Star* is an abundant data source of numerous non-profit organizations. It provides general information (e.g., "who we are", year founded, physical address, etc.), mission & programs, board of directors, Form 990, financials, and so on. It also provides customized reports depending on the level of subscription.

that from *Guide Star*.[32] Of the variables in Table 4.1, the following variables were coded from the mission statements: organizational *type*, *age*, *orientation*, *strategy*, *orientation*, and area. Using mission statements as a data source may raise several questions regarding reliability and coding. First, mission statements can vary in length and style depending on the organizational preferences (e.g., longer mission statements may have more strategies expressed), which raises an issue of how to legitimately use them to establish comparability between organizations. I dealt with this issue by following the principles such as: (*a*) I used broad knowledge of the organizations and their characteristics that the literature had provided (for example, the literature viewed the Sierra Club as being "mainstream" rather than "conservative/right-wing" or "radical" whereas it viewed the Green Peace as being "radical"). (*b*) I compared information in *Guide Star* and the mission statements with each other to arrive at the appropriate coding of the organizational attributes. The information from the mission statements, which tended to vary depending on the organizations, was verified by the information that was in relatively uniform format in *Guide Star*. (*c*) Since this dissertation was not a joint project, I was the only coder. Thus, I coded the organizational variables from *Guide Star* and the mission statements twice over six month of interval to ensure the reliability of the coding.

While "4.3 Data: Nature" below will discuss in more detail how these data sources were specifically used to create organizational variables and the difficulties that had to be dealt with, here I briefly discuss the extent to which the current data sources can be considered complete and reliable. As indicated above, the main data sources on

[32] Typical mission statements are 1-2 sentences in succinct format and 1-2 paragraphs in extended format in length. For example, the Sierra Club uses four short sentences for its mission statement. Typical mission statements tend to be written in standard format in plain language, though some organizations do use different styles.

environmental litigation including *LexisNexis*, *FindLaw*, and legal defense firms provided complete records of legal activities of the EORGs by year, level (of court), and type (of litigation) that even the Department of Justice did not provide. Particularly, *LexisNexis* was a single important data source that had complete information for the defined scope of the data. The main data sources for organizational attributes including *Guide Star* and mission statements had to be used more carefully. Although the two sources provided detailed information, the generation of organizational variables from these sources largely depended on the interpretation of the data by me alone. As indicated above, I attempted to minimize the possibility of the introduction of my judgment by using broad knowledge of the field from the literature, comparing the two main data sources with each other (*Guide Star*, mission statements), and coding more than once over an interval for the verification of the coding.

Another issue of using mission statements as a data source concerned the possible differences between what was expressed and what was factual in the mission statements about the organizations. For example, many EMOs had been actively involved in litigation even though they never mentioned litigation as a movement strategy in their mission statements. That is, it is possible that expressed strategies of a movement organization are different from the operating strategies of the organization. I consider important the expressed information as well as the factual information and believes that the differences may be, rather than simply misleading, one of the objects that research outcomes have to explain. Section 4.3 Data: Nature will describe more about the data while focusing on how the organizational variables were generated from the data sources that this section revealed.

## 4.2 Data: Collection

Given the data sources identified, the data collection was conducted in a series of steps: first, the lawsuit cases with regard to the federal environmental laws and regulations were identified for the years from 1970 to 2001. The number of environmental lawsuit cases varied from dozens to thousands depending on the year. The environmental lawsuit cases that involved local and state environmental laws and regulations were excluded from consideration. As a result, the investigation in later chapters does not target the legal activities regarding local and state environmental laws and regulations by any levels of EORGs.

Second, of numerous environmental lawsuit cases identified from 1970 to 2001, the lawsuit cases that involved the EORGs operating at the national level were selected. For the lack of absolute criteria for the national EORGs, the EORGs were considered environmentalist organizations operating at the national level if they were operating in more than two states or had membership in more than two states. Accordingly, local and regional EORGs were excluded in the data set even if they were involved in the lawsuits regarding federal laws and regulations. As a result, the investigation in later chapters does not target the legal activities by the local and regional EORGs regarding any levels of environmental litigation. Since this dissertation confined its focus on the national EORGs that had been involved in federal environmental litigation between 1970 and 2001, a number of other types of EORGs had to be excluded from the data set, though they played important roles in American environmentalism during the period. For example, industrial organizations such as labor unions, for-profit corporations, and trade associations such as United Steelworkers of America (USWA), Monsanto Inc., American Forest & Paper Association (AF&PA) were not considered in data collection because they were thought to belong to for-profit sector.

Finally, the data collected for the period, 1970-2001 on the lawsuit ties regarding the federal environmental laws and regulations and the national EORGs involved were collapsed into eight periods of four years. The historical events for the period in the United States were not used to divide the entire period. The national EORGs and the environmental lawsuit ties between them were thought to constitute the conflictual movement structure and the national EORGs and the partnership relations for joint lawsuits between them the alliance structure. Accordingly, the findings from the investigation in Chapters 6, 7, and 8 have implications only for the movement structure, as defined in this chapter, represented by the movement organizations and the interorganizational relations in the EMS in the United States, 1970-2001.

## 4.3 Data: Nature

The nature of the data is of four different kinds: (*a*) organizational attributes, (*b*) organizational relations, (*c*) network configurations, and (*d*) yearly statistics. Organizational attributes refer to the organizational characteristics including size, age, orientation, action area, primary strategy, and geographic location. Organizational relations include lawsuit relations and alliance relations between the EORGs over the period, 1970-2001. Third, network configurations refer to dyadic and triadic composition of the ties. Finally, yearly information include yearly characteristics of the EMS such as the number of lawsuits, the number of EORGs in lawsuits, the number of EORGs that filed lawsuits, the number of EORGs that were filed lawsuits, the number of alliances, and the number of EMOs in alliances.

### 4.3.1 Organizational Attributes

The first dataset contains information on organizational characteristics that will be used to explain the existence of lawsuit ties and alliance ties as response variables. Table 4.1 summarizes organizational variables, which are arranged by label, unit of observation, data type, description for both explanatory and response variables, and main data sources. As presented above in Section 4.1, organizational variables were constructed and coded largely based on my interpretation of the descriptions of the organizations provided in the data sources. Thus, the introduction of the organizational variables that follows will focus on what the variables were, how the categories of the variables were constructed, and how the data sources were coded.

First, I had explored organizational variables that could characterize the EORGs and came up with the following variables as necessary: organizational *type*, *location*, *age*, *size*, (ideological) *orientation*, (action) *area*, and *strategy*.[33] The criteria to code the organizational descriptions for organizational variables came mainly from the reading of the literature on social movements/collective action and American environmentalism. For example, the literature (Andrews, 1999; Shabecoff, 2000, 2003) that describes the development of American environmentalism uses three categories of conservative,

[33] Other organizational variables include organizational structure, culture, resources, and so on. They were not included in this dissertation due to either the irrelevancy to the current purpose or the unavailability of the data.

mainstream, and radical to classify the EORGs into ideological camps. In case there was no better classification scheme, I followed the literature.

Second, the data sources (mainly, *Guide Star* and mission statements) were coded for organizational variables after the sources had been cross-compared. The first variable, organizational *type* was classified into only two categories since I intended to distinguish movement organizations from other types of organizations: thus, environmental movement organization ("EMO") and environmental government agency ("EGA").[34] The distinction between the two types of organizations was obvious. For the distribution of the EORGs in each category, refer to Section 5.1 Environmental Organizations (EORGs) in the following chapter.

The data sources for organizational *age* were both *Guide Star* and mission statements. An EORG's age was calculated by the absolute difference between the year when the EORG was founded and the year of 2001. The data source for organizational *size* was *Guide Star* and the most up-to-date annual operating budget of the EORGs was used as a proxy of the EORG's size. The variable was coded binary (small: annual budget ≤ \$25,000; large: annual budget ≥ \$25,000) depending on their annual budget circa 2001. The EORGs with less than an annual budget of \$25,000 were exempt from reporting tax and their annual budget was not obtainable. Of course, this dichotomy of annual budget should not hide the differences in organizational size among the national EORGs.

The difficulties of coding mostly contained in coding the following three variables: *orientation*, (primary action) *area*, and *strategy*. In contrast to the variables described above, several challeges were facing the coding processes of these variables.

[34] There were sixteen social movement organizations (SMOs) committed to general action areas other than the environment. However, they were not distinguished in the analysis from the EMOs due to the reason specified above.

Initially, it was challenging to come up with a complete list of categories that would contain all possible cases of the variables and that were mutually exclusive at the same time. From a preliminary coding of the data sources, I had a long list of the categories for each variable, and then made the list short yet still complete for the current data by combining similar categories.[35]

As indicated above in Section 4.1 Data: Sources, I used prior knowledge from the literature, cross-comparison of the main data sources, and multiple coding to ensure the reliability of the coding. The data sources of organizational *orientation* were both *Guide Star* and mission statements. An EORG was coded as belonging to one of the three distinct ideological groups: conservative, mainstream, or radical.[36] The criteria for the classification came mainly from the reading of the literature on social movements/collective action and American environmentalism (Andrews, 1999; Shabecoff, 2000, 2003). Shabecoff (2000, 2003), for example, describes that the conservatives include members of hunting, fishing, and land preservation groups such as National Wilderness Institute (NWI). They are suspicious of government but rarely criticize business. They try to reach their goals largely through the private sector. The members of the mainstream camp are pragmatists seeking incremental reforms. They work with government and the political parties and, while often battling with business and industry, do not see them as their enemies either. They include widely known EMOs such as Natural Resources Defense Council (NRDC). Finally, the members of the radical

[35] For example, preliminary categories of the variable, *strategy* including {(funding for) research, (developing) education(al programs), information diffusion, publication}, {consciousness raising, campaigning, public awareness}, {lobbying (for policy reform)}, and {legal defense, legal assistance} were shorted to "research/education", "public awareness", "policy/lobbying", and "litigation".

[36] For a counter-movement in American environmentalism, see an anti-environmental organization (*Center for the Defense of Freedom* or *CDF*) tracing the financial resources of the EMOs (URL: http://www.activistcash.com or http://www.undueinfluence.com).

camp such as Military Toxic Project (MTP) are anti-government as well as anti-business. They seek fundamental changes in the political and economic systems and give the need to protect nature primacy over the need to protect humans. I classified the EORGs based on the goals, ideologies, and strategies that the EORGs expressed in their mission statements and that *Guide Star* summaried.

The data sources for organizational (primary action) *area* were *Guide Star* and mission statements. As with organizational *orientation* above, the data sources were coded initially into dozens of categories based on what the EORGs expressed in their mission statements and what *Guide Star* summarized, and then reduced to the following categories: air/climate, ocean/river, wildlife/land, historic preservation, recycle/energy, public transportation, toxic/nuclear, animal rights, and general. A challenge was that many EORGs were committed to more than one action area. I had to consider the primary action area of an EORG as its organizational area.

Organizational *strategy* was also identified from both *Guide Star* and mission statements based on the expressed organizational strategies and tactics. The EORGs were classified into one of the following categories: research/education, public awareness, policy/lobbying, or legal defense. The EORGs that used research/education as a strategy were the EORGs that committed to research and education inside their organizations rather than more aggressive activities outside. The public awareness EORGs expressed as their strategies more active strategies including campaigning, picketing, and so forth. The EORGs that expressed as their strategies an intervention in the political system by affecting policy processes were coded policy/lobbying EORGs. Finally, the EORGs that chose to affect the court decisions as a movement strategy were considered legal defense EORGs.

Table 4.1: Description of Organizational Variables

| Label | Unit of Observation | Data Type | Description | Main Data Sources |
|---|---|---|---|---|
| ***Response Variables*** | | | | |
| Lawsuit | Dyad (directed) | Categorical (Binary) | Whether an EORG files a lawsuit against another EORG for a given period | LexisNexis FindLaw |
| Alliance | Dyad (undirected) | Categorical (Binary) | Whether two distinct EORGs have a alliance for a given period | LexisNexis FindLaw |
| ***Explanatory Variables*** | | | | |
| *Attributes* Type | Organization | Categorical | EMO or EGA | Guide Star Mission Statement |
| Location | Organization | Categorical | Geographical location in which an EORG' headquarter is located (Northeast, Midwest, South, or West) | Guide Star |
| Age | Organization | Continuous | Years since foundation (2001-year of foundation) | Guide Star |
| Size | Organization | Categorical | Whether an EORG is small or large in annual operating budget | Guide Star |
| Orientation | Organization | Categorical | Ideological orientation (radical, mainstream, or conservative) | Guide Star Mission Statement |
| Area | Organization | Categorical | Primary action area (air/climate, ocean/river, wildlife/land, historic preservation, recycle/energy, public transportation, toxics/nuclear, animal rights, public health, general) | Guide Star Mission Statement |
| Strategy | Organization | Categorical | Primary strategy (research/education, public awareness, policy/lobbying, or litigation) | Guide Star Mission Statement |
| *Relations* Number of out-lawsuits (*lsoutdegree*) | EORG | Continuous | Number of lawsuits filed by an EORG for a given period | LexisNexis FindLaw |
| Number of in-lawsuits (*lsindegree*) | EORG | Continuous | Number of lawsuits filed to an EORG for a given period | LexisNexis FindLaw |
| Number of partners (*ptdegree*) | EORG | Continuous | Number of partners of an EORG for a given period | LexisNexis FindLaw |
| *Configurations* (1) Edges | Dyad | Discrete | Edges (mutuality) (i<->j) | LexisNexis FindLaw |
| (3) 2Stars | Triad | Discrete | 2Stars (popularity or expansiveness) (j<->i<->k) | LexisNexis FindLaw |
| (6) Triads | Triad | Discrete | Triads (Closure) (i<->j, i<->k, j<->k) | LexisNexis FindLaw |

The data source for organizational *location* was *Guide Star* and the website of the EORGs. I followed the conventional classification of the U.S. region into four different areas: Northeast, Midwest, South, or West. An EORG was considered operating in a region where the EORG was headquartered. By definition, national EORGs operated in multiple states. However, the locations where they were headquartered were thought to inform who they were, i.e., organizational identity and movement/organizational strategy.

### 4.3.2 Organizational Relations

As shown in the third and fourth rows of Table 4.1, the first response variable (variable name, *lawsuit*) measured whether or not an EORG filed a lawsuit against its opponent for a given period. Since this dissertation research is concerned with under what structural conditions the EORGs employed litigation as a movement strategy, analytic focus is on "who utilized litigation under what conditions" rather than "what parties were involved in a lawsuit." The second response variable (variable name, *alliance*) measured whether or not there was an alliance tie between two distinct EORGs. The other relational variables are summarized under "relations" in Table 4.1. The relational variables measure the extent to which the EORGs were engaged in litigation: number of out-lawsuits (*lsoutdegree*), number of in-lawsuits (*lsindegree*), and number of partners (*ptdegree*). The number of out-lawsuits *(lsoutdegree)* was calculated by the number of lawsuits filed by an EORG for a given period while the number of in-lawsuits (*lsindegree*) was calculated by the number of lawsuits filed to an EORG for a given period. Finally, the number of partners (*ptdegree*) was calculated by the number of partners of an EORG for a given period.

### 4.3.3 Network Configurations

Third, network configurations refer to the dyadic and triadic configurations in which the focal EORG is involved in the network. While there are dozens of network configurations worthy of studying, this dissertation research focuses on only three network configurations because the ties are undirected in alliance networks, which are (1) Edges (mutuality: **i↔j**), (3) 2Stars (popularity or expansiveness, **j↔i↔k**), and (6) Triad (closure: **i↔j, i↔k, j↔k**) (the numbers are the identification numbers for parameters in *MultiNet*). Edges (mutuality) measures whether or not EORGs **i** and **j** choose each other as partners and 2Stars measures, first, the EORG **i**'s expansiveness–whether or not EORG **i** chooses both EORG **j** and EORG **k** as its partners or, second, the EORG **i**'s popularity–whether or not EORG **i** is chosen by both EORG **j** and EORG **k** as their partners. Triads (closure) measures closedness as a form of a triad in which EORGs **i**, **j**, and **k** are all tied to each other.

### 4.3.4 Yearly Statistics

The fourth data set stores yearly characteristics of the EMS. Table 4.2 summarizes the yearly statistics of the EMS between 1970 and 2001, which are arranged in label, unit of observation, data type, and description. The variables are classified in two groups: statistical or graph-theoretic. The statistical variables are as follows: *the number of lawsuits*, *the number of EORGs in lawsuits*, *the number of EORGs that filed lawsuits*, *the number of EORGs that were filed lawsuits*, *the number of alliances*, and *the number of*

*EMOs in alliances*. As in the other dataset, the yearly information has been further collapsed into eight consecutive periods. The graph-theoretic variables include *centralization*, *density*, and *clustering coefficient*.

Table 4.2: Description of Yearly Variables

| Label | Unit of Observation | Data Type | Description |
|---|---|---|---|
| *Statistical*<br>No. of lawsuits | Tie | Discrete | Number of lawsuit ties |
| No. of EORGs in lawsuits | Organization | Discrete | Number of EORGs in lawsuits |
| No. of EORGs that filed Lawsuits | Organization | Discrete | Number of EORGs that filed lawsuits |
| No. of EORGs that were Filed lawsuits | Organization | Discrete | Number of EORGs that were filed lawsuits |
| Number of alliance ties | Tie | Discrete | Number of alliance ties |
| Number of EMOs in alliance ties | Organization | Discrete | Number of EMOs in alliance ties |
| *Graph-theoretic*<br>Centralization | Network | Continuous | Network degree centralization ($S(cmax - c(v_i))$ divided by the maximum value possible) |
| Density | Network | Continuous | Total number of ties divided by the total number of possible ties |
| Clustering coefficient | Network | Continuous | Overall clustering coefficient is the mean of the clustering coefficient of all the nodes. Node clustering coefficient is the density of its open neighborhood. |

# Part III

# Dynamic Environmental Movement Sector

# Chapter 5

# EMS: Anatomy of the Structure

This chapter will explore the structure of the environmental movement sector (EMS) in the United States while focusing on the environmental organizations (EORGs) and the ties between them. The EORGs are of two different kinds: environmental movement organizations (EMOs) and environmental government agencies (EGAs) that have used litigation as an organizational strategy. The inter-EORG relations are also of two different kinds: litigation and alliances. The following parts will explore these components separately before analysis can be made in the following chapters. The EMOs in alliances are a subset of the EMOs in litigation because the alliances considered were only for joint litigation. Chapter 8 will investigate inter-EORG signed ties and yet they are a combination of (negative) litigation and (positive) alliances. An exploration of the EMS will help investigate, in the following chapters, the structural dynamics of the sector for the given period in the United States.

## 5.1 Environmental Organizations (EORGs)

This section will explore the organizational characteristics of the EORGs (EMOs, EGAs) before more structural-relational analyses will be done in the following chapters. The EORGs have been selected such that they operate at the national level and they have been involved in federal environmental litigation between 1970 and 2001. From these criteria, I have identified 176 EORGs including 143 EMOs (81%) and 33 EGAs (19%). A complete list of the EMOs and EGAs can be found in Appendix A and B, respectively. They are different in organizational characteristics including organizational age, size, geographical location, ideological orientation, primary action area, and strategy. The organizational variables were not measured every year for the given period due to the limited availability of the data. Thus, the organizational characteristics provided below describe the summary image of the EORGs for the entire period, 1970-2001.

## 5.1.1 Environmental Movement Organizations (EMOs)

The 143 EMOs include sixteen social movement organizations (SMOs) (11%) with general action areas other than environmental one, though they will not be distinguished from the EMOs in analysis. Despite the important roles that they have played in American environmentalism, a number of other types of EORGs have not been included in the data set because this dissertation research focuses on the national EORGs that have been involved in federal environmental litigation between 1970 and 2001. For example, all local and regional EMOs such as the Oregon Natural Resource Council (ONRC) have been excluded. Also excluded are all industrial organizations such as labor unions, for-profit corporations, and trade associations such as United Steelworkers of America (USWA), Monsanto Inc., American Forest & Paper Association (AF&PA). In addition, national EORGs that were involved in lawsuit cases at the local or state levels were also excluded.

Yet, the EORGs in the current dataset are not homogeneous in terms of age, size, geographical location, ideological orientation, primary action area, strategy, and so on. Of the 143 EMOs excluding 33 EGAs, a majority of the EMOs in the data set are still young: 41 EMOs (29%) were founded before 1970 while the other 94 EMOs (66%) after 1970 (8 EMOs (6%) unknown). The fact that more EMOs in the dataset were founded after 1970 reflects the heightened atmosphere in the environmental movement in the United States since the first Earth Day. Since 1970, each decade has seen fairly similar number of new EMOs (39, 28, and 27, respectively). Figure 5.1 displays the number of newly founded EMOs between 1970 and 2001.

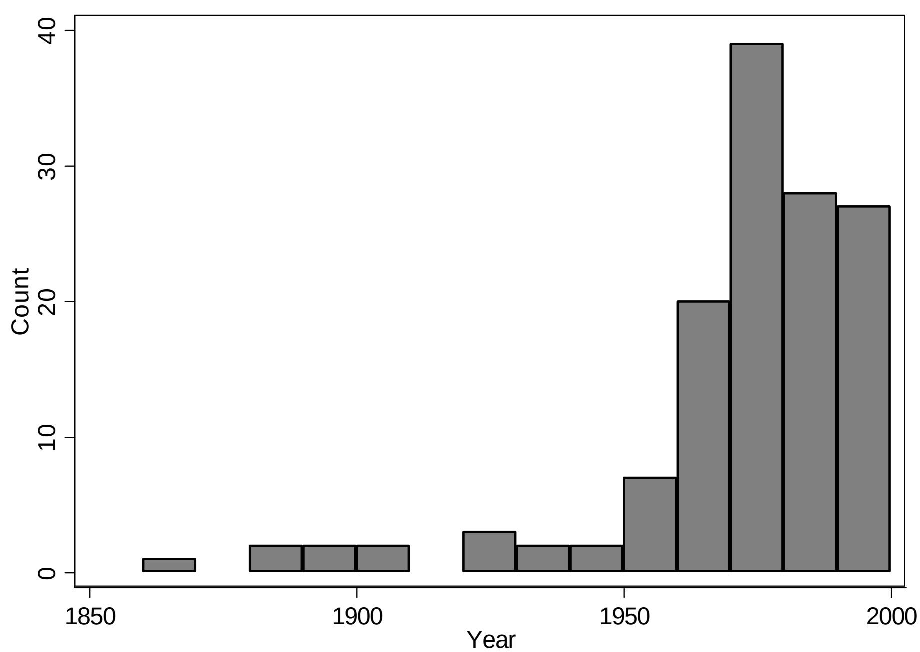


Figure 5.1: Number of Newly Founded EMOs

In terms of organizational size, the majority of the EMOs were large, though there were small EMOs as well. While an EMO's annual budget is an indicator of the EMO's size, I did not collect the annual budget for every year. Instead, I measured the most up-to-date budget of the EMOs as a proxy. 124 EMOs (87%) were considered large (budget ≥$25,000) whereas 19 EMOs (13%) small (budget ≤$25,000). The EMOs with less than a budget of $25,000 are exempt from reporting tax. Of course, this dichotomy of annual budget should not hide the differences in organizational size among the EMOs. For example, large EMOs also vary from having an annual budget of $25,000 to several million dollars. In contrast, there are EMOs with a small budget of less than $25,000. For example, the Cabinet Resource Group (CRG), the Desert Protective Council (DPC), and The Animal Fund (TAF) are such EMOs.

Geographically, the national EMOs operate in multiple states. However, the locations where they are headquartered may inform who they are, i.e., organizational identity and movement/organizational strategy. A majority of the EMOs are headquartered in South and West. Of 143 EMOs, 56 EMOs (39%) are in South, 52 EMOs (36%) in West, 26 EMOs (18%) in Northeast, and 9 EMOs (6%) in Midwest. Interestingly, of 56 EMOs in South, 36 EMOs are headquartered in Washington, DC, the capital city of the United States, which suggests their primary strategies–lobbying and litigation, though they rarely identify themselves as such in their organizational texts such as mission statements.

Importantly, in ideological orientation, the EMOs are not homogeneous either despite the same organizational type. From what they announce in their mission statements regarding their goals and ideologies, they can be classified into three distinct camps: ‘mainstream,’ ‘radical,’ or ‘conservative.’ 106 EMOs (74%) can be classified as mainstream, 25 EMOs (17%) radical, and 12 EMOs (8%) conservative. The members of the mainstream camp are pragmatists seeking incremental reforms. They work with government and the political parties and, while often battling with business and industry, do not see them as their enemies either. They include widely known EMOs such as Natural Resources Defense Council (NRDC). On the other hand, the members of the radical camp such as Military Toxic Project (MTP) are anti-government as well as anti-business. They seek fundamental changes in the political and economic systems and give the need to protect nature primacy over the need to protect humans. The conservatives include members of hunting, fishing, and land preservation groups such as National Wilderness Institute (NWI). They are suspicious of government but rarely criticize business. They try to reach their goals largely through the private sector.

The EMOs are diverse also in organizational/movement strategies to achieve their goals. That is, a majority of the EMOs (102 EMOs; 71%) identify themselves in their mission statements as those employing 'public campaign' as their primary strategy while the others 'research/education' (17 EMOs; 12%), 'policy/lobbying' (11 EMOs; 8%), and 'legal defense' (13 EMOs; 9%). Still, more than 80% of the EMOs are employing traditional strategies such as public campaign and research/education whereas less than 20% of the EMOs non-traditional strategies such as policy/lobbing and legal defense. The fact that the American EMS has been flooded with environmental litigation since 1970 suggests two contradictory facts: (*a*) a majority of the EMOs announce that they use traditional strategies and yet (*b*) a majority of the EMOs employ non-traditional strategies as well. Thus, it appears that a majority of the EMOs have been involved in environmental lawsuits regardless of their official movement strategies.

Finally, the EMOs can also be classified into differing groups in terms of primary action areas: wildlife/land (48 EMOs; 34%), general (34 EMOs; 24%), animal rights (24

EMOs; 17%), ocean/river (15 EMOs; 10%), toxics/nuclear (10 EMOs; 7%), air/climate (2 EMOs; 1%), historic preservation (2 EMOs; 1%), recycle/energy (2 EMOs; 1%), and public transportation (1 EMOs; 1%). A majority of the EMOs focus on a single action area whereas a quarter of them on multiple (general) issues. The EMOs are mostly concerned with land followed by water and air of the natural resources. In sum, wildlife/land, animal rights, ocean/river, and toxics/nuclear were dominant action areas in the American EMS for the given period. Surprisingly, however, there were not many EMOs dedicated to air/climate, historic preservation, recycle/energy, public transportation (total 7 EMOs; 5%), which may be popular issues outside the United States.

### 5.1.2 Environmental Government Agencies (EGAs)

The data set includes 33 EGAs against which the 143 EMOs have mostly been filed lawsuits. Although the organizational characteristics of those EGAs were different in as those of the EMOs, they will not further be described beyond the list of the EGAs in Appendix B because this dissertation research aims to focus primarily on the EMOs and their (litigation, alliance) activities. One can assume that they are different in background and relationship with other branches and agencies in the government. All local and regional EGAs have been excluded despite their important roles in American environmentalism.

## 5.2 Environmental Ties

The EORGs described above are interconnected in various ways. This dissertation research considers the inter-EORG relations only in terms of two different kinds: litigation and alliances. As mentioned, the alliances considered were only for the purpose of joint litigation. Since there were EORGs that filed lawsuits independently of other EORGs, the EORGs in alliances were a subset of the EORGs in litigation. The description of the (litigation, alliance) ties will be minimal as more will be provided in the following chapters.

### 5.2.1 Environmental Litigation

First, the EMS comprises the litigation ties between the EORGs. Litigation relations refer to the involvement in the federal environmental lawsuit cases filed by national EORGs against each other. The ways in which the EORGs are interconnected with each other in lawsuit ties inform important structural aspects of the EMS and may play an important role in the EMS facilitating and/or constraining the EORGs' activities. The formation of lawsuits between the EORGs was active throughout the entire period.

As Table 5.1 summarizes, the formation of lawsuit ties involved both EMOs and EGAs. Mostly, EMOs filed lawsuits against EGAs and yet a few EMOs were also filed lawsuits from other EORGs. EGAs also filed lawsuits, though they were the targets of most of the lawsuits.[37] For the entire period, 154 EORGs filed lawsuits and 39 EORGs

[37] The environmental lawsuits that EGAs filed are as follows: Period II (1975. *Russell E. Train (US EPA)* v. *Natural Resources Defense Council (NRDC)*; 1976. *Russell E. Train (US EPA)* v. *Colorado Public Interest Research Group (PIRG)*; 1976. *Kleppe (US DOI)* v. *Sierra Club (SC))*. Period III (1979. *Andrus (US DOI)* v. *Sierra Club (SC)*; 1980. *Costle (US EPA)* v. *Pac. Legal Found. (PLF))*. Period IV (1983. *Ruckelshaus (US EPA)* v. *Sierra Club (SC))*. Period VI (1992. *Lujan (US DOI)* v. *Defenders of Wildlife (DW))*.

were filed lawsuits. All 34 EGAs were involved in lawsuit ties in one way or another and 11 EGAs filed lawsuits against others. Interestingly, thirteen lawsuits were exchanged between the EGAs.[38] The total volume of lawsuits exchanged between the EORGs was 411 throughout the entire period, which indicates that, on average, an EORG filed 2.67 lawsuits (=mean outdegree) whereas an EORG was filed 10.54 lawsuits (=mean indegree). The variation of lawsuit ties was also large: a few EORGs filed more than ten lawsuits whereas a majority of them filed only one or two lawsuits (std.: 2.53). On the other hand, a majority of them were filed fewer than two lawsuits whereas a few EORGs were filed more than 50 lawsuits whereas (std.: 8.42). This suggests that the lawsuit ties were also concentrated against a few EORGs resulting in a hierarchical structure.

[38] The environmental lawsuits between EGAs are as follows: Period I (1973. *Brennan (US DOL)* v. *Occupational Safety & Health Review Commission (US OSHRC))*. Period II (1974, 1975. *Brennan (US DOL)* v. *Occupational Safety & Health Review Commission (US OSHRC)*; 1975, 1976. *Earl L. Butz (US DOA)* v. *Russell E. Train (US EPA)*). Period III (1981. *Marshall (US DOL)* v. *M. W. Watson, Inc. (US OSHRC))*. Period IV (1982. *Ray Marshall (US DOL)* v. *Federal Mine Safety and Health Review Commission (US FMSHRC)*; 1985. *United States (US)* v. *S.S. (Joe) Burford (US DOI))*. Period V (1987. *Department of Navy (US Navy)* v. *Federal Labor Relations Authority (US FLRA)*; 1987. *Nuclear Regulatory Comm'n (US NRC)* v. *Federal Labor Relations Auth. (US FLRA)*; 1989. *Department of Interior, Bureau of Land Management (US DOI)* v. *Federal Labor Relations Authority (US FLRA)*; 1989. *HHS, etc. (US HHS)* v. *Federal Labor Relations Authority (US FLRA))*. Period VI (1990. *Department of Interior, Bureau of Land Management (US DOI)* v. *Federal Labor Relations Authority (US FLRA)*; 1990. *HHS Family Support Admin. (US HHS)* v. *Federal Labor Relations Authority (US FLRA)*; 1990. *HHS, etc. (US HHS)* v. *Federal Labor Relations Authority (US FLRA)*; 1990. *Nuclear Regulatory Comm'n (US NRC)* v. *Federal Labor Relations Auth. (US FLRA)*; 1991. *Martin (US DOL)* v. *OSHRC (US OSHRC)*; 1992. *United States Dep't of Interior (US DOI)* v. *FERC (US FERC)*; 1992. *Federal Labor Relations Auth. (US FLRA)* v. *US DOD (US DOD)*; 1992. *Federal Labor Relations Auth. (US FLRA)* v. *Navy (US Navy)*; 1993. *Reich (US DOL)* v. *OSHRC (US OSHRC)*). Period VII (1994. *United States Dep't of Defense (US DOD)* v. *Federal Labor Relations Auth. (US FLRA)*; 1996. *DOT (US DOT)* v. *United States (US)*; 1996. *Environmental Tech. Council (US EPA)* v. *Sierra Club (SC))*. Period VIII (1998. *Alexis M. Herman (US DOL)* v. *Occupational Safety & Health Review Commission (US OSHRC)*; 2000. *United States (US)* v. *US DOI (US DOI))*.

Table 5.1: Lawsuit Ties by EORG Type

| | No. Ties | No. EORG | |
|---|---|---|---|
| | | OUT | IN |
| EMOs | 398 (96.84%) | 143 (92.86%) | 5 (12.82%) |
| EGAs | 411 (100%) | 11 (7.14%) | 34 (87.18%) |
| Total | 411 (100%) | 154 (100%) | 39 (100%) |

### 5.2.2 Environmental Alliances

Second, the EMS comprises the alliance ties between the EMOs. Alliance relations refer to joint efforts of the EMOs for environmental litigation with regard to federal environmental laws and regulations. The ways in which the EMOs are interconnected with each other in alliance ties may inform important structural aspects of the EMS and may play an important role in the EMS facilitating and/or constraining the EMOs' activities. The formation of alliances between the EMOs for litigation was active throughout the entire period. Of 143 EMOs in the data set, 104 EMOs (73%) formed alliance relations with other EMOs whereas 39 EMOs (27%) did not. The total volume of the alliance ties between the EMOs was 411, which indicates that, on average, an EMO created 3.91 alliance ties over the period. The variation of the alliance ties was large: a few EMOs formed more than 40 alliances whereas some formed only a single alliance tie (std.: 8.22). This suggests that alliance ties were concentrated toward a few popular EMOs by relatively few EMOs resulting in a hierarchical structure.

# Chapter 6

# Movement Dynamics: Conflictual Structure

The following three chapters in Part III investigate the structural dynamics in the environmental movement sector (EMS) in the United States over the period, 1970-2001, based on the discussions in the preceding parts. In all three chapters, the unit of analysis is environmentalist organizations (EORGs) including environmental movement organizations (EMOs) and environmental government agencies (EGAs) operating at the national level. Chapters 6 and 7 address the generative-structural emergence of the contemporary inter-EORG structure in terms of the conflictual and alliance relations, respectively, in the EMS while Chapter 8 investigates the dynamics of the structural conflictual and alliance relations combined in the EMS. The findings from these chapters will be used to discuss in the concluding chapter the structural characteristics of the contemporary inter-EORG relations in the EMS in the United States.[39]

Recently, a segment of scholars studying social movements/collective action have considered the environmental movement as part of the "new social movements" (NSMs) with other movements including peace/anti-war and feminist movements. The characteristics of the contemporary environmental movement that the scholars have

[39] While a SMI can be considered as a collection of all social movement organizations (SMOs), all of the SMIs in a society can be considered as the SMS.

identified can be briefly summarized as follows: increased professionalization, dependence on private foundations, widespread alliances, prevalent use of lobbying and litigation, growing movement conflicts, and growing right-wing conservative movement and counter-movement.[40] [41] Although the new social movements have shared movement characteristics with conventional social movements (Gamson, 1989),[42] this chapter considers the prevalent use of litigation by the national EMOs and the growing conflicts within the movement sector as signifying significant structural changes in the movement sector (Edwards, 1995).

Nonetheless, this chapter notices that little systematic effort has been made to reveal and analyze the growing conflicts within the movement sector from a relational-structural perspective. In fact, scholars have dealt with conflicts and tensions in social movements but the discussions have been limited to the contention between movements and the movement opponents. This chapter posits that this intellectual negligence of the within-sector conflicts has left the study of contemporary social movements incomplete and inaccurate.

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[40] The environmental resources that have flown into the EMS include financial, labor, and time and the available resources in the EMS for the period have increased significantly. In parallel, activities to mobilize those resources have also been professionalized. Particularly, national EMOs have been successful in raising large amounts of resources from their affluent constituents and especially from private foundations (e.g., Ford, Pew, and McArthur) (Jenkins and Halcli, 1999; Brulle and Caniglia, 1999). As a result, however, national EMOs could not avoid their dependence upon these institutional sources of support that have provided them with stable resources that were not subject to shifts in political opportunities.

[41] For a more detailed discussion of the structural changes in the contemporary environmental movement, refer to Chapter 2. For general narratives, refer to Liroff (1976), Trubek (1978), Fox (1981), Andrews (1999), Brulle (2000). See also journalistic accounts by Shabecoff, Silverstein, Cockburn, and St. Clair.

[42] The debate, however, has been fierce with regard to, among other topics, the questions of “newness” of the NSMs and whether the NSMs are a product of the shift to a postindustrial economy (for an overview, see Pichardo, 1997). The debate will not come to an end until we have more evidence to support varying theorization of the contemporary social movements. In addition, as scholars have pointed out, comparative study of varying social movements in different movement sectors will be a necessity before we can fully evaluate the nature of contemporary social movements (see Canel, 1992; Klandermans, 1986; Klandermans and Tarrow, 1986).

This chapter investigates the movement dynamics in the EMS with regard to conflicts and tensions between EORGs at the national level in the EMS in the United States, 1970-2001. It focuses on the increased use of litigation as a non-conventional movement strategy since 1970 when modern environmental social movement took off in the United States. The research questions that this chapter addresses are: "In what ways have the organizational characteristics been associated with lawsuit formation in the environmental movement sector (EMS) in the United States since 1970?" [Q1a] "Under what conditions have triadic dominant movement structures been formed in the environmental movement sector (EMS) in the United States since 1970?" [Q2a] and "What are the structural characteristics (e.g., connectedness, balance, and hierarchy) of the contemporary movement structure that has emerged in the environmental movement sector (EMS) in the United States since 1970?" [Q4][43]

To answer these questions, the following sections will explore the contentious structure within the movement sector and investigate the longitudinal dynamics of the inter-EORG lawsuit ties by using, first, statistical network analysis and, second, the E-state structural models introduced in Chapter 2 (Berger, Wagner, and Zelditch, 1985; Fararo and Skvoretz, 1986). An investigation of the structural dynamics of the movement sector in terms of environmental litigation will help us not only understand the contemporary EMS but also predict the structural consequences in the EMS in the United States.

[43] Given the overall increase in popularity of the environmental litigation, more specific questions could be further raised as follows, for example: "When was litigation employed most popularly?", "Who has employed litigation against whom?", and "What have been the outcomes of the litigation in the environmental movement?", and "Is it a 'unique' strategy that represents the changing nature of the contemporary social movements?" Although they are not the main research questions in this dissertation research, the questions above will also be answered through investigation.

## 6.1 From "Consensus" to "Conflict" Movement

In studying social movements/collective action, scholars have focused on the contentious relationships between the movement and the movement opponents while leaving behind the contentious relationships within the movement itself. In fact, as pointed out at the outset of this chapter, the growing movement conflicts, i.e., conflictual relationships within the movement sector have characterized the modern American environmentalism. The literature has found evidence from both the relationships between the SMOs (Zald and McCarthy, 1987) and the relationships between the movement and the countermovement (Zald and Useem, 1987) in the movement sector. The evidence seems abundant to call the transition of the movement from "consensus movement" to "conflict movement."

The contemporary environmental movement in the United States has seen the growth of the organizations and institutions such as law-reform organizations (e.g., defense firms) and foundations specifically established for conflictual purposes such as legal activities. A few examples include the foundation of the National Association for the Advancement of Colored People (NAACP) and the NAACP Legal Defense and Education Fund (LDF) in general social movement and the Environmental Defense Fund (EDF), Sierra Club/Sierra Club Legal Defense Fund (SC), and the Natural Resources Defense Fund (NRDC) in the environmental movement in particular.

The past decades have also seen the actual increase in the conflictual relationships between the EMOs in the movement sector. As the literature pointed out, not all EMOs share a common movement goal and have little interest in competition and conflict (Zald and McCarthy, 1987). In fact, a wide range of forms of conflicts have existed in the environmental movement sector, which include verbal claims, direct confrontation, lobbying authorities, speaking disparate audiences, litigation, and so on. Litigation that this dissertation is focusing on may be the most highly structured type of antagonistic encounter between the EMOs (Handler, 1978; Barkin, 1979; Epp, 1990; Morag-Levine, 2003). Evidence shows that it has gained more and more popularity as an effective movement strategy in the movement sector in general since the 1970s (Zald and Berger, 1978; Barkan, 1979; Mueller and Judd, 1981; Balser, 1997; McCright and Dunlap, 2000).

The evidence is also concerned with the growth of the combative coalitions in the movement sector. Activities for coalition formation have been diverse in the movement sector: an umbrella organization with membership SMOs, a joint project among participating SMOs, and so on.[44] There have been multiple environmental coalitions in the EMS in the United States. A few examples include the "*Wise-Use*" group, the *Townhall*, the *Project Relief*, the *Turning Point Project (TPP)*, and the *Activist Cash*. Environmental coalitions have been formed by both mainstream (pro-environmentalist) and conservative (anti-environmentalist) camps in the EMS since the 1980s. In fact, the coalitions formed by the conservative EMOs outnumber those by the mainstream EMOs. Coalitions formed exclusively by the radical EMOs (e.g., Earth First!) have not been found, though the radical EMOs have joined the coalitions formed by the mainstream EMOs.

In sum, the growth of combative EMOs, oppositional coalitions, and the conflictual relationships within the movement sector over the past decades have turned the direction of the contemporary environmental movement in the United States from the

[44] For a detailed discussion of the environmental coalitions, refer to Section 7.1 in Chapter 7.

"consensus" movement to the "conflict" movement. The activities to create conflicts have been widely used for achieving various movement goals in the EMS: publicity, fund raising, consciousness-raising, political leverage, enforcement of existing and new laws, and legitimacy.[45]

### 6.1.1 Environmental Legislation

The legislation for environmental laws and regulations in the EMS has provided the EMOs and the general public with environmental standards. As movement strategies, the EMOs have used lobbying for environmental legislation and, in turn, the legislation has provided the EMOs with the standards for which they can use litigation to achieve further movement goals since the 1970s. For example, the National Environmental Policy Act (NEPA) announced the policy of the federal government to create and maintain conditions of "productive harmony" between man and nature by assuring "safe, healthful, productive, and aesthetically and culturally pleasing surroundings." To back up this pledge, the act required that all major federal projects significantly affecting the

[45] Incidental events such as (inter-)national meetings including environmental summits and natural/man-made environmental disasters have also played important roles in American environmentalism since 1970. For example, the first Earth Day (April 22, 1970) was such an event. As Shabecoff (2000) describes, "On that day, environmentalism emerged for the first time on the national state as an unmistakable mass social movement." Since the first Earth Day until when the UN Report, *Our Common Future* was proposed in 1987, efforts for establishing governance in civil society over environmental issues have been consensus domestically and internationally. A year later in 1988, however, a counter-environmental movement called "wise-use" movement fundamentally transformed the environment movement in the United States. That is, the rise of the right-wing conservative environmental movement by the "wise-use" affiliates and the property owners changed American environmentalism from the "consensus" movement to the "conflict" movement thereafter. Since then, the bipartite oppositional structure in the EMS between the pro-environmental and the anti-environmental movements started characterizing American environmentalism. In contrast, however, the demand from the pro-environmentalists for global standards of environmental regulation seemed surfacing outside the United States. In 1997, global summits met to set the protocol for controlling ozone gases in Kyoto, Japan, though the protocol has not been observed by super powers including the United States.

environment be accompanied by a statement detailing the environmental impact of the proposed action.

Of numerous enactment and amendments in environmental legislation, this section will only identify major developments. Major laws and regulations enacted from 1970 to 2001 include *Occupational Safety and Health Act* (*OSHA*, 1970), *Endangered Species Act* (*ESA*, 1973), *Comprehensive Environmental Response, Compensation, and Liability Act* (*CERCLA* or *Superfund*, 1980), *Pollution Prevention Act* (*PPA*, 1990), and so on. The scope of the environmental legislation has covered most of the action areas that the EMOs have been working on. Since the 1970s, each decade has seen 25, 13, and 6 enactments/amendments of 44 major legislations, respectively.

## 6.2 Methods, Data, and Hypotheses

The statistical network methods used in this chapter are three fold: (*a*) describing tie distribution (network size, density, centralization, clustering coefficient, transitivity, and centrality), (*b*) partitioning network structure into a set of positions of equivalent EORGs, and (*c*) estimating tie probability by using categorical data analysis to examine whether or not there is a (incoming, outgoing) lawsuit tie between two distinct EORGs. The data include both environmental movement organizations (EMOs) and environmental government agencies (EGAs) operating at the national level and the inter-EORG lawsuit ties in the United States for the period, 1970-2001. Of the hypotheses presented in Chapter 1, the following will be tested in this chapter:[46]

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[46] For more details of the methods, measures, and data, refer to Chapter 4.

**Hypothesis 1a.** "The environmental movement organizations (EMOs) that are specialized in modern strategies of litigation and lobbying have used litigation as a movement strategy against movement opponents in the environmental movement sector (EMS) in the United States since 1970." [H1a]

**Hypothesis 2a.** "The litigation structure has been transitive ($x \rightarrow y \rightarrow z$ then, $x \rightarrow z$) in the environmental movement sector (EMS) in the United States since 1970, i.e., an environmental organization (EORG) ($x$) that filed a lawsuit against EORG ($y$) that filed a lawsuit against EORG ($z$) has been more likely than others to file a lawsuit against EORG ($z$)." [H2a]

**Hypothesis 4.** "The contemporary movement structure in the environmental movement sector (EMS) in the United States can be characterized as disconnected, decentralized, and yet balanced." [H4]

## 6.3 Emergence of Conflictual Structure (1970-2001)

Now, this section investigates the structural dynamics of the inter-EORG lawsuit relations thereby the contemporary inter-EORG conflictual structure has emerged from a generative structural perspective (Epstein and Axtell, 1997; Fararo and Butts, 1999). In what follows, investigation will be done in two steps: (*a*) network analysis of degree distributions in eight consecutive periods and (*b*) statistical analysis of the association between the organizational attributes and lawsuit ties in eight consecutive periods by using categorical data analysis. The findings from these analyses will be used to discuss the structural dynamics of the EMS in Section 6.4.

### 6.3.1 Description of Change

Figure 6.1 displays the increase in the number of EORGs involved in lawsuit ties by period and the increase in the number of lawsuit ties by period, respectively. As shown, the number of EORGs has increased relatively more steadily throughout the period than the number of lawsuit ties. Both have increased steadily with two valleys–the third (1978-

1981) and the seventh periods (1994-1997)–in the middle of the entire period. In the first period (1970-1973), 25 EORGs formed 34 lawsuit ties. The downturns in the third and seventh periods may reflect more fundamental changes (e.g., legislation) in the EMS. In the final period (1998-2001), 100 EORGs formed the highest 164 lawsuit ties, which was an increase of 300% in EORGs and 382.35% in lawsuit ties compared to the first period, respectively.

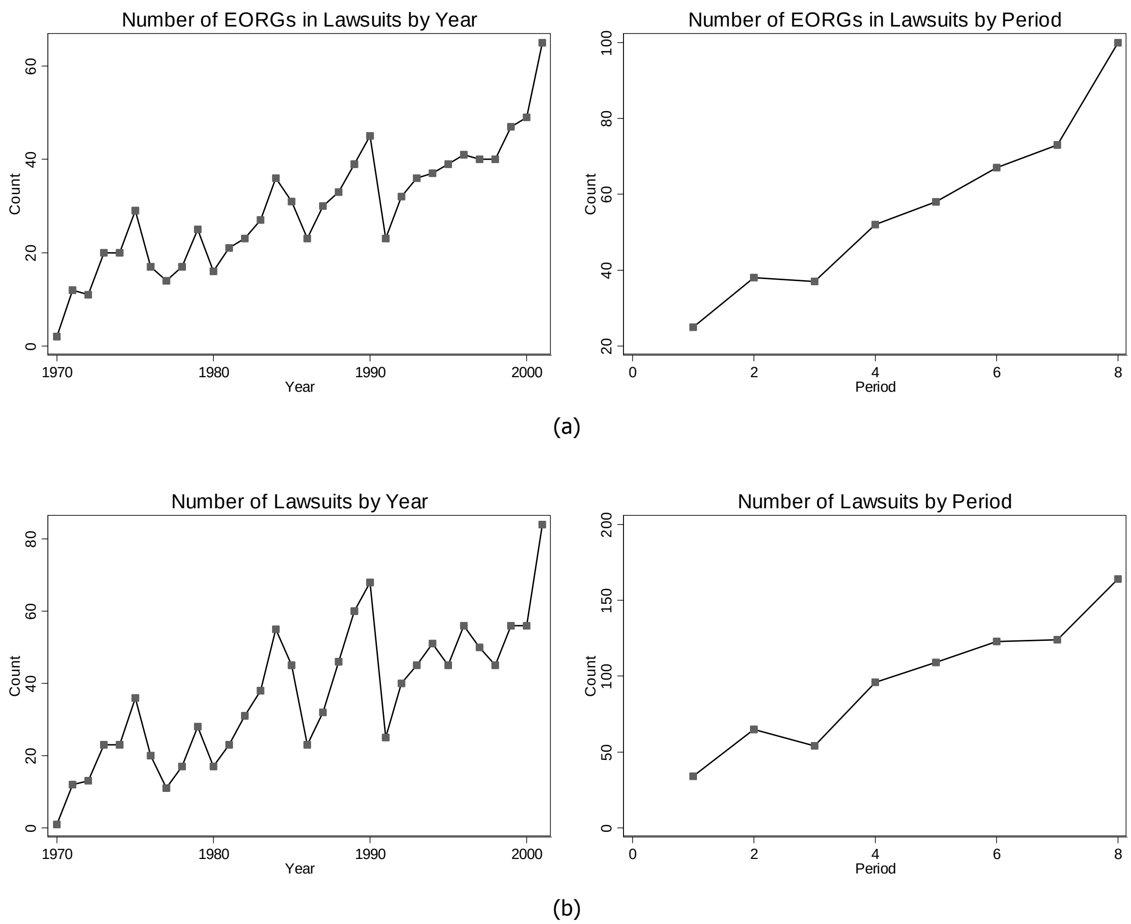



Figure 6.1: Increase in EMOs in Lawsuits (a) and Lawsuit Ties (b)

A look at the degree distribution of the lawsuit networks provides a better understanding of the structural-relational dimension of the EMS. Table 6.1 summarizes the investigation of the degree distribution of the lawsuit networks in eight periods: network size, lawsuit filing EORGs, and lawsuit filed EORGs. As shown, in terms of lawsuit filing, most lawsuits were filed by the EMOs and the number of EMOs that file lawsuits has grown considerably. Interestingly, the EGAs have also employed lawsuits in all periods. That is, in terms of lawsuits filed, most lawsuits were filed against the EGAs. The EMOs have also been filed lawsuits in a majority of the periods. Finally, a comparison of the total EORGs (154) in lawsuit filing and the total EORGs (39) in lawsuits filed suggests that the EORGs that filed lawsuits outnumber the EORGs that were filed lawsuits for the entire period, which indicates that the structural organization of lawsuit ties has a hierarchical structure.

Table 6.1: Changes of EORGs in Lawsuits

| Period | Year | Network (Node, Arc) | Lawsuit Filing | | | Lawsuits Filed | | |
|---|---|---|---|---|---|---|---|---|
| | | | EMO | EGA | Total | EMO | EGA | Total |
| I | 1970-1973 | (25, 34) | 15 | 1 | 16 | 0 | 9 | 9 |
| II | 1974-1977 | (38, 65) | 23 | 4 | 27 | 3 | 14 | 17 |
| III | 1978-1981 | (37, 54) | 25 | 3 | 28 | 2 | 11 | 13 |
| IV | 1982-1985 | (52, 96) | 32 | 3 | 35 | 1 | 20 | 21 |
| V | 1986-1989 | (58, 109) | 42 | 4 | 46 | 0 | 16 | 16 |
| VI | 1990-1993 | (67, 123) | 48 | 5 | 53 | 1 | 18 | 19 |
| VII | 1994-1997 | (73, 124) | 56 | 3 | 59 | 1 | 17 | 18 |
| VIII | 1998-2001 | (100, 164) | 81 | 2 | 83 | 0 | 18 | 18 |
| Total | 1970-2001 | (177, 411) | 143 | 11 | 154 | 5 | 34 | 39 |

The lawsuit network is directed. Thus, investigation of the degree distributions of the lawsuit network involves consideration of the EORGs that filed lawsuits and the EORGs that were filed lawsuits. In terms of lawsuit filing, most lawsuits were filed by the EMOs and the number of EMOs that filed lawsuits has increased considerably.

Interestingly, the EGAs have also filed lawsuits throughout the period. In terms of lawsuits filed, most lawsuits were filed against the EGAs. The EMOs have also been filed lawsuits in most periods. Table 6.2 summarizes the outcomes from the investigation of the degree distribution of the lawsuit networks in eight periods: network size, network density, mean (out- and in-) degree, and network centralization. As the network size has increased over time, the measures of mean (out- and out-) degree and the network density have stayed at the same level. In contrast, the network centralization in out-degree has decreased significantly whereas the network centralization in in-degree has increased, which implies that the added lawsuits have been filed against a few EORGs, though more EORGs have engaged in the litigation.

Table 6.2: Structural Properties in Lawsuit Networks

| Period | Year | Network (Node, Arc) | Network Density | Out-Degree | | In-Degree | |
|---|---|---|---|---|---|---|---|
| | | | | Mean (std.) | Centralization | Mean (std.) | Centralization |
| I | 1970-1973 | (25, 34) | 0.06 | 1.36 (1.62) | 20.14% | 1.36 (2.36) | 33.16% |
| II | 1974-1977 | (38, 65) | 0.05 | 1.71 (1.97) | 17.46% | 1.71 (2.80) | 25.79% |
| III | 1978-1981 | (37, 54) | 0.04 | 1.46 (1.50) | 15.82% | 1.46 (2.86) | 30.09% |
| IV | 1982-1985 | (52, 96) | 0.04 | 1.85 (2.27) | 16.30% | 1.85 (4.13) | 40.29% |
| V | 1986-1989 | (58, 109) | 0.03 | 1.88 (1.73) | 14.50% | 1.88 (4.47) | 30.56% |
| VI | 1990-1993 | (67, 123) | 0.03 | 1.84 (1.60) | 9.48% | 1.84 (4.36) | 24.86% |
| VII | 1994-1997 | (73, 124) | 0.02 | 1.70 (1.69) | 7.47% | 1.70 (5.10) | 41.26% |
| VIII | 1998-2001 | (100, 164) | 0.02 | 1.64 (1.53) | 7.51% | 1.64 (5.77) | 39.14% |
| Total | 1970-2001 | (177, 411) | 0.01 | 2.322 (2.527) | 6.67% | 2.322 (8.417) | 33.53% |

Note: Network density: average value within blocks

### 6.3.2 Formation of Litigative Ties

Now, I move onto explaining the relationships between the EORGs' attributes and the ways in which they exchange lawsuit ties with each other. In search of the conditions under which the EORGs have formed lawsuit ties, I employed a conventional model of categorical data analysis in which the existence of lawsuit ties was explained by the EORGs' attributes such as organizational type, age, size, orientation, strategy. While the inter-EORG lawsuit ties were collected over time, the EORGs' attributes were not. Thus, a caveat is that the analysis was based on the assumption that the EORGs did not change considerably in terms of organizational characteristics over the periods. All parameter estimation was done in SAS. Table 6.3 summarizes the estimation of the parameters from the analysis. As shown, up to the sixth period, it was only organizational type that was significant in affecting the use of litigation as a movement strategy. That is, EMOs, rather than EGAs, filed most lawsuits for the first six periods. The other variables such as organizational age, size, orientation, and strategy turned out not to be significant. The last two periods (1994-2001), however, saw that the EMOs founded later (i.e., young EMOs) tended to employ litigation as a movement strategy rather than the EMOs founded earlier (i.e., old EMOs). Yet, organizational size, orientation, and strategy did not affect the outcome. The results suggest that the environmental litigation were used by the EMOs regardless of their organizational characteristics until the early 1990s and yet, after the mid 1990s on, it was used by young EMOs with limited resources while old EMOs turned to diverse movement activities.

Thus, the first hypothesis [H1a], "the environmental movement organizations (EMOs) that are specialized in modern strategies of litigation and lobbying have used litigation as a movement strategy against movement opponents in the environmental movement sector (EMS) in the United States since 1970" was not supported from a categorical data analysis. As shown, the EMOs founded later tended to use litigation as a movement strategy against the EGAs while old EMOs turned to diverse movement activities. The findings resonate with those from organizational studies that traditional organizations with abundant resources tend to resort to the strategy of "exploitation" whereas other organizations "exploration" (March, 1991).

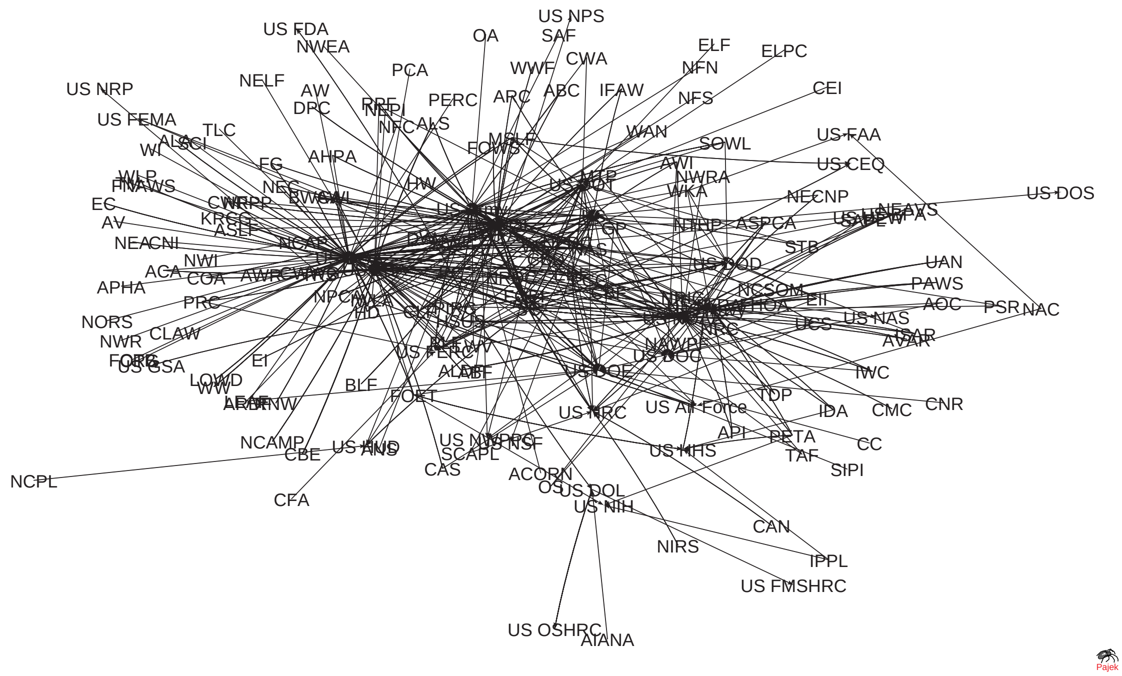
Table 6.3: Estimation from Categorical Data Analysis

| Period | Year | Type | Age | Size | Orientation | Strategy |
|---|---|---|---|---|---|---|
| I | 1970-1973 | -3.871<br>(0.049*) | -0.021<br>(0.189) | n/a | n/a | 0.629<br>(0.337) |
| II | 1974-1977 | -2.771<br>(0.023*) | -0.004<br>(0.730) | n/a | 0.920<br>(0.563) | 1.522<br>(0.141) |
| III | 1978-1981 | -4.489<br>(0.051) | -0.027<br>(0.118) | n/a | 1.742<br>(0.198) | 0.689<br>(0.263) |
| IV | 1982-1985 | -4.110<br>(0.036*) | -0.023<br>(0.125) | n/a | 0.246<br>(0.786) | 0.552<br>(0.262) |
| V | 1986-1989 | n/a | -0.027<br>(0.070) | n/a | -0.841<br>(0.273) | 0.936<br>(0.101) |
| VI | 1990-1993 | -3.744<br>(0.019*) | -0.020<br>(0.056) | -0.615<br>(0.694) | -0.338<br>(0.615) | 0.693<br>(0.154) |
| VII | 1994-1997 | n/a | -0.079<br>(0.005**) | 1.770<br>(0.170) | -0.395<br>(0.668) | 0.080<br>(0.836) |
| VIII | 1998-2001 | -3.738<br>(0.023*) | -0.025<br>(0.009**) | n/a | 0.265<br>(0.612) | 0.431<br>(0.234) |
| Total | Total | -2.591<br>(0.050*) | -0.020<br>((0.007**) | 1.160<br>(0.280) | 0.257<br>(0.521) | 0.421<br>(0.121) |

Note: 1. Inside the parenthesis is the significance.
2. *Significant at α=0.05; **Significant at α=0.01
3. n/a indicates dropped variables in analysis due to multicollinearity.

A preliminary observation of the cross-sectional structure of the lawsuit ties for the entire period before I investigate the structure in each period provides a summary view of the overall structural characteristics of the inter-EORG litigation network. From 1970 to 2001, 177 EORGs (143 EMOs, 34 EGAs) formed 411 lawsuit ties. As summarized in Table 6.1 above, the network was sparse (network density: 0.01) indicating that the network was open rather than closed. However, as shown in Figure 6.2, the litigation network in which 154 EORGs filed lawsuits against 39 other EORGs, was structured in 36 different levels of hierarchical positions (Burt, 1992).[47] In terms of lawsuit-filing activities, measured as out-degree centrality, the network was not centralized. And yet, it was highly centralized in terms of lawsuit-receiving activities measured as in-degree centrality. The Sierra Club (SC) (14) filed most lawsuits followed by the Friends of the Earth (FOEI) (13), the Natural Resources Defense Council (NRDC) (12), the Environmental Defense Fund (EDF) (12), and the National Audubon Society (NAS) (10) (inside the parentheses are the out-degrees). On the other hand, the US Department of Agriculture (US DOA) (61) invoked most lawsuits followed by the US Department of Interior (US DOI) (54), the US Environmental Protection Agency (US EPA) (38), the US Army (including US Army Corps of Engineers) (37), and the US NOAA (including US National Marine Fisheries Service, NMFS) (NOAA) (36) (inside the parentheses are the in-degrees).

[47] Burt's (1992) adjustment of constraint (equation 2.9, pg 71), indicating the extent to which constraint on ego is concentrated in a single alter.



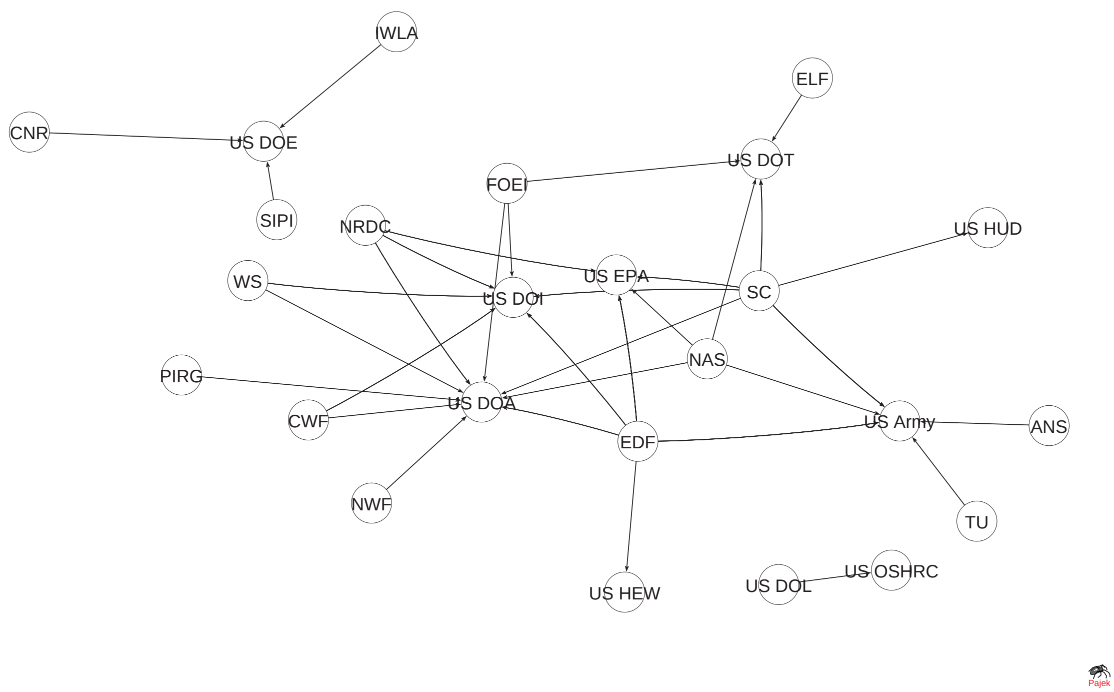

*L* (177, 411)

Figure 6.2: Lawsuit Network (1970-2001)

Note: *L* (177, 411) indicates a litigation network composed of 177 vertices interconnected through 411 arcs.

## 6.3.3 Evolution of Conflictual Structure

Looking at the structures of the lawsuit networks by period helps to better understand the patterns of the changes in lawsuit ties, i.e., who has filed lawsuits against whom over time. Figure 6.3 displays the structure of lawsuit ties for the first period (1970-1973). As shown, 25 EORGs were forming 34 lawsuit relations in the early 1970s. The network was not quite hierarchical at the initial stage: It was structured in only two levels of hierarchical positions (Burt, 1992). In terms of lawsuit-filing activities, measured as out-degree centrality, the network was most hierarchical (network centralization: 20.14%) of all litigation networks whereas it was less hierarchical in terms of lawsuits received, measured as in-degree centrality, which indicates that there were few EORGs that filed lawsuits for the size of the network structure. The Sierra Club (SC) (6) filed most lawsuits followed by the Environmental Defense Fund (EDF) (5), and the National Audubon Society (NAS) (4). On the other hand, the US Department of Agriculture (US DOA) (9) received most lawsuits followed by the US DOI (US DOI) (6), and the US Army (US Army) (5). As shown, all attacks (or attempts to "dominate") were directed from EMOs to EGAs. Since all EORGs were involved in either attacking or being attacked only, no transitive hierarchical (or "dominance") structure was found, though the victim effect was observed (Berger, Wagner, and Zelditch, 1985; Fararo and Skvoretz, 1986).



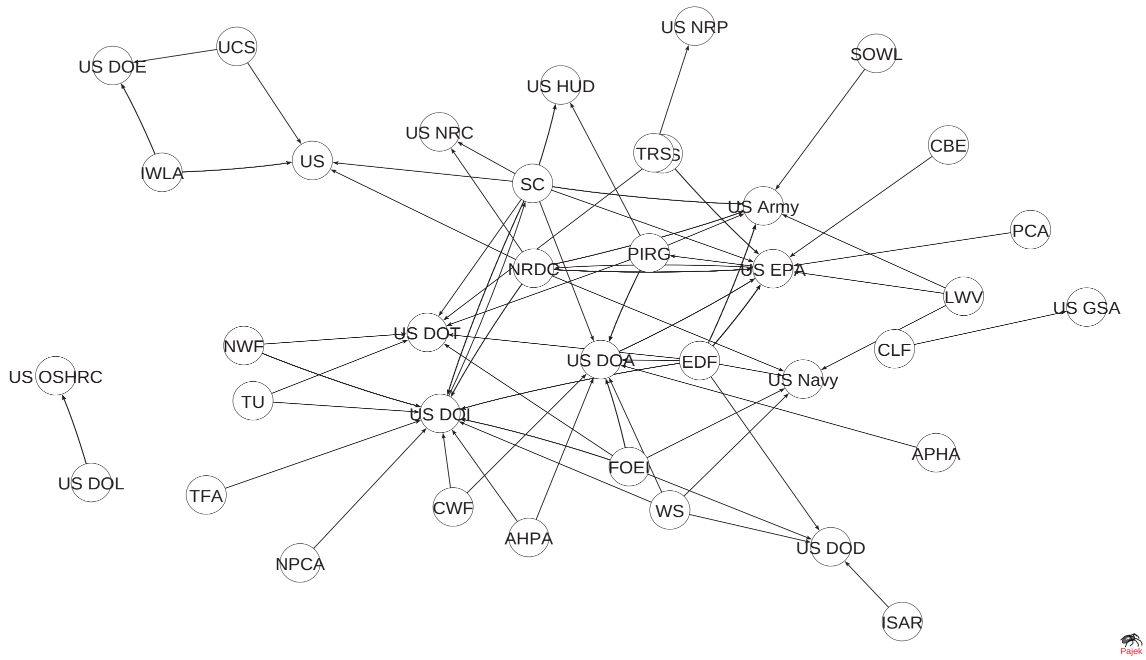

*L* (25, 34)

Figure 6.3: Lawsuit Network (Period I: 1970-1973)

Figure 6.4a displays the litigation structure in the second period (1974-1977) when 38 EORGs were forming 65 lawsuit relations. In terms of both lawsuit-filing and lawsuit-receiving activities, the network became less hierarchical (network centralization: 17.46% and 25.79%, respectively), which suggests that more EORGs were using litigation against more EORGs compared to the first period. The network hierarchy measure indicates that the network was composed of eight different levels of hierarchical positions, which was a significant increase from the first period. In this period, the Sierra Club (SC) (8) filed most lawsuits followed by the Environmental Defense Fund (EDF) (7), and the Natural Resources Defense Council (NRDC) (6). On the other hand, the US Department of Interior (US DOI) (11) received most lawsuits followed by the US Environmental Protection Agency (US EPA) (8), and the US Department of Agriculture (US DOA) (8).

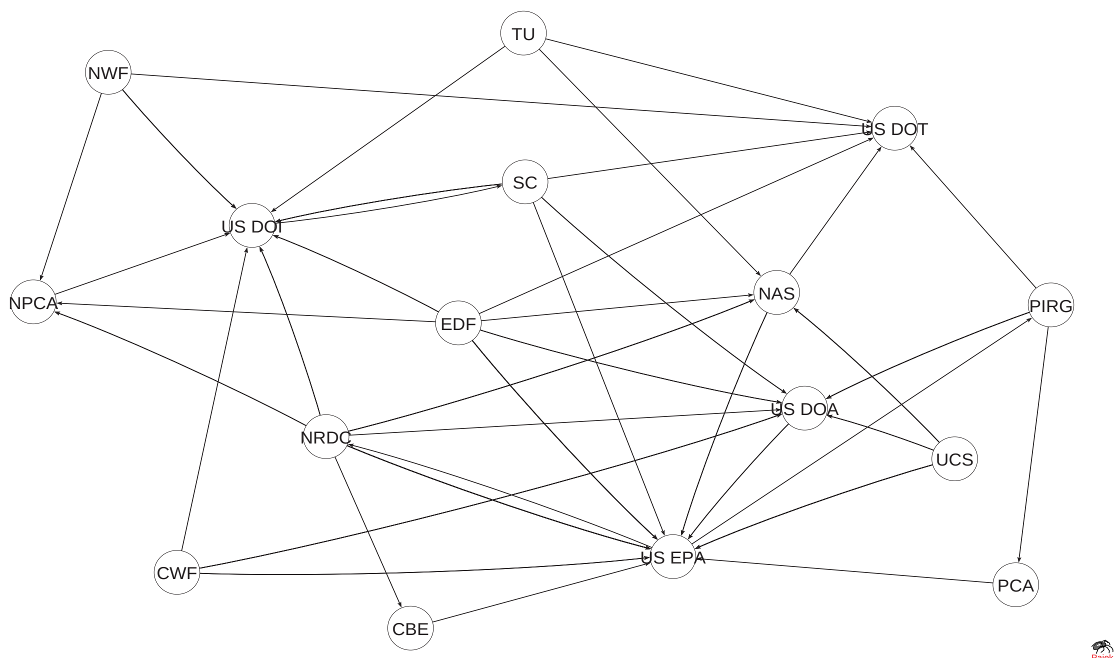
In contrast to the litigation structure in the first period, the litigation network became complicated in varied respects in the second period: First, there were two cases of reciprocal lawsuits between the Sierra Club (SC) and the Department of Interior (DOI) and the Natural Resources Defense Council (NRDC) and the US Environmental Protection Agency (US EPA). Second, EGAs also used litigation against other EGAs and EMOs. The US Department of Agriculture (US DOA) filed a lawsuit against the US Environmental Protection Agency (US EPA). The US Environmental Protection Agency (US EPA), in turn, used litigation against the Public Interest Research Group (PIRG). Third, EMOs used litigation against other EMOs as well; the Natural Resources Defense Council (NRDC) against the Citizens for a Better Environment (CBE), the Natural Resources Defense Council (NRDC) against the National Audubon Society (NAS), the Union of Concerned Scientists (UCS) against the National Audubon Society (NAS), the Public Interest Research Group (PIRG) against the Project on Clean Air (PCA), the Trout Unlimited (TU) against the National Audubon Society (NAS), and the National Wildlife Federation (NWF) against the National Parks Conservation Association (NPCA). Figure

6.4b displays the reduced litigation network in which EORGs were involved in triadic hierarchical (or "dominance") structures.




*L* (38, 65)

Figure 6.4a: Lawsuit Network (Period II: 1974-1977)

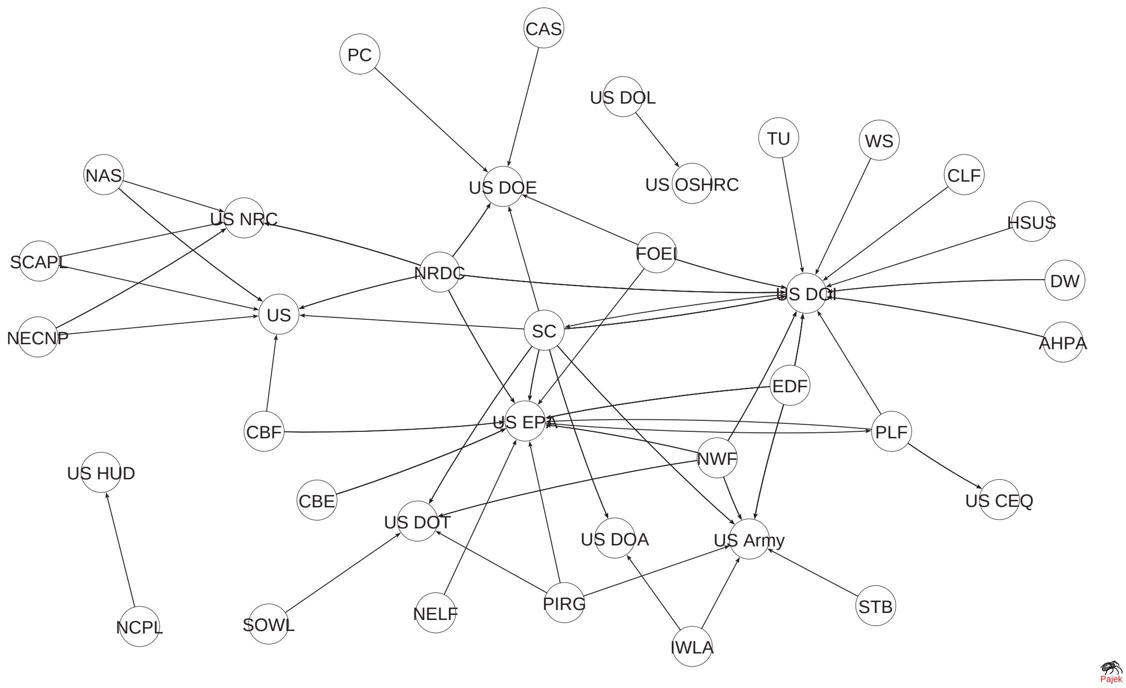



*L* (16, 40)

Figure 6.4b: Lawsuit Network (Reduced) (Period II: 1974-1977)

In the third period (1978-1981), 37 EORGs were forming 54 lawsuit relations as shown in Figure 6.6a. In terms of lawsuit-filing activities, the network became less hierarchical (network centralization: 15.82%) whereas, in contrast, in terms of lawsuit-receiving activities, the network became more hierarchical (network centralization: 30.09%), which suggests that more EORGs were using litigation against fewer EORGs compared to the previous period. The network hierarchy measure indicates that the network was composed of six different levels of hierarchical positions, which was a decrease from the second period. Still, the Sierra Club (SC) (7) filed most lawsuits followed by the Natural Resources Defense Council (NRDC) (5), and the National Wildlife Federation (NWF) (4). On the other hand, the US Department of Interior (US DOI) (12) received most lawsuits followed by the US Environmental Protection Agency (US EPA) (10), the United States (US) (6), and the US Army (US Army) (6).

The litigation network in this period did not become complicated as did in the previous period. Nonetheless, the network was not simple: First, there were reciprocal lawsuits between the Pacific Legal Foundation (PLF) versus the US Environmental Protection Agency (US EPA) and the Sierra Club (SC) versus the Department of Interior (US DOI). Second, litigation continued between the EGAs: the Department of Labor (US DOL) filed a lawsuit against the US Occupational Safety and Health Review Committee (US OSHRC) and the US Department of Interior (US DOI) against the Sierra Club (SC). Unlike in the second period, there was no litigation between EMOs in this period. A reduced litigation network is not displayed since no EORGs were involved in the triadic hierarchical structures.

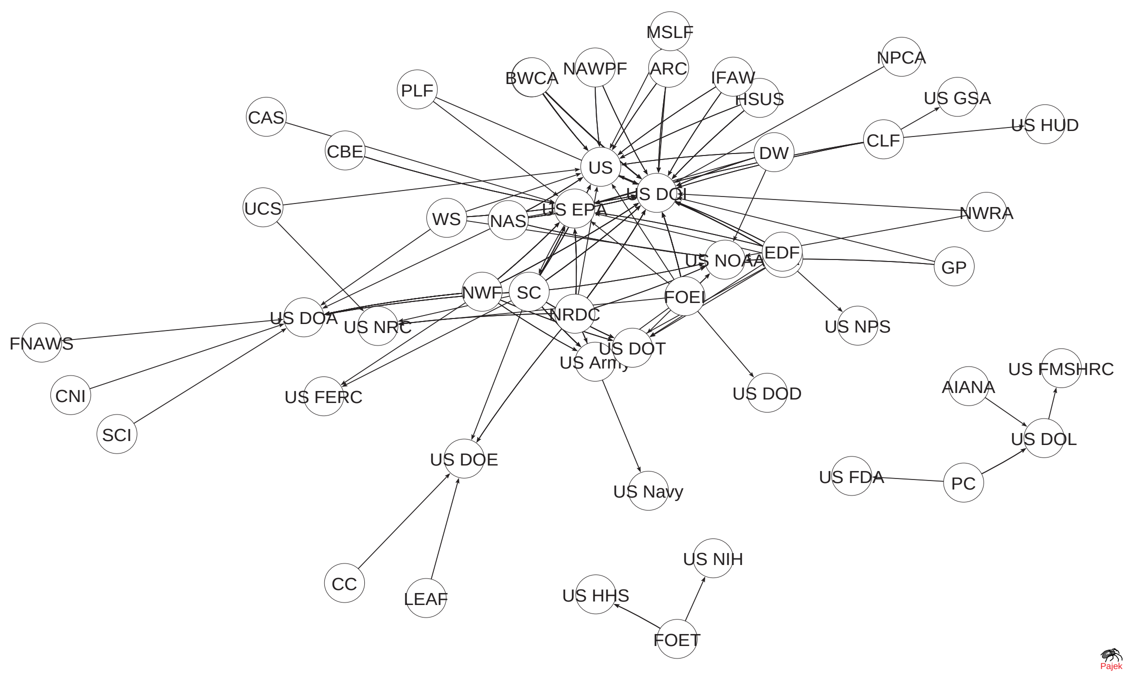



*L* (37, 54)

Figure 6.5: Lawsuit Network (Period III: 1978-1981)

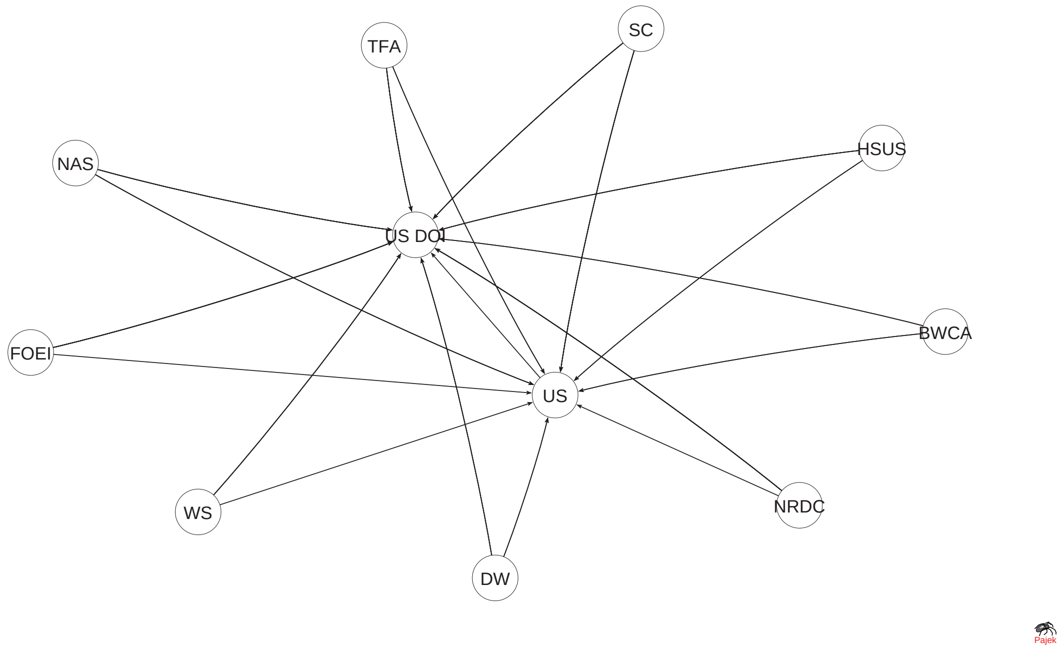
Compared to the prior periods, the litigation network expanded the most in the fourth period (1982-1985) as shown in Figure 6.6a. As shown, 52 EORGs were forming 96 lawsuit relations in this period. Network hierarchy changed in opposite directions: in terms of lawsuit-filing activities, the network became less hierarchical (network centralization: 16.30%) whereas it became hierarchical (40.29%) in lawsuit-receiving activities. The observation suggests that the lawsuits were targeted on a few EORGs although more EORGs were using litigation as a movement strategy. The network hierarchy measure indicates that the network was composed of seven different levels of hierarchical positions. The Sierra Club (SC) (10) continued to file most lawsuits followed by the Natural Resources Defense Council (NRDC) (8), and the Friends of the Earth (FOEI) (8). On the other hand, the US Department of Interior (US DOI) (22) received most lawsuits followed by the United States (US) (15), and the US Environmental Protection Agency (US EPA) (12).

The litigation network in this period became complicated as did in the second period: First, there was a reciprocal lawsuit between the Sierra Club (SC) versus the US Environmental Protection Agency (US EPA). Second, there was a conflict between EGAs: the US Department of Labor (US DOL) filed a lawsuit against the US FMSHRC (US FMSHRC) and the US Department of Interior (US DOI) against the United States (US). There was no litigation between EMOs in this period. Figure 6.6b displays the reduced litigation network in which EORGs were involved in triadic hierarchical (or "dominance") structures. The inter-EGA litigation between the United States (US) and the US Department of Interior (US DOI) created as many as nine triadic hierarchical structures in which the EMOs took the most dominant positions whereas the US Department of Interior (US DOI) the most subordinate position since it was attacked by both the EMOs and the United States (US) in transitive hierarchical structures.




*L* (52, 96)

Figure 6.6a: Lawsuit Network (Period IV: 1982-1985)

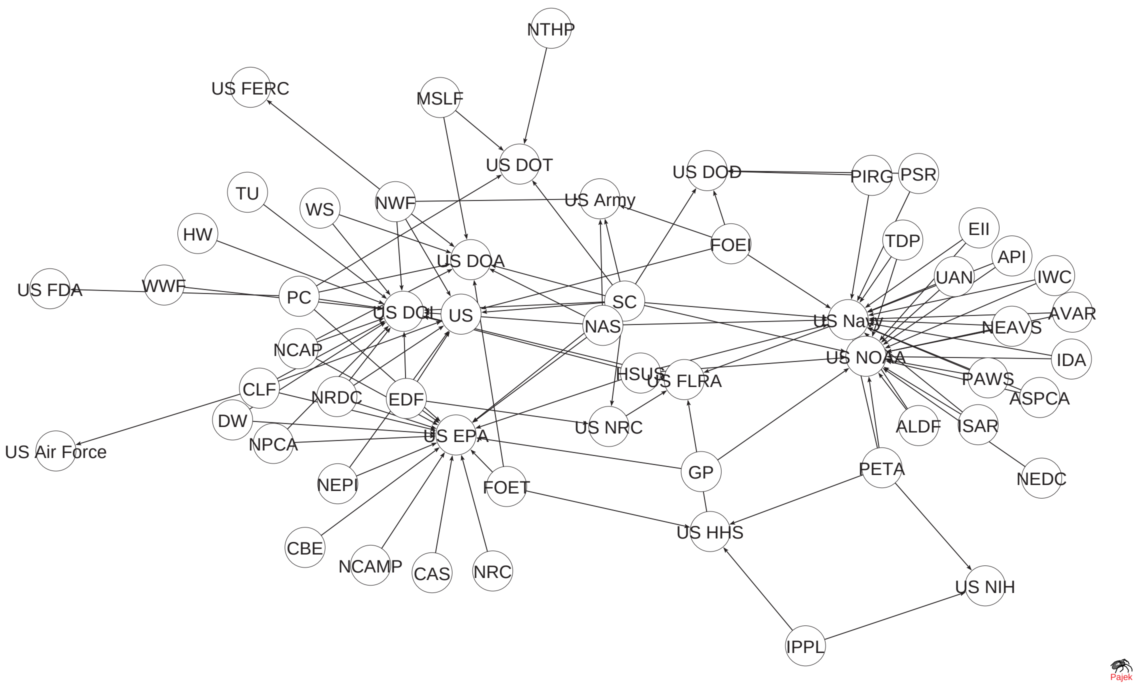



*L* (11, 19)

Figure 6.6b: Lawsuit Network (Reduced) (Period IV: 1982-1985)

In the fifth period (1986-1989), the litigation network shown in Figure 6.7 expanded even more in which 58 EORGs were forming 109 lawsuit relations. In terms of both lawsuit-filing and lawsuit-receiving activities, the network became less hierarchical (network centralization: 14.50% and 30.56%, respectively), which suggests that more EORGs were using litigation against more EORGs. The network hierarchy measure indicates that the network was composed of only two different levels of hierarchical positions, which was a significant decrease from the fourth period. Again, the Sierra Club (SC) (10) filed most lawsuits followed by the National Wildlife Federation (NWF) (5), the Public Citizen (PC) (5), and the National Audubon Society (NAS) (5). On the other hand, the US Navy (19) received most lawsuits followed by the US Environmental Protection Agency (US EPA) (17), and the US National Marine Fisheries Service (NMFS) (NOAA Fisheries Service) (US NOAA) (17).

In this period, no EORGs were involved in the triadic hierarchical structures. No reciprocal lawsuits were found. However, inter-EGA lawsuits continued to be found: the US Navy (US Navy), the US Department of Health and Human Services (US HHS), the US Nuclear Regulatory Commission (US NRC), and the US Department of Interior (US DOI) all filed a lawsuit against US Federal Labor Relations Authority (US FLRA). No litigation was found between EMOs.

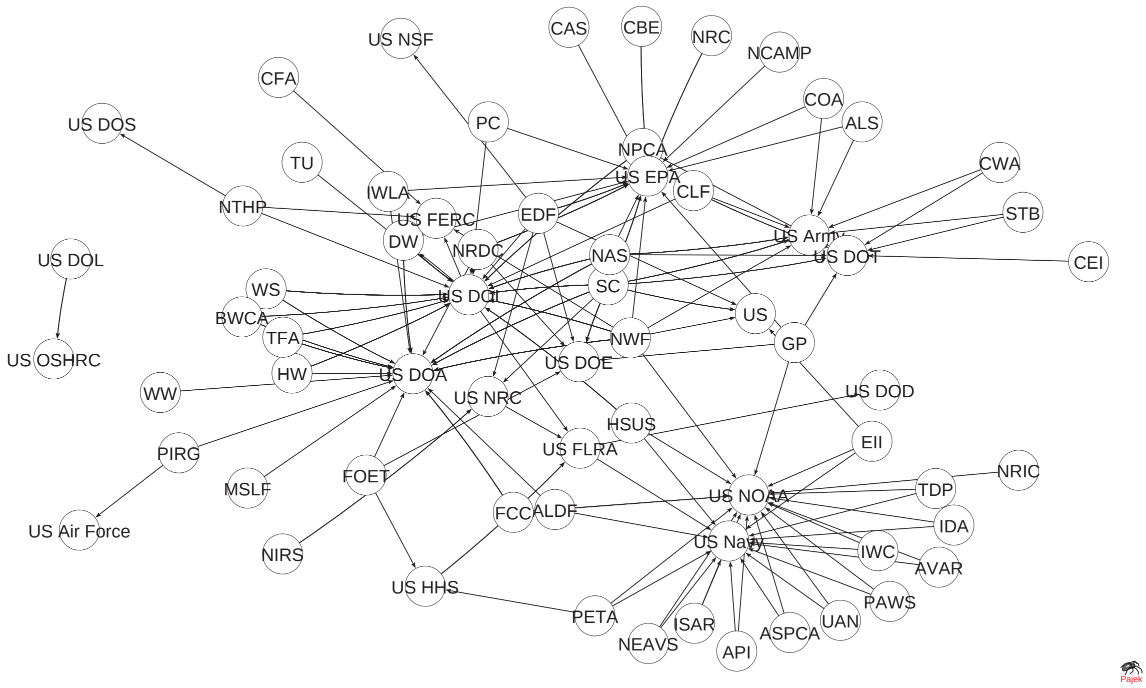



*L* (58, 109)

Figure 6.7: Lawsuit Network (Period V: 1986-1989)

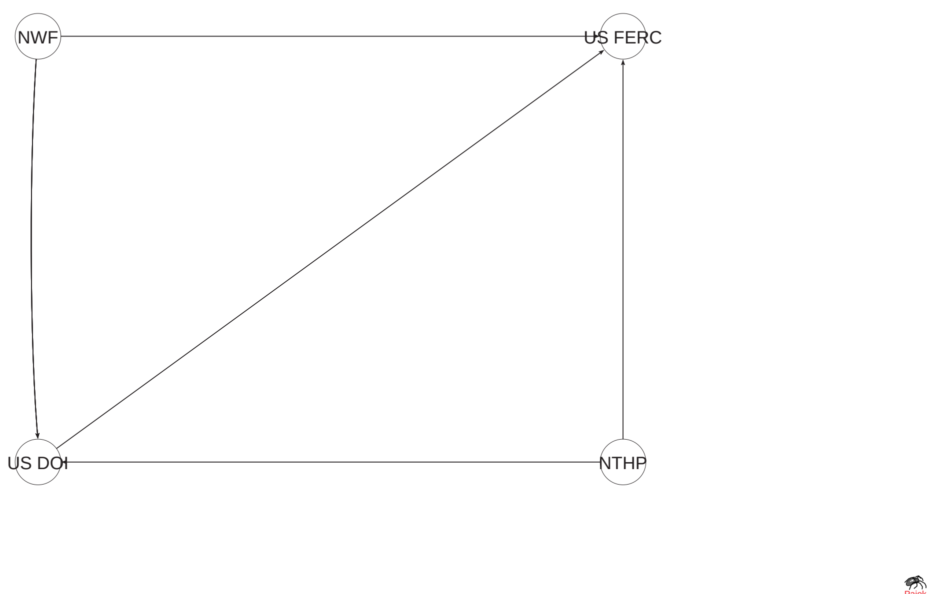
The sixth period (1990-1993) did not see a significant expansion of the litigation network. As shown in Figure 6.8a, 67 EORGs were forming 123 lawsuit relations in this period. In terms of both lawsuit-filing and lawsuit-receiving activities, the network became considerably less hierarchical compared to the fifth period (network centralization: 9.48% and 24.86%, respectively), which suggests that more EORGs were using litigation against more EORGs. The network hierarchy measure indicates that the network was composed of seven different levels of hierarchical positions, which was an increase from the fifth period. The Sierra Club (SC) (8) continued to file most lawsuits followed by the National Wildlife Federation (NWF) (7), and the Environmental Defense Fund (EDF) (6). On the other hand, the US National Marine Fisheries Service (NMFS) (NOAA Fisheries Service) (US NOAA) (18) received most lawsuits followed by the US Department of Interior (US DOI) (16) and the US Department of Agriculture (US DOA) (16).

As in the second and the fourth periods, the litigation network in this period became complicated: First, there was a reciprocal lawsuit between the Defenders of Wildlife (DW) and the US Department of Interior (US DOI). Second, the inter-EGA litigation continued: the US Department of Labor (US DOL) filed a lawsuit against US Occupational Safety and Health Review Commission (OSHRC). US Health and Human Services (US HHS), the US Department of Agriculture (US DOA), and the US Nuclear Regulatory Commission (US NRC) all filed a lawsuit against the US Federal Labor Relational Authority (US FLRA) while (US FLRA), in turn, against (US Navy) and (US DOD). However, there was no inter-EMO litigation. Figure 6.8b displays the reduced litigation network, which includes only imbalanced triples in a Heiderian sense. The figure shows that the National Trust for Historic Preservation (NTHP) and the National Wildlife Federation (NWF) took the most dominant positions whereas the US Federal Energy Regulatory Commission (US FERC) most subordinate position because it was attacked by both the EMOs and the US Department of Interior (US DOI) in the transitive hierarchical structures.




*L* (67, 123)

Figure 6.8a: Lawsuit Network (Period VI: 1990-1993)

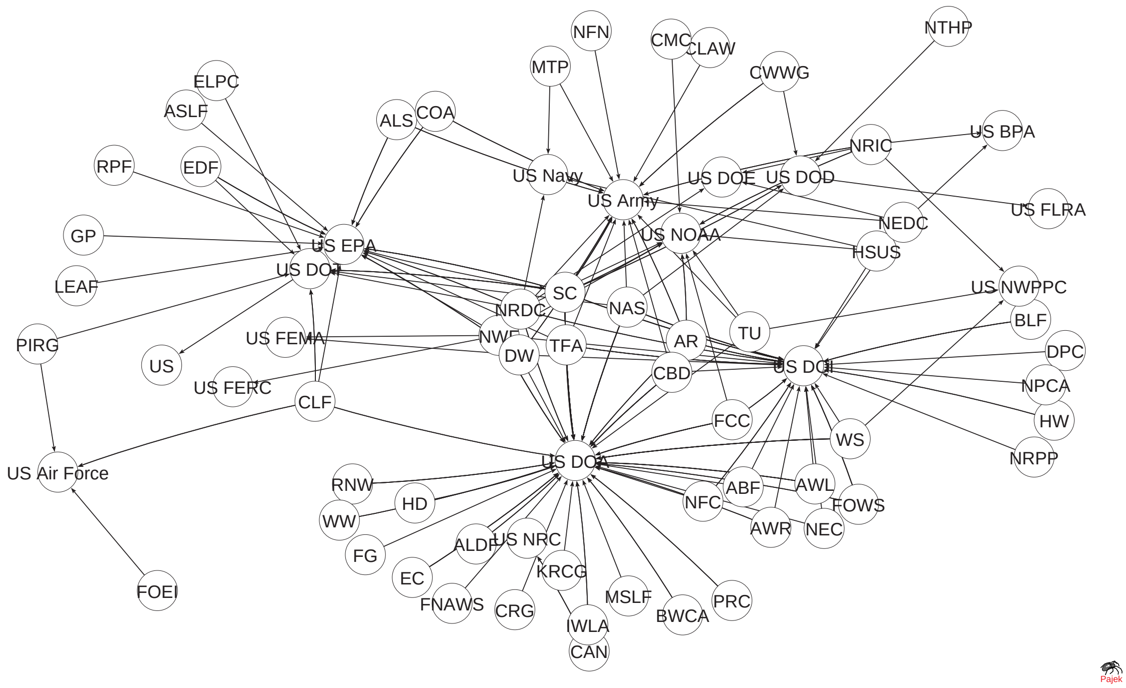



*L* (4, 5)

Figure 6.8b: Lawsuit Network (Reduced) (Period VI: 1990-1993)

The seventh period (1994-1997) saw a further expansion of the litigation network. As displayed in Figure 6.9, 73 EORGs were forming 124 lawsuit relations in this period. In terms of lawsuit-filing activities, the network became least hierarchical (network centralization: 7.47%) whereas, in contrast, in terms of lawsuit-receiving activities, the network became most hierarchical (network centralization: 41.26%), which suggests that fewest EORGs were using litigation against most EORGs throughout the entire period. The network hierarchy measure indicates that the network was composed of four different levels of hierarchical positions, which was a significant decrease from the sixth period. The Sierra Club (SC) (7), the Natural Resources Defense Council (NRDC) (7), and the National Wildlife Federation (NWF) (7) filed most lawsuits. On the other hand, the US Department of Agriculture (US DOA) (31) received most lawsuits followed by the US Department of Interior (US DOI) (23) and the US Army (US Army) (16).

In this period, no EORGs were involved in triadic hierarchical structures. Nonetheless, a reciprocal litigation was found between the Sierra Club (SC) and the Environmental Protection Agency (US EPA). The inter-EGA litigation continued: the Department of Transportation (US DOT) versus the United States (US) and the Department of Defense (US DOD) versus the Federal Labor Relations Authority (US FLRA). No litigation was found between EMOs.

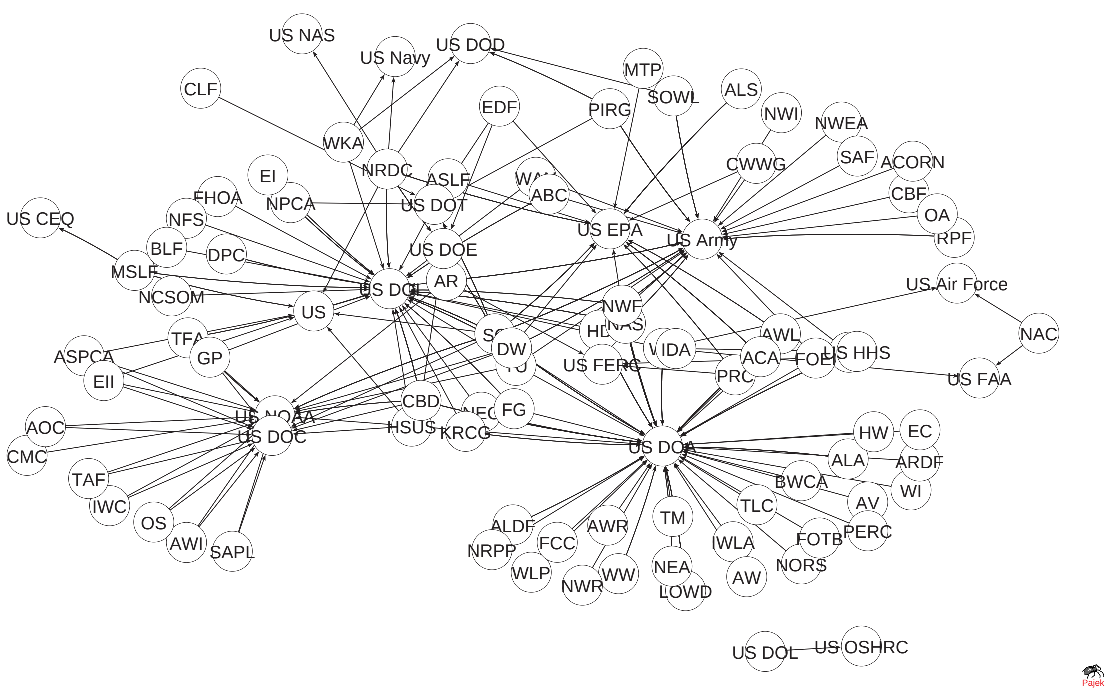



*L* (73, 124)

Figure 6.9: Lawsuit Network (Period VII: 1994-1997)

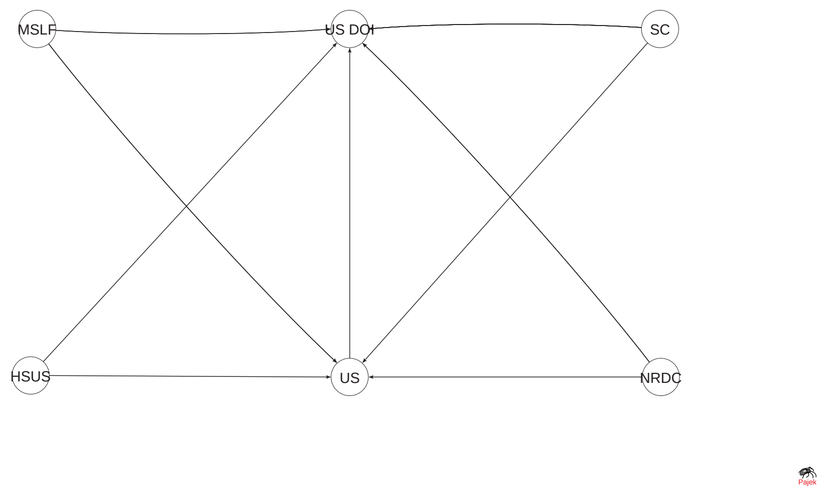
Finally, the litigation network expanded to the full extent in the final period (1998-2001) when 100 EORGs were exchanging 164 lawsuit ties. Figure 6.10a displays the litigation network in this period. The litigation network became less hierarchical. In terms of lawsuit-filing activities, the network centralization was at the lowest level (7.51%) of all litigation networks whereas it was at the highest level (39.14%) in terms of lawsuits received, which indicates that there was a great increase in the number of EORGs that used litigation as a movement strategy, while the lawsuits were concentrated on a few EORGs only. By the hierarchy measure, the network was structured in six different levels of hierarchical positions. The Sierra Club (SC) (9) filed most lawsuits followed by the Natural Resources Defense Council (NRDC) (7) and the Defenders of Wildlife (6). On the other hand, the US Department of Agriculture (US DOA) (40) received most lawsuits by the US Department of Interior (US DOI) (29) and the US Army (US Army) (21).

The litigation network, however, did not become considerably complicated for the expansion of it: There was no reciprocal litigation. Two lawsuits between EGAs were observed: the United States (US) versus the US Department of Interior (US DOI) and the US Department of Labor (US DOL) versus US Occupational Safety and Health Review Commission (US OSHRC). There was no litigation observed between EMOs in this period. Figure 6.10b displays the transitive hierarchical structure in this period in which the EMOs took the most dominant positions whereas the Department of Interior (US DOI) most subordinate position while being attacked by the EMOs and the United States (US).




*L* (100, 164)

Figure 6.10a: Lawsuit Network (Period VIII: 1998-2001)




*L* (6, 9)

Figure 6.10b: Lawsuit Network (Reduced) (Period VIII: 1998-2001)

In sum, the litigation network has seen a few common observations found in most of the periods: The Sierra Club (SC), the Natural Resources Defense Council (NRDC), the National Wildlife Federation (NWF), and the Environmental Defense Fund (EDF) have been consistently most central in lawsuit filing activities whereas the US Department of Interior (US DOI) and the US Department of Agriculture (US DOA) central in lawsuit receiving activities. In addition, there have been events that made the structure complicated: First, EGAs were also active in using litigation to advance their claims against other EGAs or EMOs. Second, litigation has often been reciprocated. Both cases have brought about changes in the pattern of the direction of litigation from the dominant pattern of "EMO→EGA" to either "EGA→EGA" or "EGA→EMO." Third, EMOs used litigation against other EMOs as well in the second period, which created the pattern of "EMO→EMO". Finally, in three periods (Periods IV, VI, and VIII), transitive hierarchical litigation structures were found such that multiple EMOs attack two EGAs and the EGAs were also involved in a litigation with each other at the same time.

Thus, the second hypothesis [H2a], "the litigation structure has been transitive ($x \rightarrow y \rightarrow z$ then, $x \rightarrow z$) in the environmental movement sector (EMS) in the United States since 1970, i.e., an environmental organization (EORG) ($x$) that filed a lawsuit against EORG ($y$) that filed a lawsuit against EORG ($z$) has been more likely than others to file a lawsuit against EORG ($z$)" was supported in three different periods. As shown, most lawsuits were filed by EMOs against EGAs, which made the development of the transitive dominance structures infrequent. And thus, it does not disapprove of E-state structuralism (Berger, Wagner, and Zelditch, 1985; Fararo and Skvoretz, 1986). The Sierra Club (SC) was involved in all the transitive dominance structures found attacking the United States (US), US Department of Agriculture (US DOA), US Department of Interior (US DOI), and US Environmental Protection Agency (US EPA) that were most often victimized in the transitive dominance structures in all three periods. Although it may be not possible to measure the extent to which the transitive dominance structures affected the hierarchical structure of the contemporary EMS, it must have made the structure more complicated.

However, the fourth hypothesis [H4], "the contemporary movement structure in the environmental movement sector (EMS) in the United States can be characterized as disconnected, decentralized, and yet balanced" was not supported from an investigation of the structural dynamics of the litigative network.[48] It was noticeable that the litigative structure in the most recent period and the one that emerged in structural dynamics was, overall, connected rather than disconnected and hierarchical rather than homogenized. As an exception, there were two sets of dyadic litigative ties separated from the main

[48] Whether or not the contemporary movement structure in the EMS has been balanced will be tested in Chapter 8.

component. The main component was highly centralized–few EGAs were being attacked by most EMOs. That is, there were relatively few movement opponents jointly filed lawsuits by common EMOs. The fact that many EMOs were sharing common movement opponents suggested a possibility for future collective action. For example, resources (e.g., finance, labor) may be mobilized and movement activities (e.g., advancing claims) may be coordinated between the EMOs that have had common movement opponents.

## 6.4 Discussion

This chapter has investigated how organizational and relational characteristics have been associated with each other in the structural dynamics of the litigative structure and how the litigative structure has evolved over time in the EMS in the United States since 1970. Specifically, this chapter has been concerned with what forms a series of dyadic and triadic litigative ties resulting in the emergence of the structural characteristics (e.g., connectedness, hierarchy) of the contemporary EMS. EMOs have played different roles in creating litigative ties depending on their organizational characteristics and locations in the movement structure. The development of triadic litigation substructures was also related to the organizational characteristics and locations, though future research has yet to explicate the extent to which those triadic substructures aggregate to the entire network structures.

Overall, the interorganizational structure in the EMS in the United States since 1970 has expanded, connected, and hierarchicalized over time. Particularly, organizational type and age, rather than organizational size, orientation or strategy, have affected the formation of dyadic litigative ties between EORGs. As summarized above, environmental litigation was used by the EMOs regardless of their organizational characteristics until the early 1990s and yet, after the mid 1990s on, it was used by young EMOs with limited resources while old EMOs turned to diverse movement activities. Organizational size, orientation, and strategy did not affect the outcome. The findings resonate with those from organizational studies that traditional organizations with abundant resources tend to resort to the strategy of "exploitation" whereas other organizations "exploration" (March, 1991).

In only a few periods, transitive dominant structures were found in which case dominated EORGs tended to be attacked by most EORGs as well. Most lawsuits were filed by EMOs against EGAs, which made the development of the transitive dominance structures infrequent. Particularly, the Sierra Club (SC) was involved in all the transitive dominance structures while attacking the United States (US), US Department of Agriculture (US DOA), US Department of Interior (US DOI), and US Environmental Protection Agency (US EPA) that were most often victimized in the transitive dominance structures. The findings do not disapprove of E-state structuralism (Berger, Wagner, and Zelditch, 1985; Fararo and Skvoretz, 1986).

The cross-sectional litigative structure for the entire period was mostly connected, except for the two sets of isolated dyadic ties, and hierarchical–few EGAs were being attacked by most EMOs. Other than the two sets of isolated dyadic ties, the main component was highly centralized–few EGAs were being attacked by most EMOs. The fact that many EMOs were sharing common movement opponents suggested a possibility for future collective action. For example, resources (e.g., finance, labor) may be mobilized and movement activities (e.g., advancing claims) may be coordinated between the EMOs that have common movement opponents.

This chapter, however, did not attempt to explain what has made the EORGs employ litigation as a movement strategy among other strategies. As a result, the findings do not directly answer why the EORGs that were active in litigation have employed litigation rather than other strategies. Although we might need further study to answer this question, which is beyond the scope of this dissertation, active environmental legislation since the 1970s must have provided environmental standards that allowed the EORGs to be able to use litigation. This chapter did not attempt to study what structural outcomes the success or failure of the environmental litigation has brought about in the movement sector.

The statistical network model used in this chapter was designed to explain whether or not the EORGs had lawsuit ties, rather than whether or not there was a relational tie between the EORGs from both attributes and network configuration. To fully explain the formation of lawsuit ties between certain EORGs based on both organizational characteristics and relational properties, future research may have to use conditional logit model (McFadden, 1973, 1981; Ben-Akiva, and Lerman, 1989). The conditional logit models are advantageous when the research aims to consider as variables the organizational characteristics of the focal parties involved, the parties' neighbors, the parties' neighbors' neighbors', and so on. Although the development of such models may require skills such as programming and data management, it seems clear that future research in this line will benefit more from them.

Currently, there is no knowledge of what inter-EORG structures might look like at the regional and local levels, let alone the overall network structure when all the EORGs at those three different levels were aggregated. Future research might include EORGs at the regional and local levels in analysis for a complete understanding of the movement structure. In addition, future research may include other types of organizations such as trade associations, corporations, labor unions other than EMOs and EGAs since they also play vital roles in EMS in the United States.

It was not clearly shown what structural mechanisms have brought about the contemporary litigative structure, though it aimed to investigate the structural dynamics thereby dyadic and triadic substructures emerged over time. As a result, to a large extent, the current work had to be satisfied with describing the network dynamics rather than explaining it. The current work points to the consideration of more systematic models (e.g., "actor network utility"; Doreian, 2005) beyond the models of "triadic completion." Recent advances in structural theorization, methodological approaches, and computer packages will help discover the structural mechanisms (Doreian and Stokman, 1997; Hedstrom and Swedberg, 1998; ICS, [2002] 2007).

## 6.5 Summary

This chapter has investigated how organizational and relational characteristics have associated with each other in the structural dynamics of the litigative structure and how the litigative structure has evolved over time in the EMS in the United States since 1970. A longitudinal analysis of the environmental lawsuit ties in the United States showed the findings such as the following: First, environmental litigation was used by the EMOs regardless of their expressed strategies or organizational characteristics until the early 1990s. And yet, after the mid 1990s on, young EMOs with limited resources tended to use litigation more actively while old EMOs tended to turn to diversify movement activities, though they were still actively involved in legal activities. Second, most lawsuits were filed by EMOs against EGAs, which made the development of the transitive dominance structures infrequent. The litigation structure was closed by the EGAs in legal disputes rather than by the EMOs, which suggests that the transitive dominance structures emerged in part due to the organizational type rather than the pure "bystander effect". Third, the cross-sectional litigative structure for the entire period was mostly connected, except for the two sets of isolated dyadic ties, and hierarchical–few EGAs were being attacked by most EMOs. The findings provide more structural knowledge of the contemporary movement structure beyond the literature that noted a simple increase in conflicts and litigation within the movement sector. The fact that many EMOs were sharing common movement opponents suggested a possibility for future collective action. For example, resources (e.g., finance, labor) may be mobilized and movement activities (e.g., advancing claims) may be coordinated between the EMOs that have common movement opponents.

# Chapter 7

# Movement Dynamics: Alliance Structure

While Chapter 6 characterized the environmental movement as the conflict movement and analyzed the conflictual structure of the movement sector in the United States, the environmentalist organizations (EORGs) have not been engaged in the conflictual relationships alone. They have cooperated in various forms of alliances. As presented in Chapter 2, scholars pointed out the structural changes due to the expansion of alliances for both mobilization and protest in contemporary social movements. This chapter focuses on the structural dynamics in environmental alliances among the environmental movement organizations (EMOs).

In reality, however, EMOs are in basic competition because they share, to a greater or lesser extent, the same adherent pools, both individual and institutional. Thus, it appears that scholars in social movements share the same idea that a variety of EMOs or groups compete with each other for resources, control, and legitimacy. The competitive relations among the EMOs may turn to either antagonistic attacks or cooperative relations depending on the circumstances. Basically, the EMOs ought to cooperate in goal accomplishment because they seek similar goals. There have been a number of factors that serve to facilitate and shape cooperation among EMOs: task specialization (i.e., similar conceptions of goals and tactics), external social control, overlapping constituents (i.e., interlocking boards or memberships), and elite/third-party constraints (Brulle, 2000). Inter-EMO cooperation takes the forms of alliances, cartels, federations, and mergers.[49]

This chapter investigates the movement dynamics in the EMS with regard to alliances between the EORGs at the national level in the EMS in the United States, 1970-2001. It focuses on the increased alliances between the EORGs since 1970 when modern environmental social movement took off in the United States. The research questions that this chapter addresses are: "In what ways have the organizational characteristics been associated with alliance formation in the environmental movement sector (EMS) in the United States since 1970?" [Q1b] "Under what conditions have triadic collaborative movement structures been formed in the environmental movement sector (EMS) in the United States since 1970?" [Q2b] and "What are the structural characteristics (e.g., connectedness, balance, and hierarchy) of the contemporary movement structure that has emerged in the environmental movement sector (EMS) in the United States since 1970?" [Q4].

To answer these questions, the following sections will explore the alliance structure within the movement sector and investigate the longitudinal dynamics of the inter-EORG alliance ties by using, first, an exponential random graph model (ERGM) or p* logit model (Frank and Strauss, 1986; Strauss and Ikeda, 1992; Wasserman and Pattison, 1996; Crouch and Wasserman, 1998) and, second, strategic actor models introduced in Chapter 2 (Burt, 1992; Doreian, 2004). An investigation of the structural dynamics of the environmental alliances will help us not only understand the

[49] In a general context, alliances have been studied in social sciences in relation to varied topics including general theory, innovation, culture, collective action, management, and uncertainty. In organizational theory, they have been studied in terms of both inter-organizational and intra-organizational contexts.

contemporary EMS but also predict the structural consequences in the EMS in the United States.

## 7.1 Alliances for Opposition

Organizations have been involved in alliances with other organizations in the environment to overcome unfavorable conditions and effectively mobilize resources. By definition, organizational environment refers to the interface or interconnections between organizations and their environments–resources, organizational population, institutions, technological uncertainty, and so on. That is, in achieving the judicial and extrajudicial purposes, alliances have been widespread between the EMOs that were relatively disadvantaged. As discussed above, Handler (1978) notes that there have been a number of factors that serve to facilitate alliances among EMOs: task specialization (i.e., similar conceptions of goals and tactics), external social control (e.g., norms, resources), overlapping constituents (i.e., interlocking boards, memberships), and elite/third-party constraints.

While the environmental movement in the United States in the 1980s depended on market forces and negotiation with business and government as tools to preserve environmental goals, since then, a number of EMOs, chiefly those operating at the national level, sought to develop new skills and tactics.[50] They were in response to the counterattack from Corporate America, which had been caught off guard by the militant environmentalism that emerged in the 1960s and the 1970s. Their chief tools were litigation among other strategies and later lobbying for legislation designed to protect the

[50] According to Shabecoff (2000), this characterizes the "third-wave" of American environmentalism.

environment. They took the battles to the courts to try to enforce the new environmental laws and to defend citizens threatened by environmental degradation.

### 7.1.1 Collective Action: Alliances and Coalitions

Alliances and coalitions in social movements have occurred in varied forms: educational programs, protests, campaigns, press conferences, online activities, publications, and so on. Alliances and coalitions between SMOs is a form of collective action that has often occurred and yet often understudied in the study of social movements. As collective action occurs in varied forms, so do the alliances and coalitions themselves in social movements: for example, an umbrella organization with membership SMOs, a joint project among participating SMOs, and so on. Alliances and coalitions as collective action allow the participating SMOs to be exposed to similar experiences and further coordinate strategies for future movement activities. Investigating under what conditions SMOs join alliances and coalitions will help better understand the structural organization of the social movement sector.

Depending on the movement circumstances, temporary alliances between SMOs can develop into longer lasting coalitions. For the past decades, there have been multiple environmental coalitions in the EMS in the United States. Table 7.1 lists a few examples including the "*Wise-Use*" group, the *Townhall*, the *Project Relief*, the *Turning Point Project (TPP)*, and the *Activist Cash*. As shown, environmental coalitions have been formed by both mainstream (pro-environmentalist) and conservative (anti-environmentalist) camps in the EMS since the 1980s. Looking at the table, in fact, the coalitions formed by the conservative EMOs outnumber those by the mainstream EMOs.

Coalitions formed exclusively by the radical EMOs (e.g., Earth First!) have not been found, though the radical EMOs have joined the coalitions formed by the mainstream EMOs.

The first environmental coalition in the table is the "*Wise-Use*" formed by conservative organizations in 1988. The "*Wise-Use*" is a loose affiliation of activists inspired by the work of Ron Arnold, a vice-president of the *Center for the Defense of Free Enterprise (CDFE)*. The coalition's goals are to increase what they see as responsible commercial use of public lands for uses such as timber, mining, and oil, and to open recreational wilderness areas for easier access by the general public.[51]

Pro-environmentalist coalitions were also noticeable during the period, of which the *Turning Point Project (TPP)* is particularly notable. The *Turning Point Project (TPP)* was formed by the 99 mainstream and radical EMOs to campaign pro-environmentalist causes in 1999. The participating EMOs included a few labor unions and trade associations that endorsed the advertisements. As a coalition of pro-environmentalist movement organizations (pro-EMOs), the *Turning Point Project (TPP)* published a series of 25 educational advertisements in *The New York Times*. The 25 educational advertisements were classified in five categories in which each category had four to six advertisements.

[51] The "wise-use" groups contrast with free-market environmentalists in that the latter is associated with libertarian political views and efforts to protect the environment through private initiatives such as land trusts. Critics believe that the "wise-use" groups may be more accurately called anti-environmentalist.

Table 7.1: Selected Environmental Coalitions

| Coalition | Year | Membership | Key Player | Orientation |
|---|---|---|---|---|
| Wise-Use | 1988 | 200 | Center for the Defense of Free Enterprise (CDFE) | Conservative |
| Townhall | 1991 | 135 | Heritage Foundation | Conservative |
| Project Relief | 1994 | 350 | Environmental Working Group (EWG) | Conservative |
| *Turning Point Project* | 1999 | 108 | Turning Point Project (TPP) | Mainstream/ Radical |
| Activist Cash/ Undue Influence | 2000 | 200 | Center for Consumer Freedom (CCF)<br>Center for the Defense of Free Enterprise (CDFE) | Conservative |

Note: Membership indicates the number of member organizations.

## 7.2 Methods, Data, and Hypotheses

The statistical network methods used in this chapter are three fold: (*a*) describing tie distribution (network size, density, centralization, clustering coefficient, transitivity, and centrality), (*b*) partitioning network structure into a set of positions of equivalent EMOs, and (*c*) estimating tie probability by using exponential random graph models (ERGM or p-star) to examine what EMOs have formed partnership ties with each other. The data include only environmental movement organizations (EMOs) operating at the national level and the inter-EMO alliance relations in the United States for the period, 1970-2001. Of the hypotheses presented in Chapter 1, the following will be test in this chapter:

**Hypothesis 1b.** "The environmental movement organizations (EMOs) with similar organizational characteristics–in particular, action areas and strategies–have cooperated with each other for litigation in the environmental movement sector (EMS) in the United States since 1970." [H1b]

**Hypothesis 2b.** "The environmental movement organizations (EMOs) located in the positions that are strategically disadvantageous have been more likely than others to cooperate with other EMOs in the environmental movement sector (EMS) in the United States since 1970." [H2b]

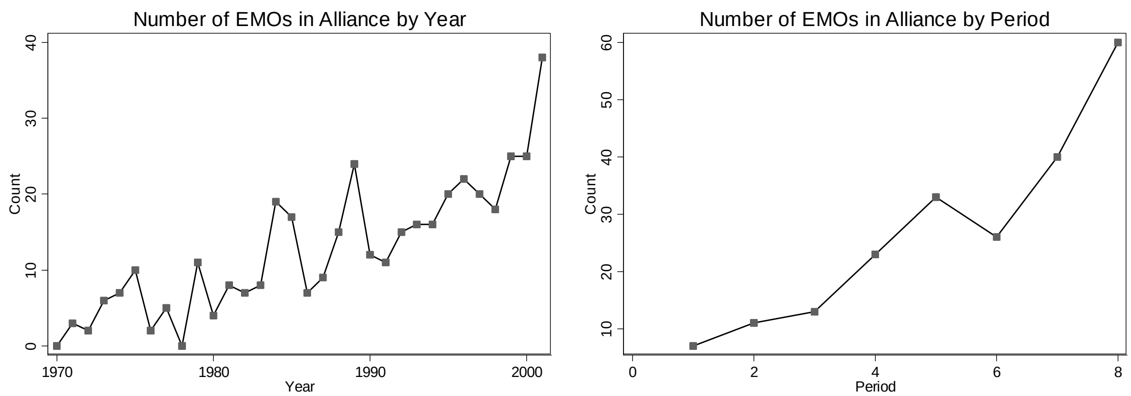
**Hypothesis 4.** "The contemporary movement structure in the environmental movement sector (EMS) in the United States can be characterized as disconnected, decentralized, and yet balanced." [H4]

## 7.3 Emergence of Alliance Structure

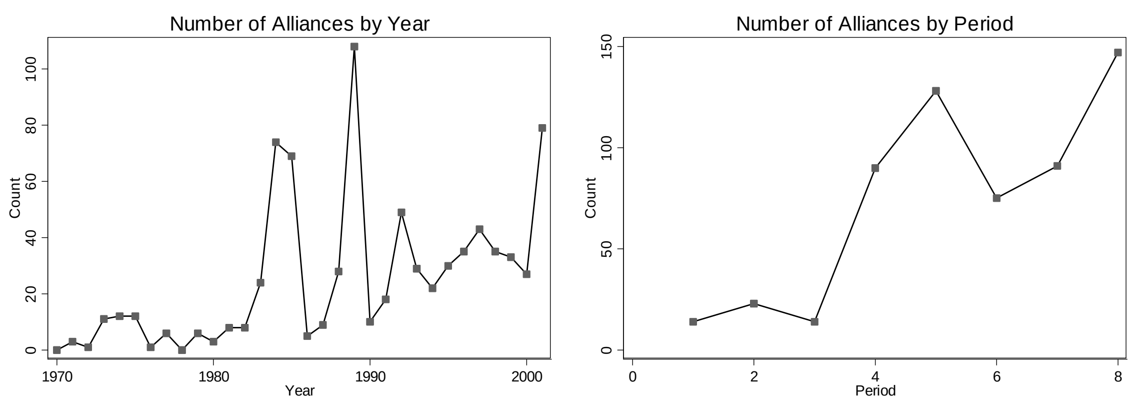
Now, this section investigates the structural dynamics of the inter-EMO alliance relations thereby the contemporary inter-EMO alliance structure has emerged from a generative structural perspective (Epstein and Axtell, 1997; Fararo and Butts, 1999). In what follows, investigation will be done in two steps: (*a*) network analysis of degree distribution in eight consecutive periods and (*b*) statistical network analysis of the association between the organizational attributes and alliance ties in the entire cross-sectional period by using a exponential random graph model or p* logit model. The findings from these analyses will be used to discuss the structural dynamics of the EMS in Section 6.5.

### 7.3.1 Description of Change

Figure 7.1 displays the increase in the number of EMOs that formed alliances for joint litigation by period and the increase in the number of alliance ties by period, respectively. As shown, both the number of EMOs and the alliance ties have increased considerably throughout the period despite some fluctuations in the process. The number of EMOs has increased relatively steadily across the periods compared to the number of alliance ties as the latter increases exponentially as the former increases. In the first period (1970-1973), only seven EMOs formed fourteen alliance ties among them. The overall pattern of increase fluctuated with peaks in the third (1978-1981) and the fifth period (1986-1989) and the valleys in the following periods (1982-1985; 1990-1993). The downturns in the two periods–particularly, in the early 1990s–may reflect more fundamental changes (e.g., legislation, counter movement) in the EMS. Yet, 60 EMOs formed 147 alliance ties in the final period (1998-2001), which is the highest in the entire period.




(a)




(b)

Figure 7.1: Increase in EMOs in Alliances (a) and Alliance Ties (b)

A look at the degree distribution of the alliance networks provides a better understanding of the structural-relational dimension of the EMS. Table 7.2 summarizes the investigation of the degree distribution of the alliance networks in eight periods: network size, mean degree, network density, and network centralization. As shown above, as the network size has increased steadily, mean degree to measure the average degree of the EMOs skyrocketed during the fourth and fifth periods (1978-1981; 1982-1985). On average, each EMO was maintaining approximately eight partners at the same time during those periods, though the number of partners has reduced since then. As the network has expanded, network density and centralization have decreased significantly throughout the period.

Table 7.2: Degree Distribution in Alliance Networks

| Period | Year | Network Size | Mean Degree (Std.) | Network Density | Network Centralization |
|---|---|---|---|---|---|
| I | 1970-1973 | *A* (7, 14) | 4.00 (1.07) | 0.67 | 46.67% |
| II | 1974-1977 | *A* (11, 23) | 4.18 (2.29) | 0.42 | 46.67% |
| III | 1978-1981 | *A* (13, 14) | 2.15 (1.23) | 0.18 | 28.03% |
| IV | 1982-1985 | *A* (23, 90) | 7.82 (4.50) | 0.36 | 50.65% |
| V | 1986-1989 | *A* (33, 128) | 7.76 (5.05) | 0.24 | 20.77% |
| VI | 1990-1993 | *A* (26, 75) | 5.77 (4.34) | 0.23 | 48.67% |
| VII | 1994-1997 | *A* (40, 91) | 4.55 (4.27) | 0.12 | 44.40% |
| VIII | 1998-2001 | *A* (60, 147) | 4.90 (4.20) | 0.08 | 33.49% |
| Total | 1970-2001 | *A* (105, 411) | 7.83 (8.29) | 0.07 | 40.36% |

Note: *A* (7, 14) indicates an alliance network composed of 7 vertices interconnected through 14 edges.

In parallel with the generative structural processes, the substructures in the alliance network have also evolved and investigating them provides an identification of subsets of the EMOs that may have similar attributes and/or play similar roles (Lorrain and White, 1971). Table 7.3 below summarizes the changes in clustering coefficients and cliques throughout the period. The measures of clustering coefficient have maintained at the similar level, which implies that the EMOs have actively formed cohesive subgroups despite the overall expansion of the network. Investigation of cliques provides a more concrete view of the substructures. By definition, a clique is a maximally complete subgraph. Thus, basically, all the EMOs that prepared litigation together belong to the same clique. The number of cliques has increased considerably while the average EMOs in cliques have fluctuated over time. For example, in the first period, there were four cliques found. That is, four groups of EMOs jointly filed lawsuits and, on average, 3.50 EMOs belonged to a clique. A significant change occurred in the fourth period when the number of cliques reached nine with an average of 5.89 EMOs in a clique. The number of cliques reached the highest of 26 in the final period, though average number of EMOs (4.12) in a clique has not changed as such. There have been partners that have belonged to the same cliques over time. For example, the Sierra Club (SC)–National Audubon Society (NAS) alliance and the Sierra Club (SC)–Natural Resources Defense Council (NRDC) alliance have been consistently found throughout the entire period.

Table 7.3: Substructure in Alliance Networks

| Period | Year | Network Size | Clustering Coefficient | Cliques |
|---|---|---|---|---|
| I | 1970-1973 | *A* (7, 14) | 0.73<br>(0.65*) | 4<br>(3.50**) |
| II | 1974-1977 | *A* (11, 23) | 0.78<br>(0.62) | 4<br>(4.25) |
| III | 1978-1981 | *A* (13, 14) | 0.44<br>(0.35) | 3<br>(3.00) |
| IV | 1982-1985 | *A* (23, 90) | 0.85<br>(0.68) | 9<br>(5.89) |
| V | 1986-1989 | *A* (33, 128) | 0.80<br>(0.91) | 9<br>(4.78) |
| VI | 1990-1993 | *A* (26, 75) | 0.82<br>(0.57) | 10<br>(5.00) |
| VII | 1994-1997 | *A* (40, 91) | 0.68<br>(0.40) | 19<br>(4.05) |
| VIII | 1998-2001 | *A* (60, 147) | 0.63<br>(0.48) | 26<br>(4.12) |
| Total | 1970-2001 | *A* (105, 411) | 0.74<br>(0.45) | 65<br>(4.97) |

Note: 1. *Weighted overall graph clustering coefficient
2. **Average size of the cliques, which is the average number of EMOs in a clique

### 7.3.2 Formation of Alliance Ties

Thus far, I have described the processes by which the contemporary alliance structure has emerged over eight consecutive periods in the EMS in the Untied States. Now, I move onto explaining the relationships between the EMOs' attributes and the ways in which they are tied to each other. The investigation in this section will be carried out for the cross-sectional alliance structure for the entire period shown in Figure 7.5 below since the longitudinal data for the entire EMOs' attributes are not available. In search of the conditions under which the EMOs have formed alliances, I employ an exponential random graph model (ERGM) or p* logit model to estimate the extent to which the differential attachment (as apposed to random attachment) is contingent on the characteristics of the attached EMOs and the characteristics of the configurations of the alliance network.

The parameter estimation was done in *MultiNet* (Richards and Seary, [1999] 2006).[52] While most network programs perform one or another type of structural analysis, *MultiNet* does contextual analysis: for example, it looks at the EMOs' attributes in the context of the relationships between them, and it looks at the characteristics of relationships between the EMOs in the context of their attributes. *MultiNet* currently allows fitting to the fifteen (non-null) triads described by Frank and Strauss (1986) and Pattison, Robins, and Wasserman (1999) and adds the blockmodel parameters described

[52] *MultiNet* (Richards and Seary, [1999] 2006) is a data analysis package that can be used for ordinary data and for network data. *MultiNet* uses sparse methods throughout. The sparse matrix implementation of p* is based on the simple observation that all of the triad change statistics can be calculated for each node independently. The program finds fits at a number of probability levels (default: P=0.5). The current Multinet implementation allows p* fit only to the dependency graphs that are well-understood and fortunately the logistic regression loop which finds p* fit parameters uses a Newton-Raphson algorithm. An earlier text-based DOS program called *PSPAR* (Seary, 1999). For mechanics of p* fitting in *MultiNet*, see Seary and Richards (1999).

in Wasserman and Pattison (1996). The fifteen parameters are Edges (Choice), REdges (Mutuality), 2Stars (Out-star, In-star, Mixed-star), Triads (Transitivity, Cyclicity), and R2Stars (R*2Stars, R*Triads) (inside the parentheses are the parameters used in other p* literature). This section employs *MultiNet* to fit Edges (Choice), 2Stars (Out-star), and Triads (Cyclicity), which are only relevant in undirected networks, to triad counts with blocking based on the EMOs' attributes.

*MultiNet* allows for block-modeling by using the EMOs' attribute information in the Node variables.[53] It permutes the adjacency display by the value of "Orient". As shown, the EMOs' attributes are related to the alliance ties because the dots are positioned inside the blocks on the diagonal rather than off the diagonal. I have chosen all Node variables one at a time and then allowed *MultiNet* to fit to the subsets of actors (not to the whole network) that share certain Node variables–thus, simple blocks vis-à-vis complex blocks. In simple blocks, *MultNet* assumes, by default, that an attribute will be used to define a simple cohesive block structure. This block structure assumes that any pair of EMOs sharing the same ideological orientation are considered as belonging to the same block. Since there is only one type of block (with value 1), any pair of EMOs with the same ideological orientation are counted together–for example, "Choice within Blocks".

Figure 7.2 displays the p* results with the tie distribution after permuting based on Node variable "Orient". On the left of the matrix are analytic information that

[53] The recent development of p-star methods (Wasserman and Pattison, 1996) provides a valuable confirmatory tool for evaluating and comparing the blockings produced by the eigenspace methods available in *MultiNet*. If we can assume a Chi-squared distribution with degrees of freedom equal to the difference in the number of parameters, then the 4-parameter blocking model is significantly better (than the 2-parameter model without blocking). While the simple block method may be sufficient for fitting to global and "within block" effects, some models may also require "between blocks" effects as well.

includes: (*a*) the Link (network) variable, (*b*) the Node (attribute) variable (in this case "Orient"), (*c*) the permutation state (in this case "ON"), and (*d*) the value of -2*Log Pseudolikelihood for this fit.[54] As shown, there are 104 EMOs in 814 alliance ties and the -2*Log Likelihood is 2630.246. The matrix permuted based on "Orient" reveal significant patterns of ties between the EMOs in similar ideological orientation in the same blocks. For complete graphs, refer to Appendix C. The dots inside the matrix represent three kinds of alliance ties: (*a*) green: an alliance exists and was successfully predicted at the selected probability level (default is P=0.5), (*b*) blue: an alliance exists but was not successfully predicted (False Negative), and (*c*) red: an alliance does not exist but was falsely predicted (False Positive).

Similarly, the network crosstabulation below the model fit summarizes the "OBSERVED" link in the rows and the "PREDICTED" links in the columns. The cells represent the following: (*a*) the total unobserved (and unpredicted) alliances in grey, (*b*) the total number of false negative in blue, (*c*) of false positives in red, and (*d*) of correctly predicted alliances in green. The total number of observed alliances is in black with the percentages (of this total) of false negatives in blue and correct predictions in green. The total number of predicted alliances is in black and percentages (of this total) of false positives in red and correct predictions in green. As shown, of 531 PREDICTED ties, 475 ties (89.5%) were actually observed while leaving 56 ties (10.5%) unobserved. Table 7.4 provides the output in more detail and further parameter estimation when the three (1, 3, 6) of 15 parameters relevant in symmetric networks such as in alliance network were included.

[54] -2*Log Pseudolikelihood is the most important result for evaluating the fit in the p-star literature. One goal of p* fitting is to get the lowest such value with the fewest parameters.

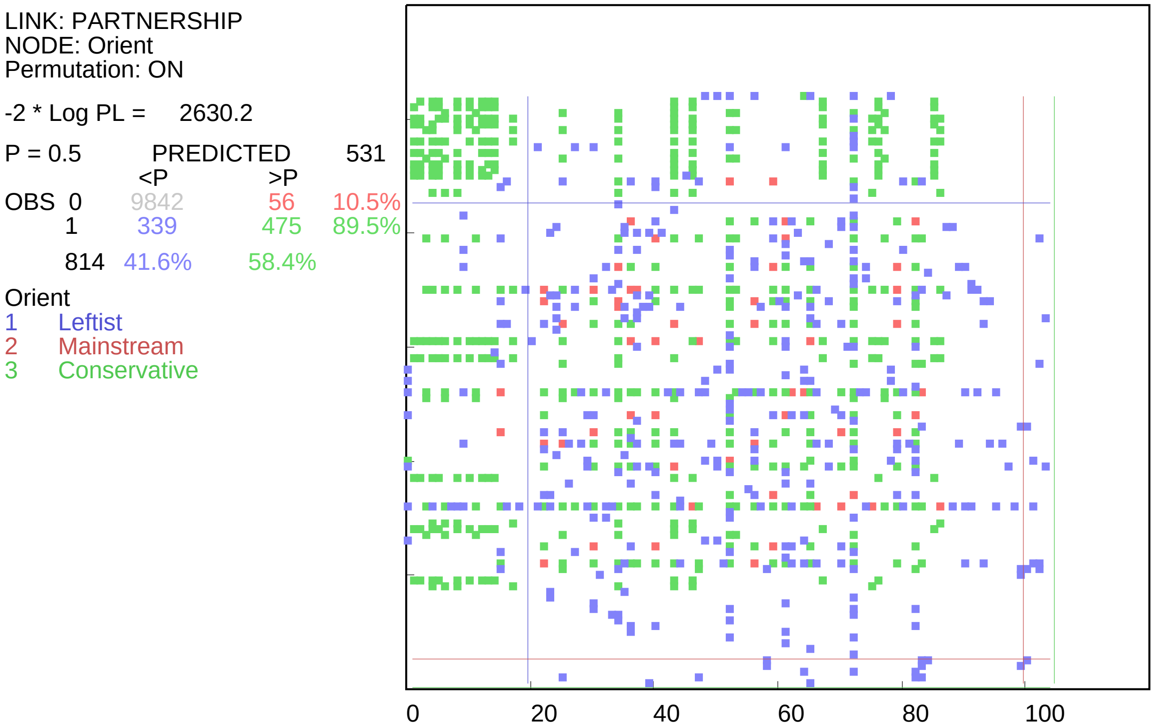



Figure 7.2: p* Fitting (permuted by Orientation)

Table 7.4: p* Fitting with Variable “Orientation”

```
LINK: "PARTNERSHIP"  LINKS =    814  NODES =  104  (DIAGONAL NOT INCLUDED)
NODE = "Orient "
BLOCKING
   1   0   0
   0   1   0
   0   0   1

 -2 Log PseudoLikelihood =             2630.246
         Goodness of Fit =             9407.740
       Model Chi-squared =            12219.739     df = 6

FIT AT P = 0.5                          RESIDUALS
               PRED            531
            <P   ¦   >P                 Absolute =          667.422
         ------------------             Squared  =          336.636
      0 ¦     9842¦      56  10.5%
OBS     ¦--------¦--------  -----
      1 ¦      339¦     475  89.5%
        ¦        ¦
814     ¦    41.6%¦    58.4%

PARM  BLOCK      b    "Std.Err"    PLWald    p(df=1)    exp(b)    Counts    Errors
  1     1     1.0303    0.2534    16.5294    < 0.01     2.80        566    0.00000
  3     1     0.0270    0.0141     3.6596    < 0.10     1.03       9020    0.00000
  6     1    -0.0999    0.0222    20.2238    < 0.01     0.90      11046    0.00000
```

Table 7.5 summarizes the model properties for all organizational attributes. As shown, the models (-2*Log Pseudolikelihood) improved as Node variables were included compared to the models without Node variables. Including orientation, region, area, size, strategy, and age in order of magnitude substantially improved the models. Model improvement was computed by considering the differences between the -2*Log Likelihood without attributes (2669.7) and those with attributes. Now, we have evidence that the EMOs with similar attributes tended to form alliance ties with each other. Particularly, the EMOs that were similar in terms of orientation were most likely than others to form alliance ties with each other.

Table 7.5: Model Properties

| Attributes / Parameters | None | Orientation | Region | Area | Size | Strategy | Age |
|---|---|---|---|---|---|---|---|
| -2 Log PseudoLikelihood | 2669.7 | 2630.2 | 2639.6 | 2646.2 | 2656.6 | 2663.8 | 2666.2 |
| Goodness of Fit | 9255.7 | 9407.7 | 9435.1 | 9217.5 | 9515.1 | 9375.0 | 9320.3 |
| Model Chi-squared | 12180.3 | 12219.7 | 12210.3 | 12203.8 | 12193.4 | 12186.2 | 12183.8 |
| Df | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

Table 7.6 summarizes parameter values, Wald statistic, and p-value from p* fitting for the entire period, although *MultiNet* reports other important results including -2*Log Pseudolikelihood, Goodness of fit, and model Chi-square. The results show the following outcomes: First, with respect to "edges" (i.e., mutuality), since the estimated edges parameters are positive for orientation, region, area, and size, the probability that an alliance is present between two distinct EMOs **i** and **j** is larger than the probability that it is absent in the one block where the EMOs are similar in those organizational

attributes, while holding all other effects constant in the model (significant at $\alpha$=0.10). That is, the EMOs with similar orientation, region, area, and size tended to form alliance ties ("edges" or "mutuality", **i↔j**) with each other.

Second, with respect to "2-stars", since the estimated 2-stars parameters are positive for orientation and strategy, the probability that alliances are present versus absent among three distinct EMOs **i**, **j**, and **k** can be explained by the popularity or expansiveness of the focal EMO **i** in the one block where the EMOs are similar in those organizational attributes. In contrast, the estimated 2-stars parameter is negative for region, which indicates that the probability that alliances are present among three distinct EMOs **i**, **j**, and **k** cannot be explained by the popularity or expansitiveness of the focal EMO **i**. That is, the EMOs tended to "expand" alliances to the EMOs similar in orientation and strategy ("popularity" or "expansiveness", **j↔i↔k**).

Finally, with respect to "Triads", since the estimated triads parameters are negative for orientation and size, the probability that alliances are absent versus present among three distinct EMOs **i**, **j**, and **k** can be explained by the tendency of triadic closure by the focal EMO **i** in the one block where the EMOs are similar in those organizational attributes. That is, the EMOs tended not to "close" the alliances with the EMOs similar in orientation and size ("triads" or "closure", **i↔j, j↔k, i↔k**).

Overall, the EMOs similar in orientation, region, area, and size tended to form alliances with each other. Moreover, the EMOs tended to maintain alliances simultaneously with others similar in orientation and strategy. However, the EMOs tended not to close the triadic alliance structure when they are similar in orientation and size. The other twelve network configurations could not be considered in analysis because the statistics were linearly dependent when they were included.

Table 7.6: Estimation of Model Parameters

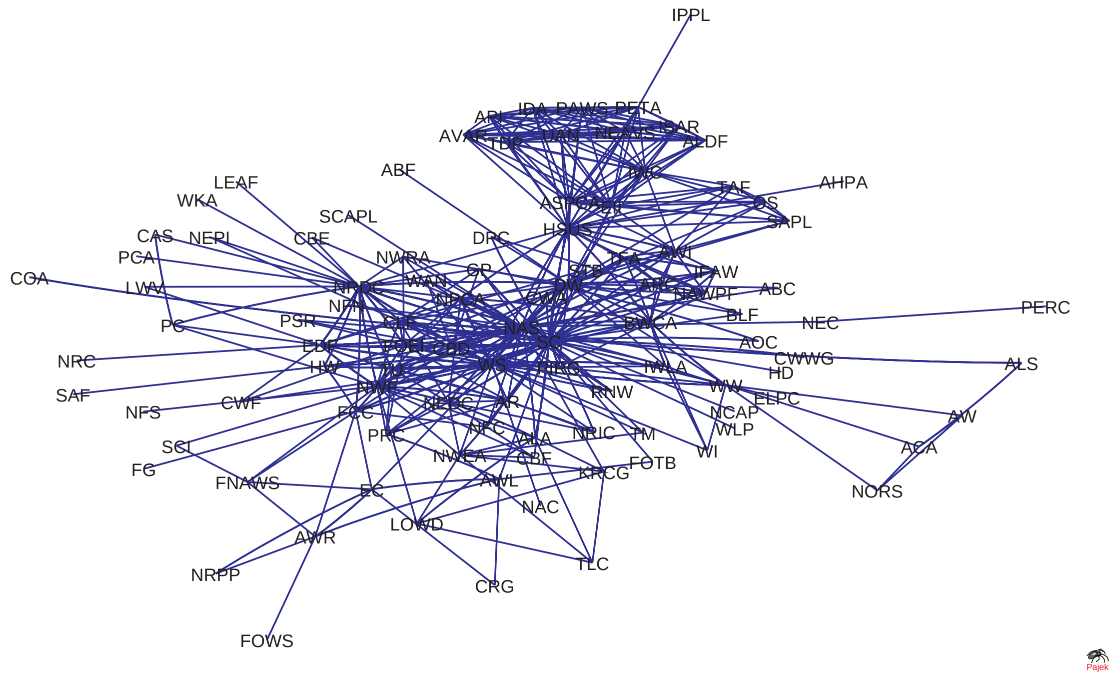
| Attributes / Parameters | Orientation | Region | Area | Size | Strategy | Age |
|---|---|---|---|---|---|---|
| Edges (1) b<br>Wald<br>P(df=1) | 1.0303**<br>16.5294<br>< 0.01 | 0.8942**<br>20.3820<br>< 0.01 | 0.7861**<br>14.5306<br>< 0.01 | 0.8025**<br>5.6563<br>< 0.02 | -0.2121<br>1.0402<br>> 0.10 | 0.2376<br>1.1537<br>> 0.10 |
| 2Stars (3) | 0.0270*<br>3.6596<br>< 0.10 | -0.0195**<br>2.9636<br>< 0.10 | -0.0186<br>2.2055<br>> 0.10 | 0.0223<br>1.1550<br>> 0.10 | 0.0227*<br>2.9293<br>< 0.10 | -0.0130<br>0.9707<br>> 0.10 |
| Triads (6) | -0.0999**<br>20.2236<br>< 0.01 | -0.0108<br>0.3428<br>> 0.50 | -0.0069<br>0.1413<br>> 0.50 | -0.0684**<br>5.9123<br>< 0.02 | 0.0105<br>0.3372<br>> 0.50 | -0.0189<br>1.0078<br>> 0.10 |

Note: 1. Inside the parenthesis is the significance (*significant at α=0.10, **significant at α=0.05).
2. Standard error (SE) and exp(b) are not specified due to space.
3. Estimation of model parameters has been done within blocks.

In sum, the first hypothesis [H1b], "the environmental movement organizations (EMOs) with similar organizational characteristics–in particular, action areas and strategies–have cooperated with each other for litigation in the environmental movement sector (EMS) in the United States since 1970" was supported in the p-star analysis. The EMOs similar in organizational characteristics have formed alliance ties with each other for environmental litigation than with the EMOs dissimilar. In principle, the findings resonate with the popular rules of preferential attachment, "homophily" (McPherson and Smith-Lovin, 1987; McPherson et al., 2001). However, the EMOs similar in "orientation" and "strategy" in particular have been more active in forming alliances with each other than others, whereas the EMOs similar in size and age have not. This finding is rather counterintuitive because the EMOs will like to cooperate with large and old EMOs with abundant resources for expensive and long-lasting environmental litigation.

A preliminary observation of the cross-sectional structure of the alliance ties for the entire period before I investigate the structure in each period provides a summary view of the overall structural characteristics of the inter-EMO alliance network. From 1970 to 2001, 104 EMOs formed 411 alliance ties. As summarized in Table 7.2 above, the network was sparse (network density: 0.07) indicating that the network was open rather than closed. However, as shown in Figure 7.3, the alliance network was structured in 37 different levels of hierarchical positions (Burt, 1992). The Sierra Club (SC) (48) had the most allies followed by the National Audubon Society (NAS) (40), the Defenders of Wildlife (DW) (29) and the Humane Society of the United States (HSUS) (29) (inside the parentheses are the number of allies). Since all alliances were formed to file joint lawsuits, all EMOs that joined at least a joint lawsuit belonged to a clique.[55] However, all of them were forming a clique with the Wilderness Society (WS), the National Wildlife Fund (NWF), the Natural Resources Defense Council (NRDC), and the Friends of the Earth (FOEI).

[55] A clique is a maximally complete subgraph in which every vertex is linked directly to every other vertex.



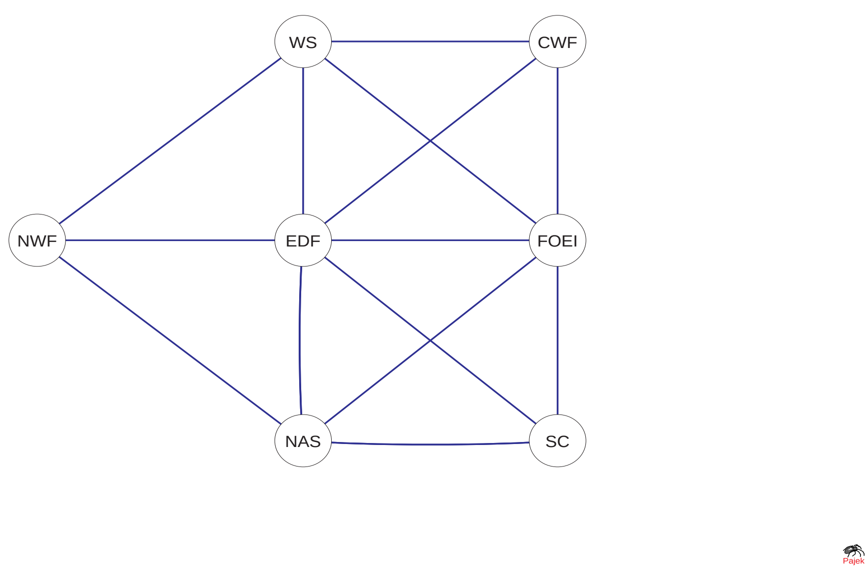

*A* (104, 411)

Figure 7.3: The Alliance Network (1970-2001)

### 7.3.3 Evolution of Alliance Structure

As was in the previous chapter, looking at the structures of the alliance networks for the periods when significant structural expansion occurred helps to better understand the patterns of the changes in alliance ties, i.e., who has partnered with whom over time. Figure 7.4 displays the structure of alliance ties for the first period (1970-1973). As shown, seven EMOs were forming fourteen alliance relations in the early 1970s. The initial network was quite small but hierarchical: (*a*) the network was structured in nine different levels of hierarchical positions and (*b*) network centralization was 46.67%. The Environmental Defense Fund (EDF) (6) had most allies followed by the Friends of the Earth (FOEI) (5), the National Audubon Society (NAS) (4), and the Wilderness Society (WS) (4).

As shown, the alliance network was quite dense–most EMOs were partnering with each other. To investigate the structural dynamics in terms of the processes thereby triadic alliance structures develop from disparate dyadic alliances, I observed how triadic alliance structures were closed depending on the alliance forming activities of the EMOs that were taking constrained and unconstrained positions (Burt, 1992; 2001).[56] The Environmental Defense Fund (EDF) (network constraint measure: 0.503) was most constrained whereas the Sierra Club (SC) (0.664) and the Canadian Wildlife Federation (CWF) (0.664) were least constrained in terms of the nature of the investment, which indicates that the latter is heavily invested in other EMOs that are in turn heavily invested in other EMOs whereas the latter is scarcely invested in other EMOs. Thus, the focal EMO is heavily constrained by other EMOs directly and indirectly whereas the others are not.




*A* (7, 14)

Figure 7.4: Alliance Network (Period I: 1970-1973)

[56] Scholars have discussed how a network is closed in a triadic structure by the strategic actors attempting to enhance the benefits that the positions they are occupying provide (Burt, 2001; Doreian, 2004).

Figure 7.5 displays the structure of alliance ties for the second period (1974-1977). As shown, eleven EMOs were forming 23 alliance relations in the mid 1970s. The network structure was quite hierarchical: (*a*) the network was structured in nine different levels of hierarchical positions and (*b*) network centralization was 46.67%. The Environmental Defense Fund (EDF) (8) had most allies followed by the Natural Resources Defense Council (NRDC) (7), the Sierra Club (6), and the Friends of the Earth (FOEI) (6).

As was done for the first period, I observed how triadic alliance structures were closed depending on the alliance forming activities of the EMOs. In comparison with the first period, the Environmental Defense Fund (EDF) that was most constrained in the first period remained being involved in the same number of triads (8 triads) whereas the Sierra Club (SC), which was least constrained in the first period, became involved in more triads (5 triads) and yet the Canadian Wildlife Federation (CWF), which was also least constrained, disappeared.[57] In this period, the Natural Resources Defense Council (NRDC) (0.365) was most constrained whereas the Project on Clean Air (PCA) (1.000) and the U.S. Public Interest Research Group (PIRG) (1.000) were least constrained.

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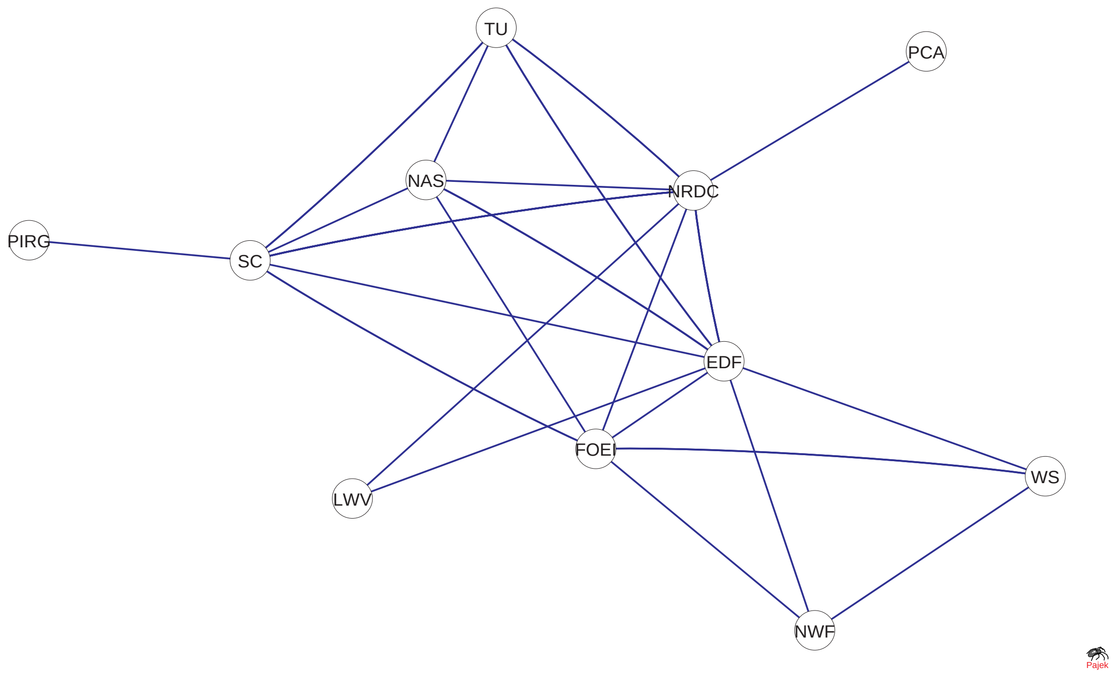
[57] The "structural hole" measures compute several measures developed by Ron Burt (1992). The measures include effective size, efficiency, constraint, and hierarchy. Of the measures, the "constraint" measure measures the extent to which ego is invested in people who are invested in other of ego's alters. The "hierarchy" is the Burt's adjustment of constraint indicating the extent to which constraint on ego is concentrated in a single alter.

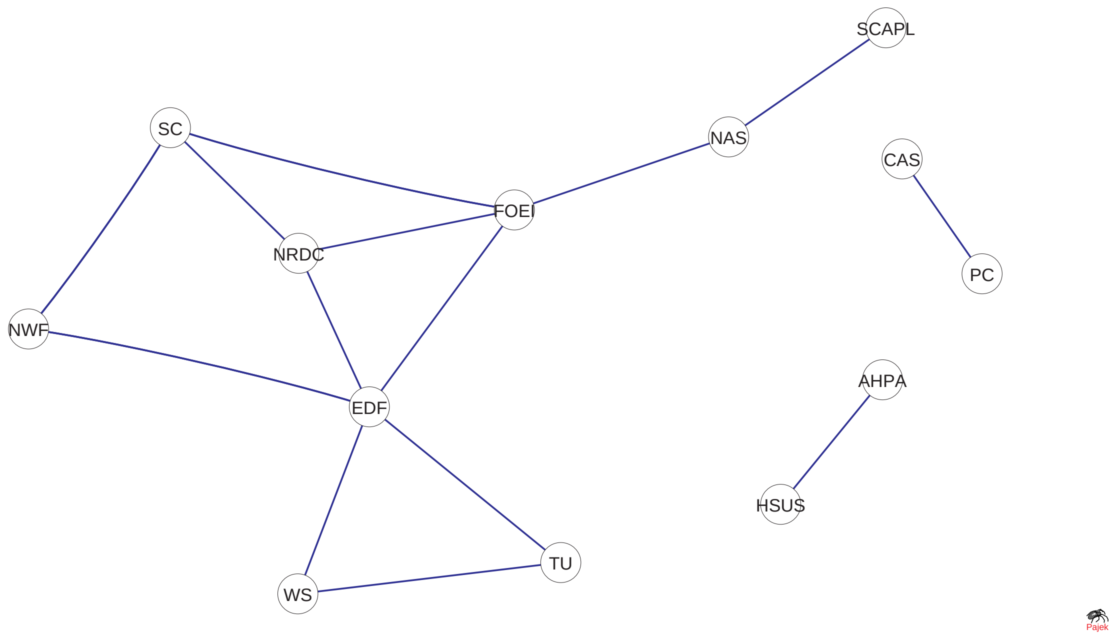



*A* (11, 23)

Figure 7.5: Alliance Network (Period II: 1974-1977)

Figure 7.6 displays the structure of alliance ties for the third period (1978-1981). As shown, thirteen EMOs were forming fourteen alliance relations circa 1980. The network structure was quite hierarchical: (*a*) the network was structured in seven different levels of hierarchical positions and (*b*) network centralization was 28.03%. The Environmental Defense Fund (EDF) (5) had most allies followed by the Friends of the Earth (FOEI) (4), the Natural Resources Defense Council (3), and the Sierra Club (3). In comparison with the second period, the Natural Resources Defense Council (NRDC) that was most constrained in the second period became involved in only two triads whereas the Project on Clean Air (PCA) and the U.S. Public Interest Research Group (PIRG) disappeared in the third period. In this period, the Environmental Defense Fund (EDF) (constraint: 0.354) was most constrained whereas five EMOs including the Humane

Society of the United States (HSUS) (1.000) (i.e., AHPA, CAS, HSUS, PC, and SCAPL) were least constrained.



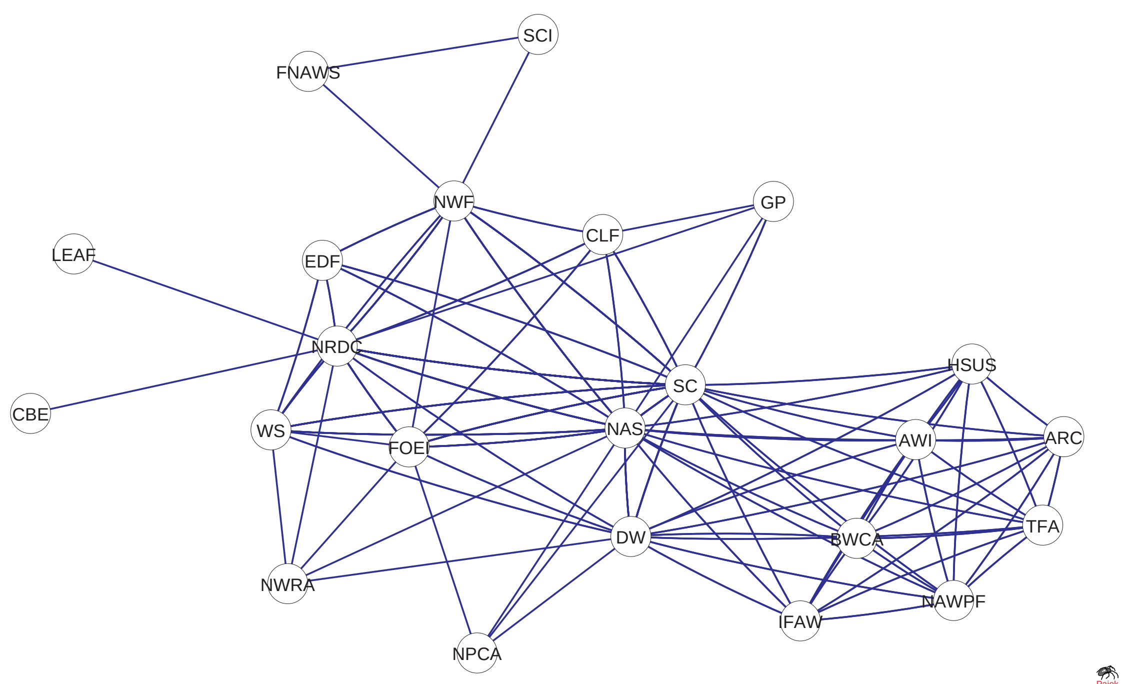

*A* (13, 14)

Figure 7.6: Alliance Network (Period III: 1978-1981)

Compared to the third period, the number of average partners skyrocketed in the fourth period (1982-1985). Figure 7.7 displays the structure of alliance ties for this period. As shown, 23 EMOs were forming 90 alliance relations in the early 1980s of which fifteen EMOs and the 82 alliances were new. Compared to the third period, network density (0.36) and clustering coefficient (0.85) doubled, which implies that the network was closed rather than open. At the same time, the network became hierarchical: (*a*) the network was structured in the twelve different hierarchical positions, which was the highest of all periods and (*b*) the network was more centralized (50.65%). The National Audubon Society (NAS) (18) was most central followed by the Sierra Club (SC) (17), the

Defenders of Wildlife (DW) (14), and the Natural Resources Defense Council (NRDC) (12).

In comparison with the third period, the Environmental Defense Fund (EDF) that was most constrained in the third period became involved in as many as eight triads whereas the EMOs that were least constrained disappeared in the fourth period except for the Humane Society of the United States (HSUS), which formed multiple triads with other EMOs. The National Audubon Society (NAS) (0.200) was most constrained whereas the Citizens for a Better Environment (CBE) (1.000) and the Legal Environmental Assistance Foundation (LEAF) (1.000) were least constrained.

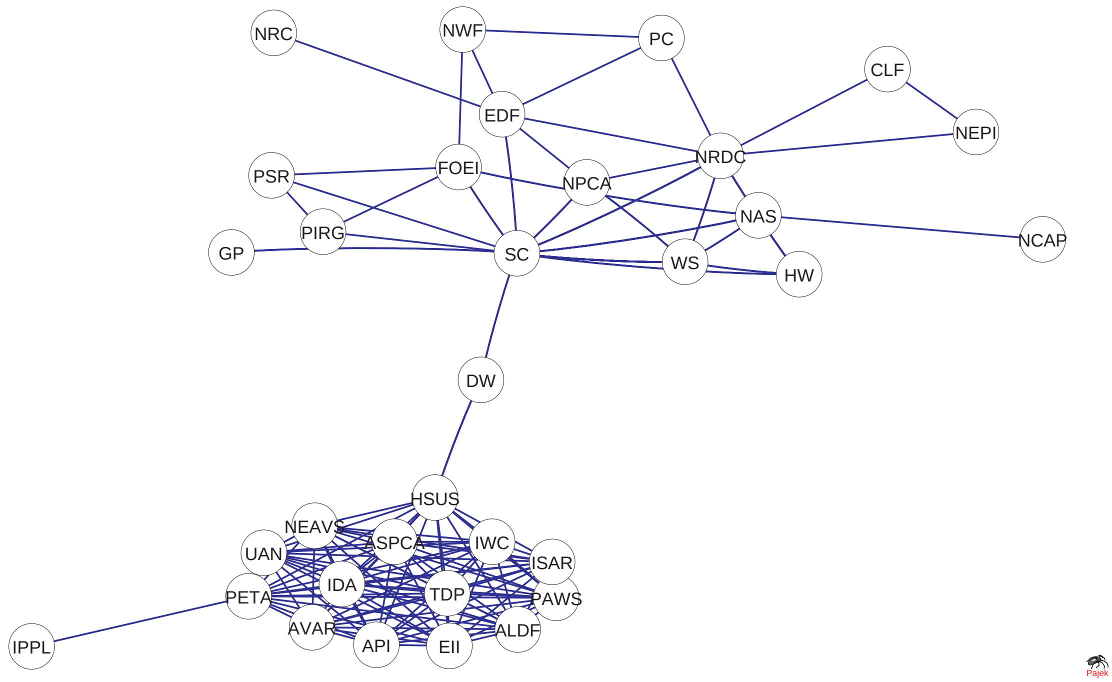



*A* (23, 90)

Figure 7.7: Alliance Network (Period IV: 1982-1985)

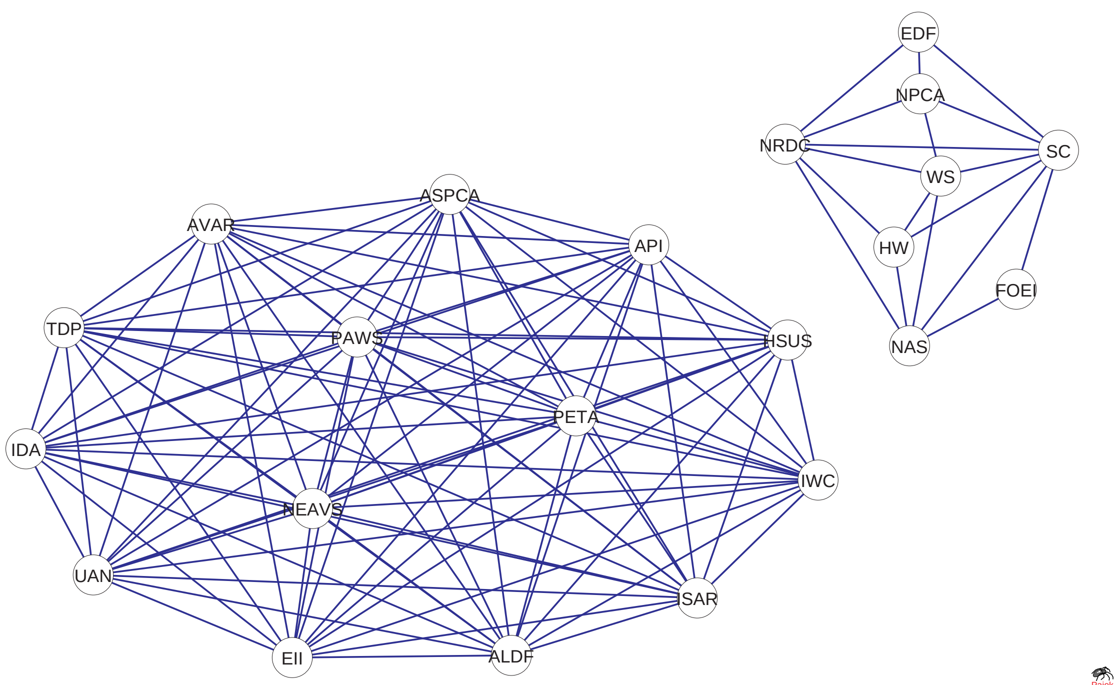
Figure 7.8a displays the structure of alliance ties for the fifth period (1986-1989). For a closer look, Figure 7.8b displays the core region (κ=4) obtained from the k-core measure of the alliance network in this period.[58] I used the k-core such that the routine selects the EMOs that have minimum degree greater than or equal to four. As shown, 33 EMOs were forming 128 alliance relations in the late 1980s. The network structure was quite hierarchical: (*a*) the network was structured in fifteen different levels of hierarchical positions and (*b*) network centralization was 20.77%. The People for Ethical Treatment of Animals (PETA) (14) and the Humane Society of the United States (HSUS) (14) had most allies followed by twelve other EMOs including the Animal Legal Defense Fund (ALDF) (13). In comparison with the fourth period, the National Audubon Society (NAS) that was most constrained in the fourth period became involved in only six triads whereas the Citizens for a Better Environment (CBE) and the Legal Environmental Assistance Foundation (LEAF) disappeared. In this period, the Sierra Club (SC) (constraint: 0.220) was most constrained whereas four EMOs including GP (1.000) (i.e., GP, IPPL, NCAP, and NRC) were least constrained.

[58] The *k*-core measure lists all *k*-cores of a graph. A *k*-core in an undirected graph is a connected maximal induced subgraph which has minimum degree greater than or equal to *k*. This procedure finds all *k*-cores for every possible value of *k* (Seidmann, 1983).




*A* (33, 128)

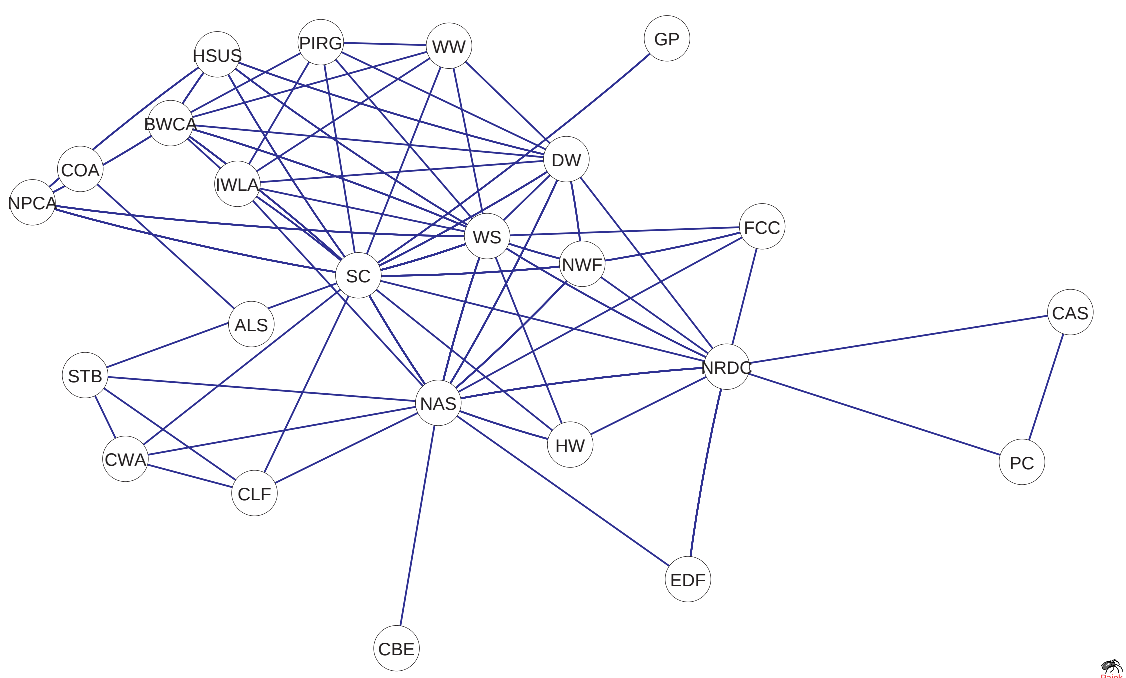
Figure 7.8a: Alliance Network (Period V: 1986-1989)




*A* (22, 109)

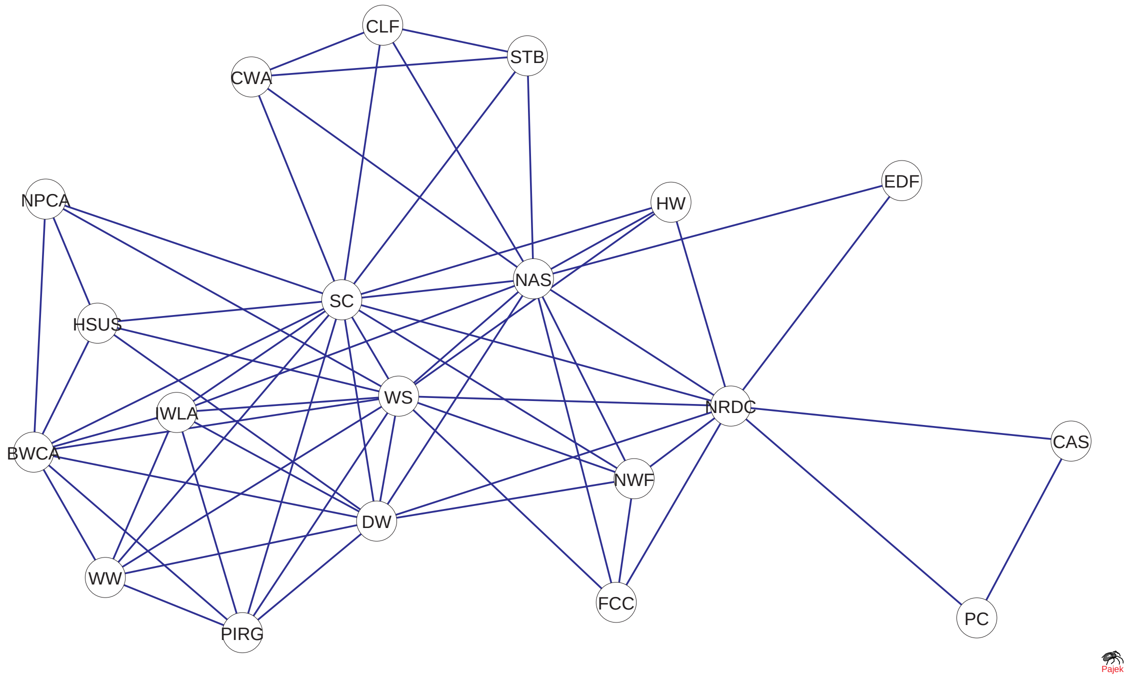
Figure 7.8b: Alliance Network (κ-core) (Period V: 1986-1989)

Figure 7.9a displays the structure of alliance ties for the sixth period (1990-1993). Figure 7.9b displays the core region (κ=2) obtained from the k-core measure of the alliance network in the sixth period. As shown, 26 EMOs were forming 75 alliance relations in the early 1990s. The network structure was quite hierarchical: (*a*) the network was structured in fifteen different levels of hierarchical positions and (*b*) network centralization was 48.67%. The Sierra Club (SC) (17) had most allies followed by the Wilderness Society (WS) (14) and the National Audubon Society (NAS) (13). In comparison with the fifth period, the Sierra Club (SC) that was most constrained in the fifth period became involved in more triads whereas the EMOs that were least constrained (i.e., GP, IPPL, NCAP, and NRC) disappeared. The Sierra Club (SC) (constraint: 0.188) was most constrained whereas five EMOs including the Green Peace (GP) (1.000) (i.e., ALS, CBE, COA, GP, and NEPI) were least constrained.




*A* (26, 75)

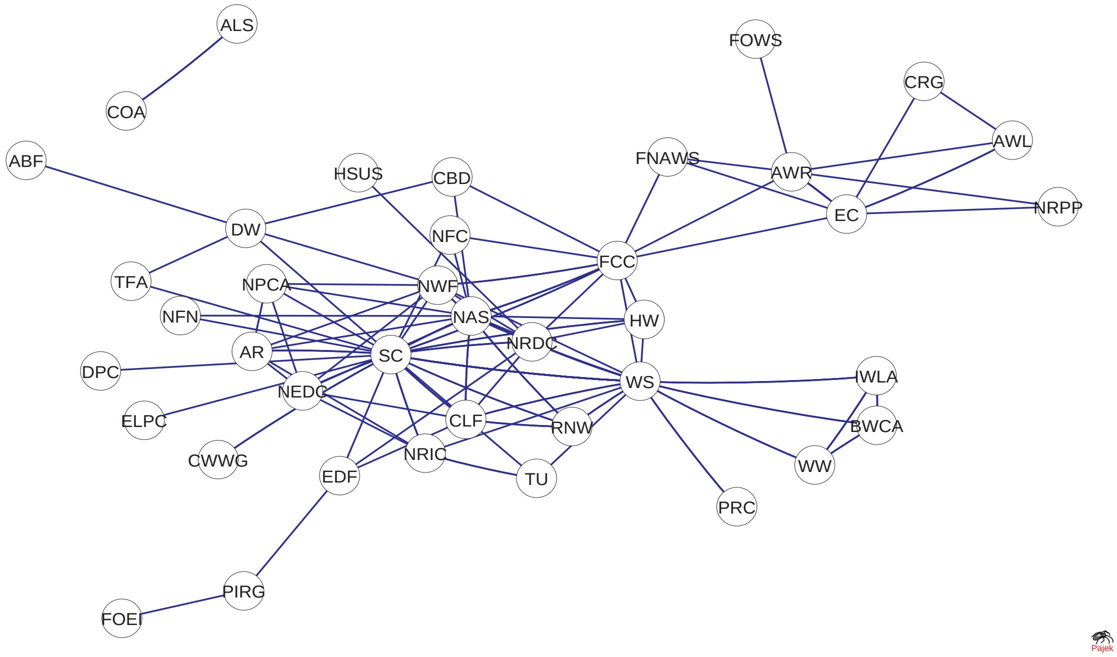
Figure 7.9a: Alliance Network (Period VI: 1990-1993)




*A* (20, 64)

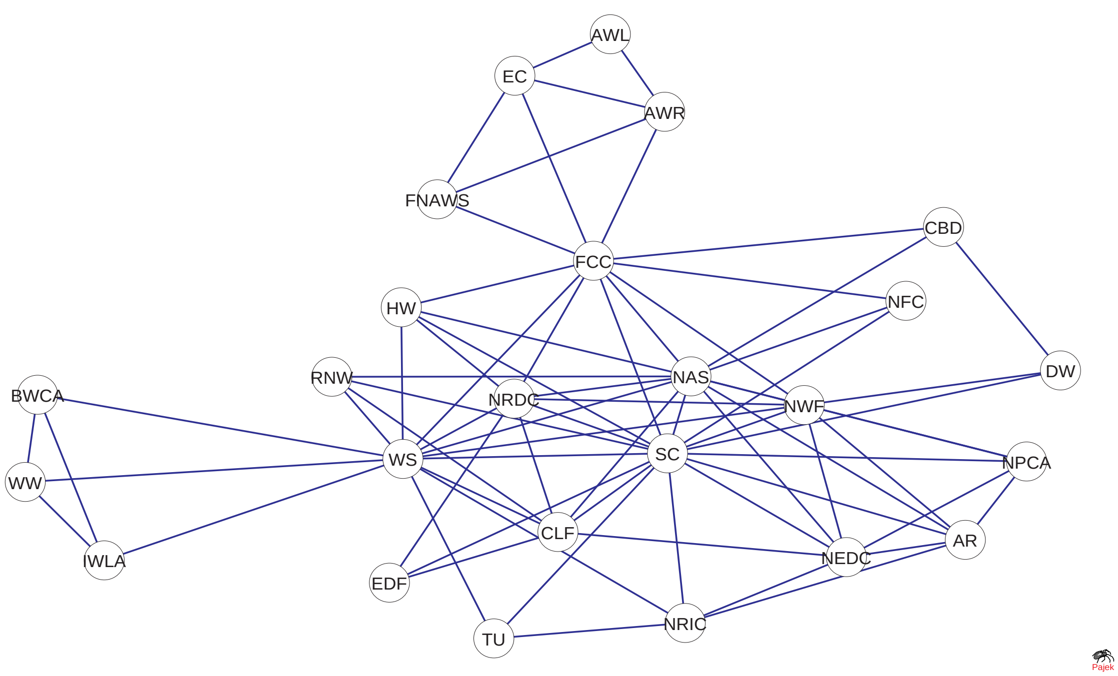
Figure 7.9b: Alliance Network (κ-core) (Period VI: 1990-1993)

Figure 7.10a displays the structure of alliance ties for the seventh period (1994-1997). Figure 7.10b displays the core region (κ=3) obtained from the k-core measure of the alliance network in the seventh period. As shown, 40 EMOs were forming 91 alliance relations in the mid 1990s. The network structure was quite hierarchical: (*a*) the network was structured in 21 different levels of hierarchical positions and (*b*) network centralization was 44.40%. The Sierra Club (SC) (21) had most allies followed by the Wilderness Society (WS) (14) and the National Audubon Society (NAS) (14). In comparison with the sixth period, the Sierra Club (SC) that was most constrained in the sixth period became involved in as many triads as before whereas the EMOs that were least constrained either remained without being involved in any triad (i.e., COA, ALS) or disappeared (i.e., CBE, GP). The Sierra Club (SC) (0.137) was most constrained whereas ten EMOs including the FOEI (1.000) (i.e., ABF, ALS, COA, CWWG, DPC, ELPC, FOEI, FOWS, HSUS, and PRC) were least constrained.




*A* (40, 91)

Figure 7.10a: Alliance Network (Period VII: 1994-1997)

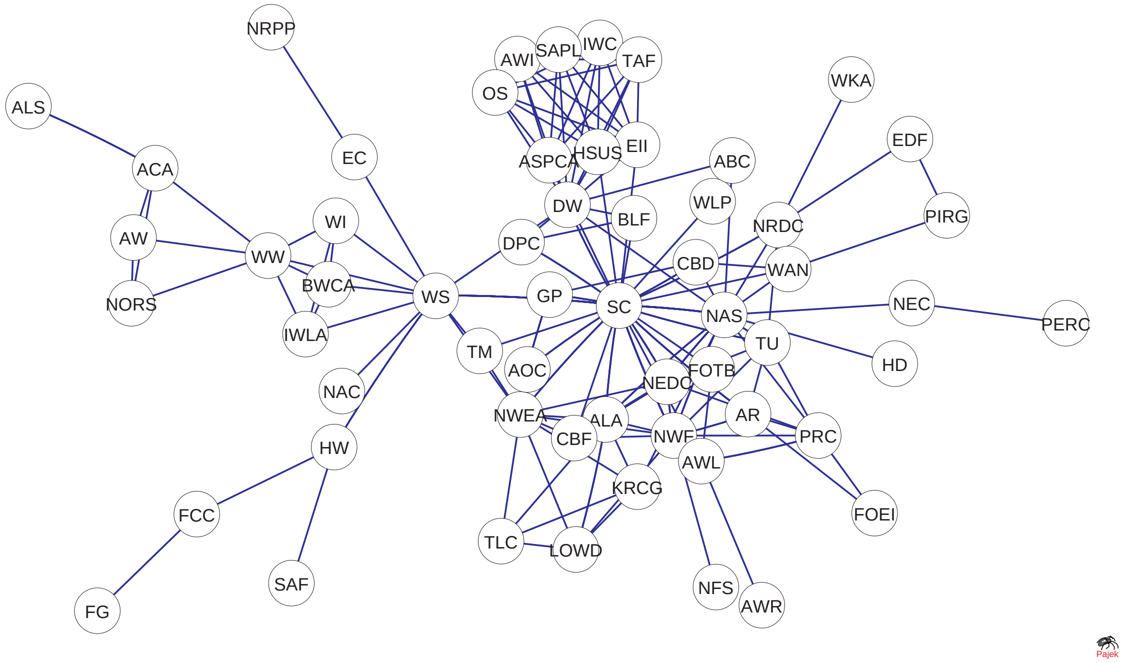



*A* (25, 73)

Figure 7.10b: Alliance Network (κ-core) (Period VII: 1994-1997)

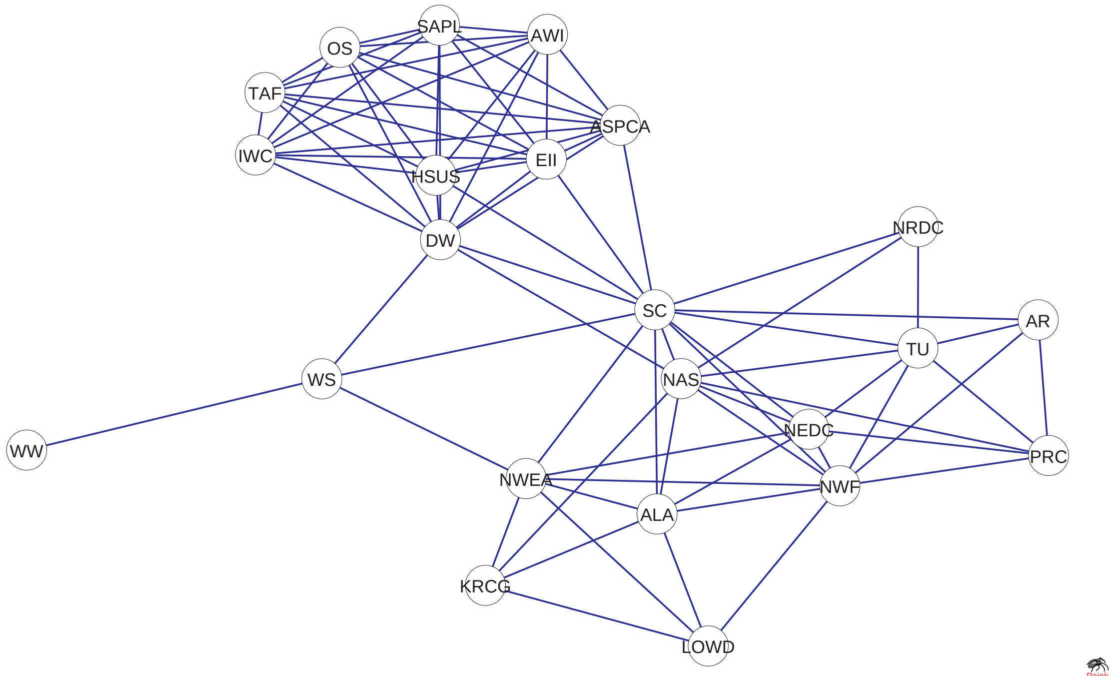
The next structural expansion in the structure of alliance ties occurred in the final period (1998-2001). Figure 7.11a displays the structure of alliance ties in the final period when 60 EMOs were connected through 147 alliance ties. Figure 7.11b displays the core region (κ=5) obtained from the k-core measure of the alliance network in the eighth period. As shown, the core alliance network was quite d ense. Due to the significant expansion of the structure, the network density became even sparser (0.08), though the clustering coefficient maintained the same (0.63). Evidence suggests that the network was open rather than closed. The network became less hierarchical: (*a*) the network was structured in only six different hierarchical positions and (*b*) the network was less centralized (33.49%). The Sierra Club (SC) (24) was most central followed by National Audubon Society (NAS) (14), and the Defenders of Wildlife (DW) (14).

In comparison with the seventh period, the Sierra Club (SC) that was most constrained in the seventh period became involved in still as many triads as before whereas the EMOs that were least constrained disappeared (i.e., ABF, COA, CWWG, ELPC, FOWS, and PRC), became involved in a few triads (i.e., ALS, FOEI, DPC), or became involved in more triads (i.e., HSUS). The Sierra Club (SC) (constraint: 0.098) was most constrained whereas twelve EMOs including the ALS (ALS) (1.000) (i.e., ALS, AWR, BDLF, FG, HD, NAC, NFS, NRPP, PERC, SAF, WKA, and WLP) were least constrained.




*A* (60, 147)

Figure 7.11a: Alliance Network (Period VIII: 1998-2001)




*A* (23, 81)

Figure 7.11b: Alliance Network (κ-core) (Period VIII: 1998-2001)

In sum, the alliance network has seen a few common observations found in most of the periods: The Environmental Defense Fund (EDF) and the Natural Resources Defense Council (NRDC) were most central in alliance activities in the earlier periods while the Sierra Club (SC) and the National Audubon Society (NAS) in the later periods. In addition, there have also been some findings regarding the development of triadic alliance structures over time: First, for most of the periods, the EMOs that were most constrained (e.g., EDF, SC, NAS, and NRDC) in a period, while being involved in multiple triads, were still most constrained in the subsequent period. On the other hand, the EMOs that were least constrained (e.g., FOEI, GP) in a period, while being involved in a few triads or none, either became involved in more triads (e.g., SC, HSUS) or disappeared in the subsequent period. That is, network closure that contributes to network utility or social capital was achieved mostly by the already most influential EMOs rather than by the marginal EMOs throughout the period, which is, according to the empirical evidence, somewhat counterintuitional against the popular theorization by network analysts (Burt, 1992, 2001).

Thus, the second hypothesis [2b], "the environmental movement organizations (EMOs) located in the positions that are strategically disadvantageous have been more likely than others to cooperate with other EMOs in the environmental movement sector (EMS) in the United States since 1970" was also supported from an investigation of the structural dynamics. The structural hole measures showed that the EMOs located in least constrained positions have tended to close triadic structures in subsequent periods trying to take advantage of the strategically advantageous positions. In contrast, the EMOs located in already advantageous positions seemed not likely to be highly motivated to create additional alliances. As in the preceding chapter, an aggregate of the closed triads must have made the structure more complicated, though it may be not possible to measure the extent to which the triadic structures affected the hierarchical structure of the contemporary EMS.

However, the fourth hypothesis [H4], “the contemporary movement structure in the environmental movement sector (EMS) in the United States can be characterized as disconnected, decentralized, and imbalanced” was not supported from an investigation of the structural dynamics of the alliance network. It was noticeable that the alliance structure in the most recent period and the one that emerged in structural dynamics was, overall, connected rather than disconnected and hierarchical rather than homogenized – few EMOs have cooperated with many other EMOs. There was no exception throughout the entire period. It may be problematic if the “connectedness” should be interpreted as “solidarity” in social movements/collective action. However, the fact that most EMOs have been connected to each other as a collectivity suggests a possibility for future collective action. For example, resources (e.g., finance, labor) may be mobilized and movement activities (e.g., advancing claims) may be coordinated between the EMOs through connected alliance ties.

## 7.4 Discussion

This chapter has investigated how organizational and relational characteristics have been associated with each other in the structural dynamics of the alliance structure and how the alliance structure has evolved over time in the EMS in the United States since 1970. Specifically, this chapter has been concerned with what forms a series of dyadic and triadic alliance ties resulting in the emergence of the structural characteristics (e.g., connectedness, balance, and hierarchy) of the contemporary EMS. EMOs have played different roles in creating alliance ties depending on their organizational characteristics and locations in the movement structure. The development of triadic alliance substructures was also related to the organizational characteristics and locations, though future research has yet to explicate the extent to which those triadic substructures aggregate to the entire network structures.

Overall, the interorganizational structure in the EMS in the United States since 1970 has expanded, connected, and hierarchicalized over time. Particularly, the EMOs with similar organizational characteristics in “orientation” and “strategy,” not necessarily in “size and “age,” have cooperated with each other. Thus, as noted above, the EMOs with similar organizational characteristics in “orientation” and “strategy,” not necessarily in “size and “age,” have cooperated with each other. In principle, the findings resonate with the popular rules of preferential attachment, “homophily” (McPherson and Smith-Lovin, 1987; McPherson et al., 2001). However, the fact that the EMOs similar in “orientation” and “strategy” in particular have been more active in forming alliances with each other than others, whereas the EMOs similar in size and age have not is rather counterintuitive because the EMOs will like to cooperate with large and old EMOs with abundant resources for expensive and long-lasting environmental litigation.

The EMOs located in most constrained positions (e.g., EDF, SC, NAS, and NRDC) in a period, while being involved in multiple triads, were still located in most constrained positions in the subsequent period. On the other hand, the EMOs located in least constrained positions (e.g., FOEI, GP) in a period, while being involved in a few triads or none, either became involved in more triads (e.g., SC, HSUS) or disappeared in the subsequent period. That is, network closure that is believed to contribute to network utility or social capital was achieved mostly by the already most influential EMOs rather than by the marginal EMOs throughout the period, which is, according to the empirical evidence, somewhat counterintuitional against the popular theorization by network analysts (Burt, 1992, 2001).

The cross-sectional alliance structure for the entire period was connected rather than disconnected and hierarchical rather than homogenized–few EMOs have cooperated with many other EMOs. There was no exception throughout the entire period. Although it may be problematic if the "connectedness" should be interpreted as "solidarity" in social movements/collective action, the fact that most EMOs have been connected to each other as a collectivity suggests a possibility for future collective action. For example, resources (e.g., finance, labor) may be mobilized and movement activities (e.g., advancing claims) may be coordinated between the EMOs through connected alliance ties.

This chapter considered EMOs as "open" systems embedded in the environment in which they operate (Aldrich, 1979; Galaskiewitz, 1979). Even if they were considered open systems, the EMOs were selective in forming (and removing) interorganizational ties when the ties were "expensive" such as litigation and alliances for which they had to pay the costs for future benefits. The current work has found some conditions under which the EMOs switched interorganizational ties and yet points to discovering more conditions from both organizational characteristics and structural locations in the interorganizational structure in non-profit and for-profit sectors.

This chapter exemplified a network-structural analysis of the EMS (particularly, mobilizing structure for opposition) in the United States, 1970-2001. The theoretical and methodological framework used in the current work is useful to the resource mobilization approach in general that has attempted to discover mobilizing structures in social movement/collective action. The current work provides some knowledge of how social movement organizations behave to make the movement sector strong by managing interorganizational ties for future collective action.

To fully explain the formation of alliance ties between certain EMOs based on both organizational characteristics and relational properties, future research may have to use conditional logit model (McFadden, 1973, 1981; Ben-Akiva, and Lerman, 1989). The conditional logit models are advantageous when the research aims to consider as variables the organizational characteristics of the focal parties involved, the parties' neighbors, the parties' neighbors' neighbors', and so on. Although the development of such models may require skills such as programming and data management, it seems clear that future research in this line will benefit more from them.

Currently, there is no knowledge of what inter-EORG structures might look like at the regional and local levels, let alone the overall network structure when all the EORGs at those three different levels were aggregated. As noted above in Section 9.3, future research might include EORGs at the regional and local levels in analysis for a complete understanding of the movement structure. In addition, future research may include other types of organizations such as trade associations, corporations, labor unions other than EMOs and EGAs since they also play vital roles in EMS in the United States.

It was not clearly shown what structural mechanisms have brought about the contemporary litigative and alliance structures, though it aimed to investigate the structural dynamics thereby dyadic and triadic substructures emerged over time. As a result, to a large extent, the current work had to be satisfied with describing the network dynamics rather than explaining it. The current work points to the consideration of more systematic models (e.g., "actor network utility"; Doreian, 2005) beyond the models of "triadic completion." Recent advances in structural theorization, methodological approaches, and computer packages will help discover the structural mechanisms (Doreian and Stokman, 1997; Hedstrom and Swedberg, 1998; ICS, [2002] 2007).

## 7.5 Summary

This chapter has investigated how organizational and relational characteristics have been associated with each other in the structural dynamics of the alliance structure and how the alliance structure has evolved over time in the EMS in the United States since 1970. A longitudinal analysis of the alliance ties for environmental litigation in the United States showed the findings such as the following: First, the EMOs with similar organizational characteristics in "orientation" and "strategy," not necessarily in "size and "age," have cooperated with each other. That is, in allying for litigation, the EMOs cooperated regardless of their ages and sizes as long as they shared similar orientation and strategies. Second, network closure that was believed to contribute to network utility or social capital was achieved mostly by the already most embedded EMOs rather than by the marginal EMOs throughout the period, which is, according to the empirical evidence, somewhat counterintuitional against the popular theorization by network analysts (Burt, 1992, 2001). Third, the cross-sectional alliance structure for the entire period was connected rather than disconnected and hierarchical rather than homogenized–few EMOs have cooperated with many other EMOs. As in the litigation structure, the findings provide more structural knowledge of the contemporary movement structure beyond the literature that noted a simple increase in alliances within the movement sector. Although the "connectedness" may not be interpreted as "solidarity" in social movements/collective action, the fact that most EMOs have been connected to each other as a collectivity suggests a possibility for future collective action. For example, resources (e.g., finance, labor) may be mobilized and movement activities (e.g., advancing claims) may be coordinated between the EMOs through connected alliance ties.

# Chapter 8

# Movement Dynamics: Signed Structure

As pointed out earlier, environmental organizations (EORGs) are in basic competition with each other because they share, to a greater or lesser extent, the same adherent pools, both individual and institutional. Thus, scholars in social movements agree, to a great extent, that a variety of EORGs compete with each other for resources, control, and legitimacy. The competitive relations among the EORGs may turn to either cooperative relations or antagonistic attacks depending on the circumstances. Basically, the EORGs ought to cooperate in goal accomplishment because they seek similar goals.[59] The literature on the movement dynamics, however, caution that it is naïve to assume that social movement organizations (SMOs) all share a common goal and therefore have little interest in competition and conflict (Zald and McCarthy, 1987). The literature has noted a considerable increase in competition and conflicts between SMOs within the SMS (Zald and McCarthy, 1987; Zald and Useem, 1987).[60]

[59] The factors that serve to facilitate and shape cooperation among EMOs have included task specialization (i.e., similar conceptions of goals and tactics), external social control, overlapping constituents (i.e., interlocking boards or memberships), and elite/third-party constraints while the forms of cooperation, alliances, cartels, federations, and mergers.

[60] A wide range of forms of conflicts have existed: verbal claims, direct confrontation, lobbying authorities, speaking disparate audiences, litigation, and so on. Of those conflictual relations, most highly structured type of an antagonistic encounter may be the litigation (Handler, 1978; Barkin, 1979; Barkan, 1980; Epp, 1990; Morag-Levine, 2003). While litigation may be a form of the most antagonistic relationships between social actors, it has gained more and more popularity as an effective movement strategy since the 1970s (Zald and Berger, 1978; Balser, 1997; Barkan, 1979; Mueller and Judd, 1981; Michaelson, 1994; Norris and Cable, 1994; McCright and Dunlap, 2000).

The previous two chapters discussed the structural dynamics in the U.S. environmental movement sector (EMS) by investigating the exchanges of litigation and alliances between the national EORGs since 1970. The analyses helped better understand how the contemporary inter-EORG structure has emerged from the differential attachments in litigation and alliances, respectively. And yet, the fact that the analyses investigated structural dynamics of litigation and alliances separately prevented us from understanding how both types of inter-EORG relations interplay while generating a complex contemporary movement structure. Thus, this chapter combines both types of ties in a single analytical framework and investigates the structural dynamics of the movement sector as such–in network terms, the evolving inter-EORG network structure in which exchanges of "signed" ties generate a complex contemporary inter-EORG network structure in the EMS in the United States since 1970.

This chapter investigates the movement dynamics with regard to how litigation and alliance relations have brought about the contemporary movement structure in the EMS in the United States, 1970-2001. The research questions that this chapter addresses are: "Under what conditions have triadic signed structures been balanced in the environmental movement sector (EMS) in the United States since 1970?" [Q3] and "What are the structural characteristics (e.g., connectedness, balance, and hierarchy) of the contemporary movement structure that has emerged in the environmental movement sector (EMS) in the United States since 1970?" [Q4]

To answer these questions, the following sections will explore the signed (litigation, alliance) structure and investigate the longitudinal dynamics of the inter-EORG signed relations by relying on recent advances in social balance models (Heider, 1946, 1958; Hummon and Doreian, 2003). An investigation of the structural dynamics of the EMS in terms of both litigation and alliances will help us not only understand the contemporary EMS but also predict the structural consequences in the EMS in the United States.

## 8.1 Dynamics: Social Balance

For a detailed introduction of social balance models, refer to Section 2.4.1 above. This section briefly revisits the major tenets and recent advances in social balance models for the discussion in the following sections. Social balance theory, as a fundamental model for network processes, focuses on imbalance as the driving force of network processes. Heider's formulation (Heider, 1946; 1958) was concerned with cognitive inconsistencies in 'unit-formation relations (*U*)' whereas Cartwright and Harary's (1956) and others, 'affect relations' (*R*) affective inconsistencies in a more generalized context. A recent revival of interest in social balance theory has provided social balance models that emphasize balance mechanisms and measures of (im)balance at equilibrium (Doreian et al, 1997; Doreian and Krackhardt, 2001; Doreian, 2002). In their simulation research, Hummon and Doreian (2003) proposed a theoretical model for social balance in the form of an agent based simulation (ABS) model that simulates distinct but interdependent social actors making positive and negative selections of each other in efforts to reach balanced cognitive states.

## 8.2 Methods, Data, and Hypotheses

This chapter uses structural partitioning and balance partitioning at the same time so that EORGs are partitioned into a set of plus-sets and a set of equivalent positions in a sequential manner. A temporal observation of the equivalent positions within and between plus-sets through time may suggest what EORGs play similar roles across distinct periods. The statistical network methods used in this chapter are two fold: (*a*) describing tie distribution (network size, density, centralization, clustering coefficient, balance, contentiousness, transitivity, and centrality) and (*b*) partitioning network structure into a set of positions of equivalent EORGs. The data include both environmental movement organizations (EMOs) and environmental government agencies (EGAs) operating at the national level and the inter-EORG relations including both lawsuit and alliance ties in the United States for the period, 1970-2001. Of the hypotheses presented in Chapter 1, the following will be test in this chapter:

**Hypothesis 3.** "The environmental government agencies (EGAs) in imbalanced structures have been more likely than the environmental movement organizations (EMOs) to make the structures balanced in the environmental movement sector (EMS) in the United States since 1970." [H3]

**Hypothesis 4.** "The contemporary movement structure in the environmental movement sector (EMS) in the United States can be characterized as disconnected, decentralized, and yet balanced." [H4]

## 8.3 Exploration: EORGS in Signed Relations

The following parts in this section will explore the EORGs and the signed (i.e., both litigation and alliance) relations between them for the given period in the United States. Focus will be on the triadic structures, in which EORGs are sign related, that generate a more complicated structure in the following phase in time. The descriptives will include the organizational characteristics such as organizational age, size, geographical location, ideological orientation, primary action area, strategy, and so on. Particularly, focus will be on the longitudinal dynamics–that is, the temporal changes in the number of both alliances and litigation. An exploration of the signed relations in the EMS will help investigate the structural dynamics of the sector in terms of the movement conflicts and alliances in the following section.

### 8.3.1 Alliance Ties

First, I investigate how the structure of alliance ties has changed in terms of the patterns of entry and exit of the partnering EORGs and the alliance ties across eight consecutive periods. The structural change in terms of the number of EORGs has occurred in two ways: old EORGs exit or new EORGs enter. The EORGs that existed between two consecutive periods did not bring about the structural change. As Table 8.1 shows, an investigation of the changes in the EORGs by type that exited and entered the alliance relations across the consecutive periods allows us to understand the structural dynamics of the sector. While there were no EGAs that formed alliance ties throughout the entire period, the changes in the number of EMOs in alliance relations have been positive except for the sixth period. The largest exits occurred in the sixth and the eighth whereas the largest entries in the fourth, fifth, seventh, and eighth. The reason for the reduction of the EMOs in alliances in the sixth period may be due to the unusual increase in the prior two periods (Periods IV and V; 1982-1989). A look at the cumulative change of the number of EORGs in the last column of the table shows that the change quadrupled in two decades after 1970 and, after the late 1980s, it doubled in the final period.

Table 8.1: Patterns of Entry and Exit of EORGs in Alliance Networks

| Period | Year | EMOs | | | EGAs | | | Total | |
|---|---|---|---|---|---|---|---|---|---|
| | | - | + | Δ | - | + | Δ | Δ | Cumul Δ |
| I | 1970-1973 | n/a | +7 | +7 | n/a | 0 | 0 | +7 | 7 |
| II | 1974-1977 | -1 | +5 | +4 | 0 | 0 | 0 | +4 | 11 |
| III | 1978-1981 | -3 | +5 | +2 | 0 | 0 | 0 | +2 | 13 |
| IV | 1982-1985 | -5 | +15 | +10 | 0 | 0 | 0 | +10 | 23 |
| V | 1986-1989 | -11 | +21 | +10 | 0 | 0 | 0 | +10 | 33 |
| VI | 1990-1993 | -18 | +11 | -7 | 0 | 0 | 0 | -7 | 26 |
| VII | 1994-1997 | -8 | +22 | +14 | 0 | 0 | 0 | +14 | 40 |
| VIII | 1998-2001 | -14 | +34 | +20 | 0 | 0 | 0 | +20 | 60 |
| Total | 1970-2001 | -60 | +120 | +60 | 0 | 0 | 0 | +60 | 177 |

Note: 'n/a' indicates 'not applicable'

An examination of the changes in the alliance ties that exited from and entered the sector across the consecutive periods allows us to understand the structural dynamics of the sector. The structural change in terms of the number of ties has occurred in two ways: old ties exit or new ties enter. The alliance ties that existed across the consecutive periods did not change the network structure. Table 8.2 summarizes the patterns of exit and entry of the alliance ties across the eight periods. Since there were no EGAs found in the alliance network, the changes in the alliance ties were all those of the EMOs. The total number of changes has been positive except for the third and the sixth periods. The large entries have occurred since the fourth period while the large exits in the second half of the entire period (1986-2001). A look at the cumulative change of the number of ties in the last row of the table shows that the biggest change occurred between the third and the fourth period and between the seventh and eighth.

Table 8.2: Patterns of Entry and Exit of Alliance Ties

| Period | I | II | III | IV | V | VI | VII | VIII | Total |
|---|---|---|---|---|---|---|---|---|---|
| Year | 1970-1973 | 1974-1977 | 1978-1981 | 1982-1985 | 1986-1989 | 1990-1993 | 1994-1997 | 1998-2001 | 1970-2001 |
| Exit of old ties | n/a | -4 | -14 | -6 | -76 | -109 | -43 | -65 | -317 |
| Entry of new ties | +14 | +13 | +5 | +82 | +114 | +56 | +59 | +121 | +464 |
| Change | +14 | +9 | -9 | +76 | +38 | -53 | +16 | +56 | +147 |
| Cumul Change | 14 | 23 | 14 | 90 | 128 | 75 | 91 | 147 | 411 |

### 8.3.2 Litigative Ties

Second, I investigate how the structure of lawsuit ties has changed in terms of the patterns of entry and exit of the EORGs and the lawsuit ties across eight consecutive periods. The structural change in terms of the number of EORGs has occurred in two ways: old EORGs exit or new EORGs enter. An examination of the changes in the EORGs by type that exited and entered the lawsuit relations across the consecutive periods allows us to understand the structural dynamics of the sector. Table 8.3 summarizes the patterns of exit and entry of EORGs across the eight periods. In contrast to the alliance ties, both types of EORGs are involved in the lawsuit relations and thus the changes in the number of the EORGs are summarized by EORG type. The change in the total number of EORGs was substantial in the first, fourth, and eighth periods. Interestingly, the number of EORGs in lawsuit ties decreased in the third period. As far as the EMOs are concerned, a large number of EMOs entered the network in the first, fifth, seventh, and eighth periods whereas a number of EMOs exited in the fifth and seventh periods resulting in a significant increase in the number of EORGs in the first, fifth, and eighth periods. As far as the EGAs are concerned, the changes were steady across the periods. However, more EGAs entered the network in the first and fourth periods whereas more EGAs exited in the fifth period resulting in fluctuations in the number of EGAs in lawsuit ties. In the first and fourth periods, the EGAs increased largest whereas the EGAs decreased in the third, fifth, and seventh periods. A look at the cumulative change of the number of EORGs in the last column shows that the change doubled in two decades since 1970 and, since the mid-1980s, doubled again in the final period.

Table 8.3: Patterns of Entry and Exit of EORGS in Lawsuit Networks

| Period | Year | EMOs | | | EGAs | | | Total | |
|---|---|---|---|---|---|---|---|---|---|
| | | - | + | Δ | - | + | Δ | Δ | Cumul Δ |
| I | 1970-1973 | n/a | +15 | +15 | n/a | +10 | +10 | +25 | 25 |
| II | 1974-1977 | -4 | +12 | +8 | -1 | +6 | +5 | +13 | 38 |
| III | 1978-1981 | -9 | +11 | +2 | -4 | +1 | -3 | -1 | 37 |
| IV | 1982-1985 | -11 | +18 | +7 | -2 | +10 | +8 | +15 | 52 |
| V | 1986-1989 | -16 | +26 | +10 | -6 | +2 | -4 | +6 | 58 |
| VI | 1990-1993 | -7 | +13 | +6 | -2 | +5 | +3 | +9 | 67 |
| VII | 1994-1997 | -23 | +31 | +8 | -5 | +3 | -2 | +6 | 73 |
| VIII | 1998-2001 | -14 | +39 | +25 | -5 | +7 | +2 | +27 | 100 |
| Total | 1970-2001 | -84 | +165 | +81 | -25 | +44 | +19 | +100 | 177 |

Note: n/a indicates not applicable

An investigation of the changes in the lawsuit ties that exited and entered the lawsuit network across the consecutive periods allows us to understand the structural dynamics of the sector. The structural changes in terms of the number of lawsuit ties have occurred in two ways: old ties exit and new ties enter. The ties that have existed across the periods did not change the network structure. Table 8.4 summarizes the patterns of exit and entry of the ties across the eight periods. The total numbers of changes were substantial in the first, fourth, and eighth periods. Interestingly, the number of lawsuit ties decreased in the third period. A large number of lawsuit ties disappeared in the third, fifth, seventh, and eighth periods. In contrast, a large number of lawsuit ties were created in the fourth, fifth, seventh, and eighth periods, which resulted in considerable additions of lawsuit ties in the first, second, fourth, and eighth periods. A look at the cumulative change of the number of ties in the last row of the table shows that the change tripled in two decades since 1970 and almost doubled in the final period since the mid-1980s.

Table 8.4: Patterns of Entry and Exit of Lawsuit Ties

| Period | I | II | III | IV | V | VI | VII | VIII | Total |
|---|---|---|---|---|---|---|---|---|---|
| Year | 1970-1973 | 1974-1977 | 1978-1981 | 1982-1985 | 1986-1989 | 1990-1993 | 1994-1997 | 1998-2001 | 1970-2001 |
| Exit of old ties | n/a | -10 | -44 | -26 | -61 | -38 | -76 | -65 | -320 |
| Entry of new ties | +34 | +41 | +33 | +68 | +74 | +52 | +77 | +105 | +484 |
| Change | +34 | +31 | -11 | +42 | +13 | +14 | +1 | +40 | +164 |
| Total | 34 | 65 | 54 | 96 | 109 | 123 | 124 | 164 | 411 |

## 8.4 Emergence of Signed Structure (1970-2001)

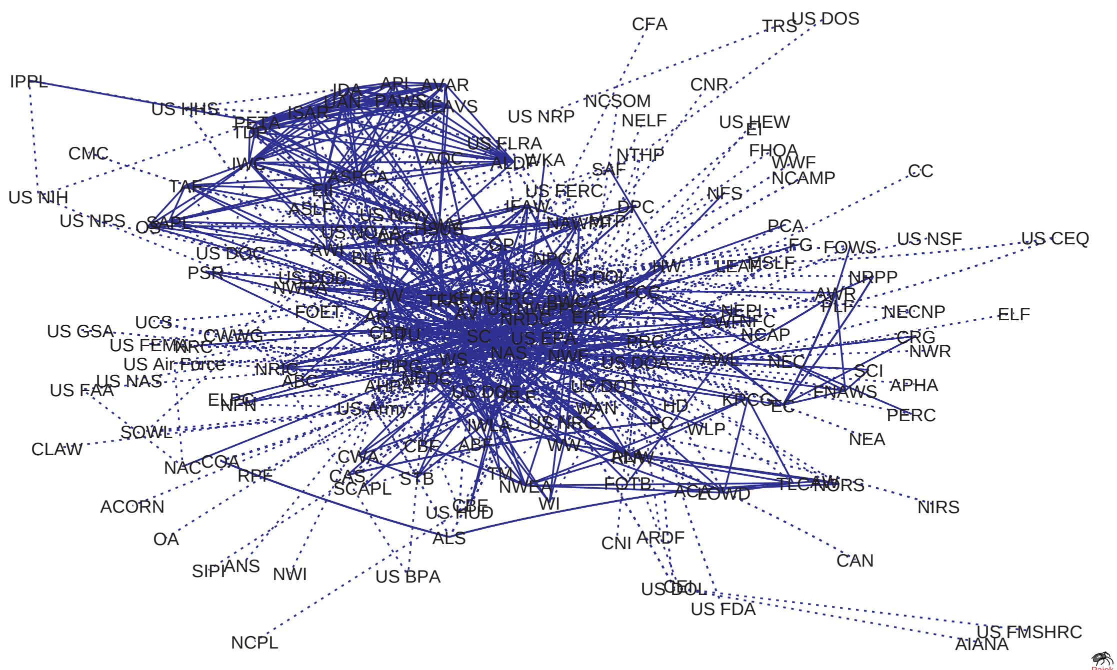
As the current network structure comprises both alliance and lawsuit ties, it is a signed (balanced or imbalanced) network whose structural properties are completely different than in networks of either ties only. While a signed network is a special case of the networks of multiplex ties, the network dynamics occur according to the (im)balanced state of the network. Now, this section investigates the structural dynamics of the inter-EMO signed relations thereby the contemporary inter-EMO movement structure has emerged from a generative structural perspective (Epstein and Axtell, 1997; Fararo and Butts, 1999). In what follows, investigation will be done in two steps: (*a*) identification of the sources of imbalance (i.e., imbalanced triples and inconsistent dyads in particular and (*b*) comparison of the imbalanced triples between the periods before and after to observe how inconsistent dyads change. The findings from these analyses will be used to discuss the structural dynamics of the EMS in Section 8.3.

### 8.4.1 Evolution of Signed Structure

Table 8.5 summarizes the structural characteristics (network size, number of plus-sets, imbalanced triples, EORGs in imbalanced triples, and level of contentiousness) of the signed networks in all eight periods. As summarized, there were multiple periods (Periods I, III, V, VI, and VII) where no imbalanced triples were found, which indicate that the network structures were in perfect balance. In contrast, imbalanced triples were found in three periods (Period II, IV, and VIII) suggesting that there were structural tensions among the EORGs involved. In the second period, there were three imbalanced triples with five EORGs involved. The number of imbalanced triples was largest in the fourth period where fourteen imbalanced triples with sixteen EORGs involved. Finally, four imbalanced triples composed of six EORGs involved in the final period. To mention the level of contentiousness, which is measured by the ratio of the number of negative (i.e., lawsuit) ties to the total number of ties, overall the level of contentiousness has decreased through time. It was 0.52 or 52% in the first period and yet decreased down to 0.32 or 32% in the last period indicating that the number of alliance ties has increased at a faster pace than the number of lawsuit ties, though the latter characterizes the period, 1970-2001. The role of contentious relations within the social movement sector (SMS) has been discussed by contemporary scholars working on social movements (Tilly and Wood, 2003).

Table 8.5: Structural Properties of Signed Networks

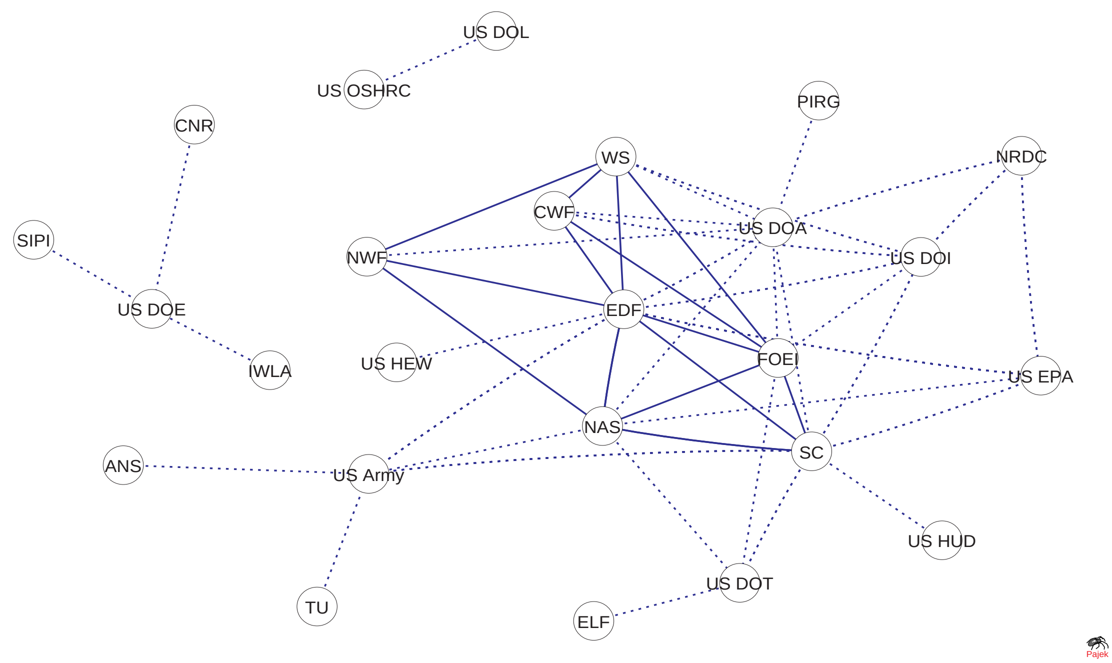
| Period | Year | Total (Node, +, -) | Imbalanced Triple | EORGs in Imbalanced Triple | Level of Contentiousness |
|---|---|---|---|---|---|
| I | 1970-1973 | (25, 48) | 0 | 0 | 0.52 |
| II | 1974-1977 | (38, 86) | 3 | 5 | 0.44 |
| III | 1978-1981 | (37, 66) | 0 | 0 | 0.56 |
| IV | 1982-1985 | (52, 185) | 14 | 16 | 0.28 |
| V | 1986-1989 | (58, 237) | 0 | 0 | 0.24 |
| VI | 1990-1993 | (67, 189) | 0 | 0 | 0.35 |
| VII | 1994-1997 | (73, 214) | 0 | 0 | 0.34 |
| VIII | 1998-2001 | (100, 311) | 4 | 6 | 0.32 |
| Total | Total | (177, 810) | 24 | 21 | 0.22 |




$S$ (177, 810)

Figure 8.1: Signed Network (1970-2001)

Figure 8.2 displays the initial signed network in the early 1970s when 25 EORGs were exchanging 48 ties of alliance and litigation with each other. In the graph, alliance ties were represented as solid lines whereas lawsuit ties as dotted lines. There were no imbalanced triples in the initial network structure, i.e., the network was perfectly balanced. However, the level of contentiousness was high (0.52), which indicates that the number of lawsuit ties outnumbered the number of alliance ties. Although the network was divided into three components, there was only one plus-set composed of seven EMOs linked through fourteen alliance ties. In the plus-set, there were EMOs that had common movement opponents, which can be considered equivalent allies against equivalent opponents. The Environmental Defense Fund (EDF)–Sierra Club (SC) alliance tie had most common movement opponents (4) while contending with the US Army, the US DOA, the US DOI, and the US EPA (inside the parentheses is the number of common opponents). Similarly, the Sierra Club (SC)–Friends of the Earth (FOEI) alliance tie had three movement opponents in common while contending with the US DOA, the US DOI, and the US DOT.




*S*(25, 14, 34)

Figure 8.2: Signed Network (Period I: 1970-1973)

Note: *S*(25, 14, 34) indicates a signed network composed of 25 vertices interconnected through 14 positive and 34 negative edges.

Figures 8.3a and 8.3b display the signed network and the imbalanced subgraph of the second period when imbalanced triples were found. As shown in Figure 8.3a, 38 EORGs were linked through 86 signed ties (23 alliances, 65 lawsuits) in this period. While the network was divided into four components, there was only one plus-set found in the network, which was composed of eleven EMOs linked through 23 alliance ties. As was in the first period, there were EMOs that had common movement opponents. The Environmental Defense Fund (EDF)–Friends of the Earth (FOEI), Environmental Defense Fund (EDF)–Sierra Club (SC), and Natural Resources Defense Council (NRDC)–Sierra Club (SC) alliance tie had most (5) common movement opponents while all alliance ties contending with the US Department of Interior (US DOI) and some with the US Department of Agriculture (US DOA) and the US Department of Transportation (US DOT).

Figure 8.3b highlights the imbalanced subgraph in which five EORGs were linked through nine signed ties in a Heiderian sense. According to Davis (1967), the subgraph is balanced with three plus-sets. A closer look at the network shows that there were two lawsuit ties between the EGAs (US DOL–US OSHRC, US DOA–US EPA), which involved four EGAs altogether creating three imbalanced triples of five EORGs.[61] As shown, the negative tie between the US Department of Agriculture (US DOA) and the US Environmental Protection Agency (US EPA) formed three imbalanced triples with the Environmental Defense Fund (EDF), the Public Interest Research Group (PIRG) and the Sierra Club (SC), respectively. The structural tension among the involved EORGs created due to the structural imbalance brought about a structural change (i.e., balanced structure) in the following period by making the EGAs (i.e., US DOA and US EPA) remove the ties between themselves to make the structure balanced.

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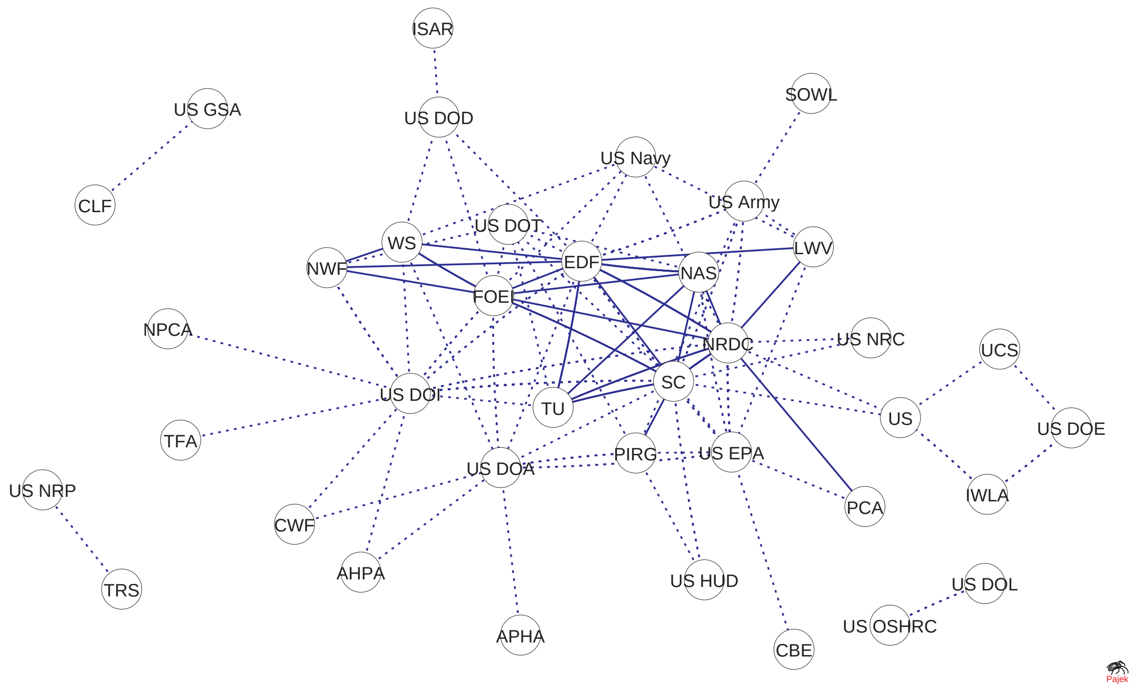
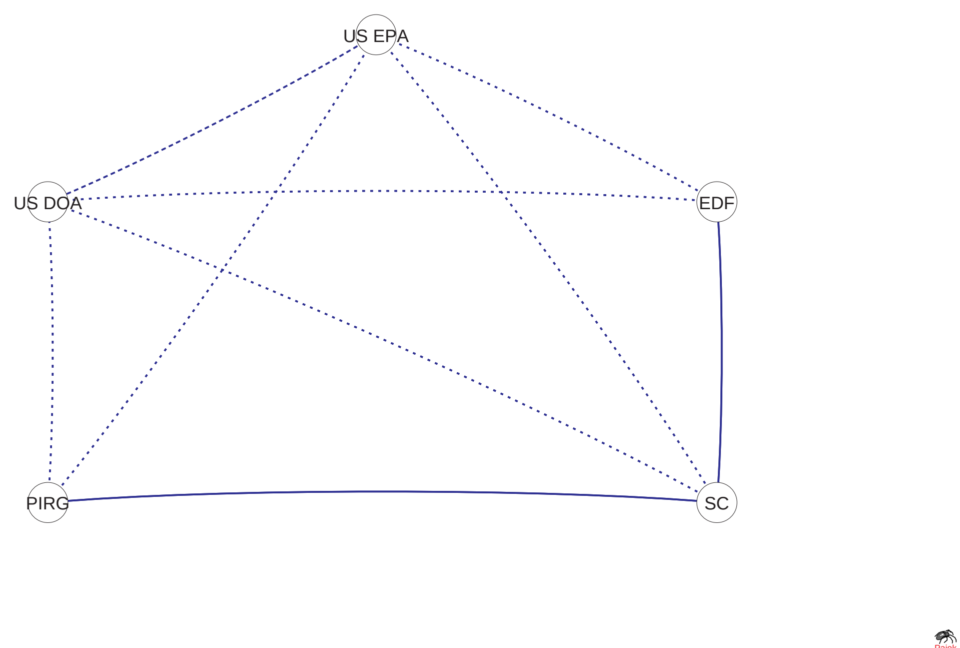
[61] The environmental lawsuits formed between EGAs in the second period are as follows: 1) 1974, 1975. *Brennan (US DOL)* v. *Occupational Safety & Health Review Commission (US OSHRC)*. 2) 1975, 1976. *Earl L. Butz (US DOA)* v. *Russell E. Train (US EPA)*.




$S\,(38, 23, 63)$

Figure 8.3a: Signed Network (Period II: 1974-1977)

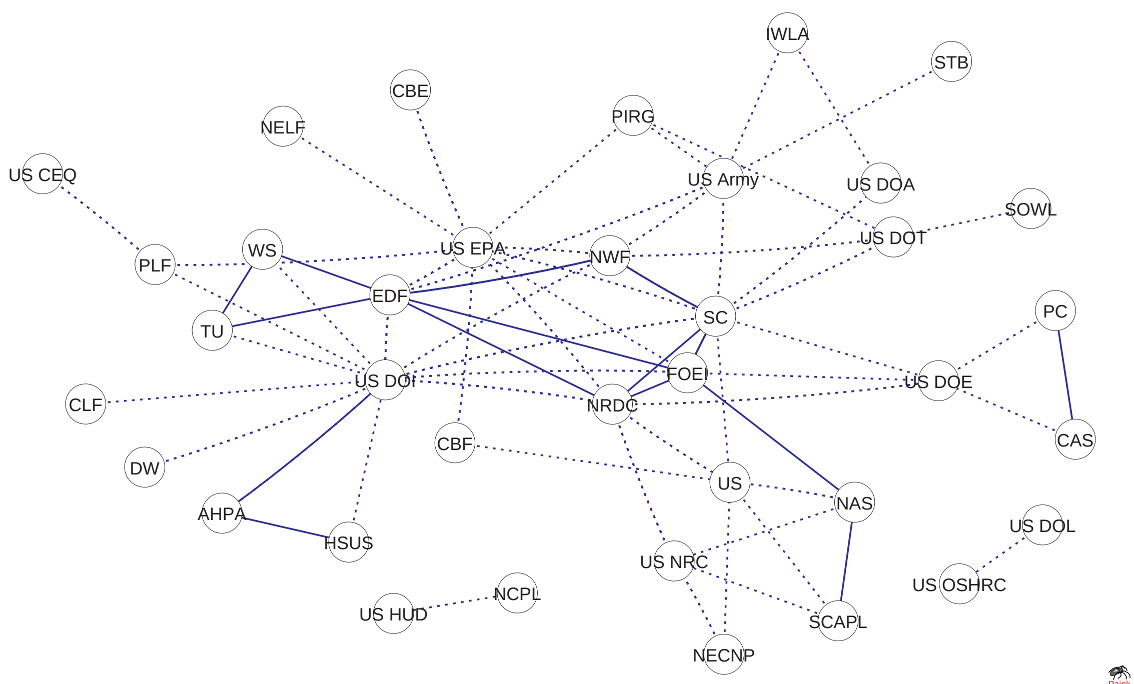



$I\,(5, 2, 7)$

Figure 8.3b: Imbalanced Subgraph (Period II: 1974-1977)

Note: 1. $I\,(5, 9)$ indicates an imbalanced network composed of five vertices interconnected through nine edges.
2. The signed network is 3-balanced (Davis, 1967)

Figure 8.4 displays the signed network and the imbalanced subgraph of the third period. As shown, 37 EORGs were linked through 66 signed ties (14 alliances, 42 lawsuits) in this period. While the network was divided into three components, there were three plus-sets found in the network. As was in the previous periods, there were EMOs that had common movement opponents. The Environmental Defense Fund (EDF)–Sierra Club (SC) alliance tie had most (4) common movement opponents while all alliance ties contending with the US Army (US Army), US Department of Interior (US DOI), US Department of Transportation, and the US Environmental Protection Agency (US EPA).




$S$(37, 14, 42)

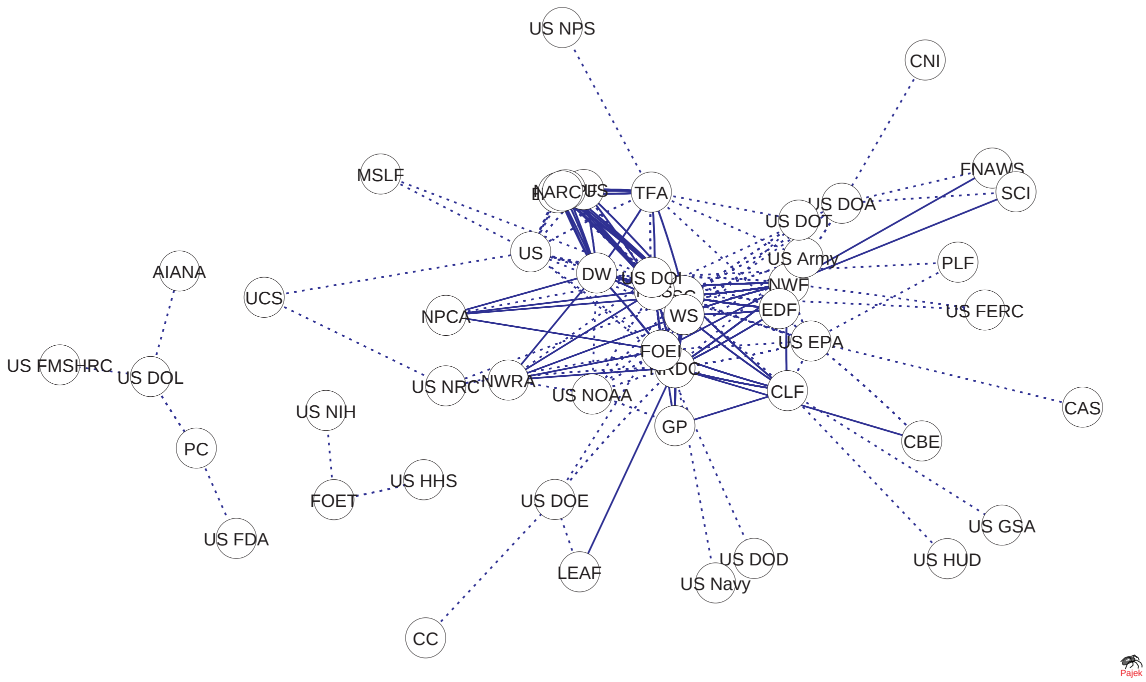
Figure 8.4: Signed Network (Period III: 1978-1981)

Figures 8.5a and 8.5b display the signed network and the imbalanced subgraph of the fourth period when imbalanced triples were found, respectively. As shown in Figure 8.5a, 52 EORGs were linked through 185 signed ties (90 alliances, 96 lawsuits) in this period. As in other periods, there was only one principal plus-set formed in the network, though the network was divided into three components. The plus-set was composed of 23 EMOs linked through 90 alliance ties. As were in the previous periods, there were EMOs that had common movement opponents. The Sierra Club (SC)–Friends of the Earth (FOEI), Sierra Club (SC)–Natural Resources Defense Council (NRDC), Natural Resources Defense Council (NRDC)–Friends of the Earth (FOEI) alliance ties had most (7) common movement opponents while all alliance ties contending with the US Army (US Army), US Nuclear Regulatory Commission (US NRC), US Environmental Protection Agency (US EPA), US National Marine Fisheries Service (NMFS) (NOAA Fisheries Service) (US NOAA), United States (US), US Department of Interior (US DOI).

Figure 8.5b highlights the imbalanced subgraph in which sixteen EORGs were linked through 29 signed ties. A closer look at the network shows that there was only one lawsuit tie between EGAs (US–US DOI), which involved two EGAs and yet created as many as fourteen imbalanced triples of sixteen EORGs.[62] As shown, the negative tie between the United States (US) and the US Department of Interior (US DOI) formed fourteen imbalanced triples with Mountain States Legal Foundation (MSLF), Animal Rights Coalition (ARC), Humane Society of the United States (HSUS), Friends of the Boundary Waters Wilderness (BWCA), Animal Welfare Institute (AWI), International Fund for Animal Welfare (IFAW), Wilderness Society (WS), North American Wildlife Park Foundation (NAWPF), Defenders of Wildlife (DW), Natural Resources Defense Council (NRDC), National Audubon Society (NAS), Friends of the Earth (FOEI), The

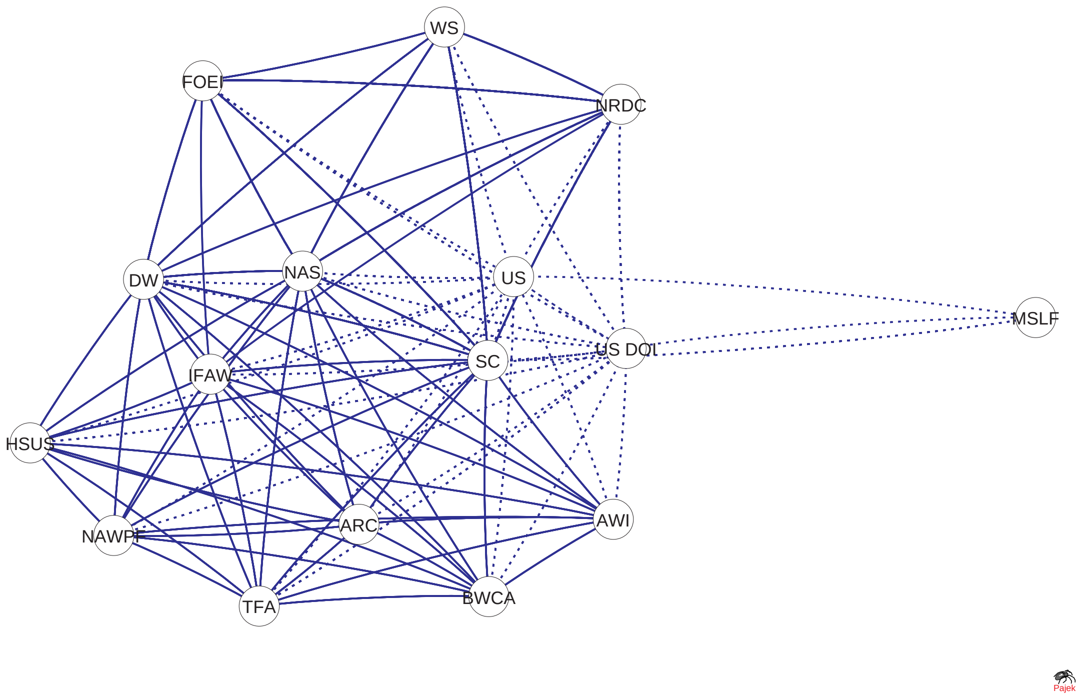
[62] The environmental lawsuits formed between EGAs in the fourth period are as follows: 1) 1982. *Ray Marshall (US DOL)* v. *Federal Mine Safety and Health Review Commission (US FMSHRC)*. 2) 1985. *United States (US)* v. *S.S. (Joe) Burford (US DOI)*.

Fund for Animals (TFA), and Sierra Club (SC), respectively. The structural tension among the involved EORGs created due to the structural imbalance brought about a structural change (i.e., balanced structure) in the following period by making the EGAs (i.e., US and US DOI) remove the ties between themselves to make the structure balanced.




*S* (52, 90, 95)

Figure 8.5a: Signed Network (Period IV: 1982-1985)

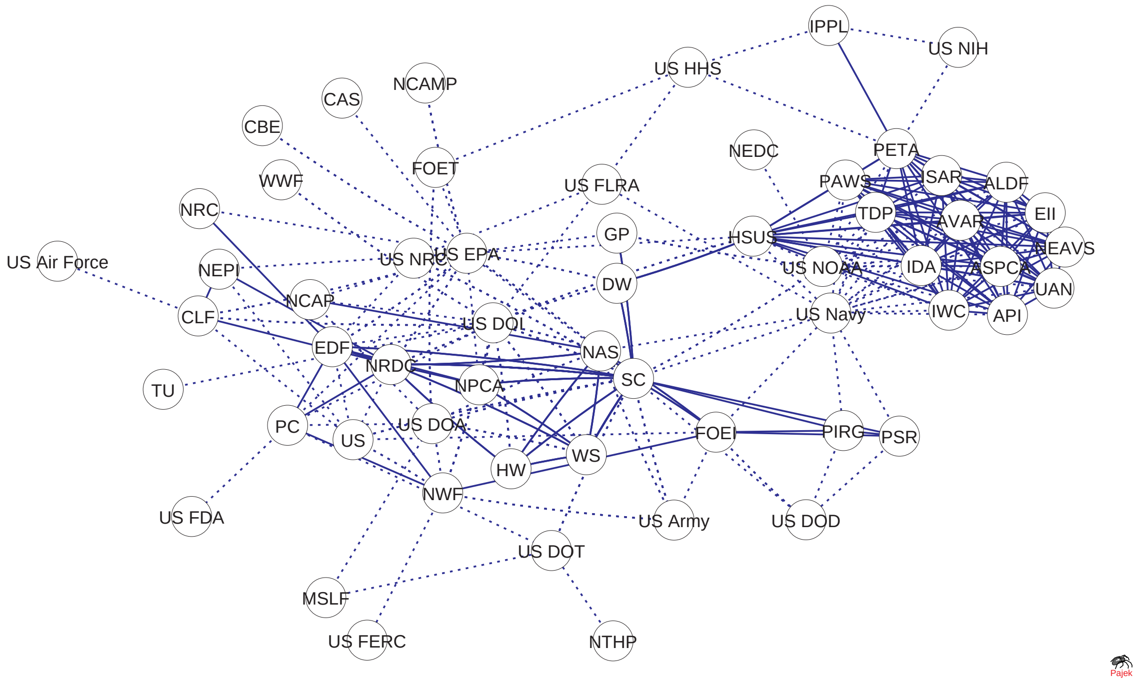



$I$(16, 118, 60)

Figure 8.5b: Imbalanced Subgraph (Period IV: 1982-1985)

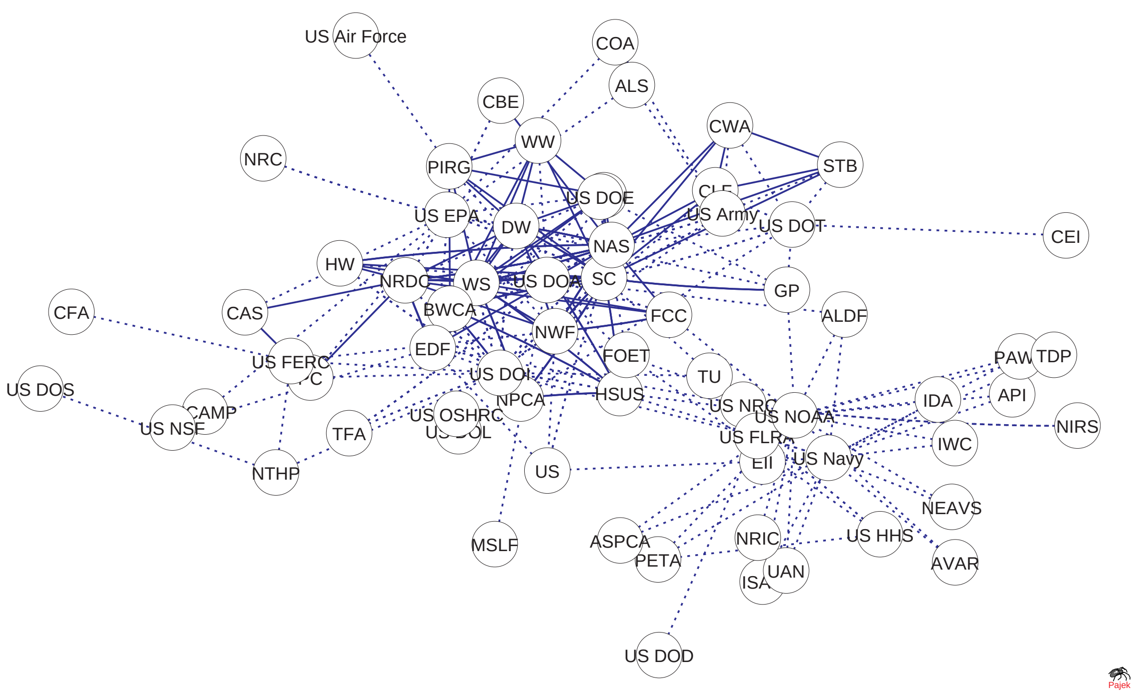
Note: 4-balanced (Davis, 1967)

Figure 8.6 displays the signed network of the fifth period. As shown, 58 EORGs were linked through 237 signed ties (128 alliances, 109 lawsuits) in this period. As the network was not divided into components, there was only one plus-set found in the network. Figure 8.7 displays the signed network of the sixth period. As shown, 67 EORGs were linked through 189 signed ties (75 alliances, 114 lawsuits) in this period. While the network was divided into two components, there were two plus-sets found in the network.




*S* (58, 128, 109)

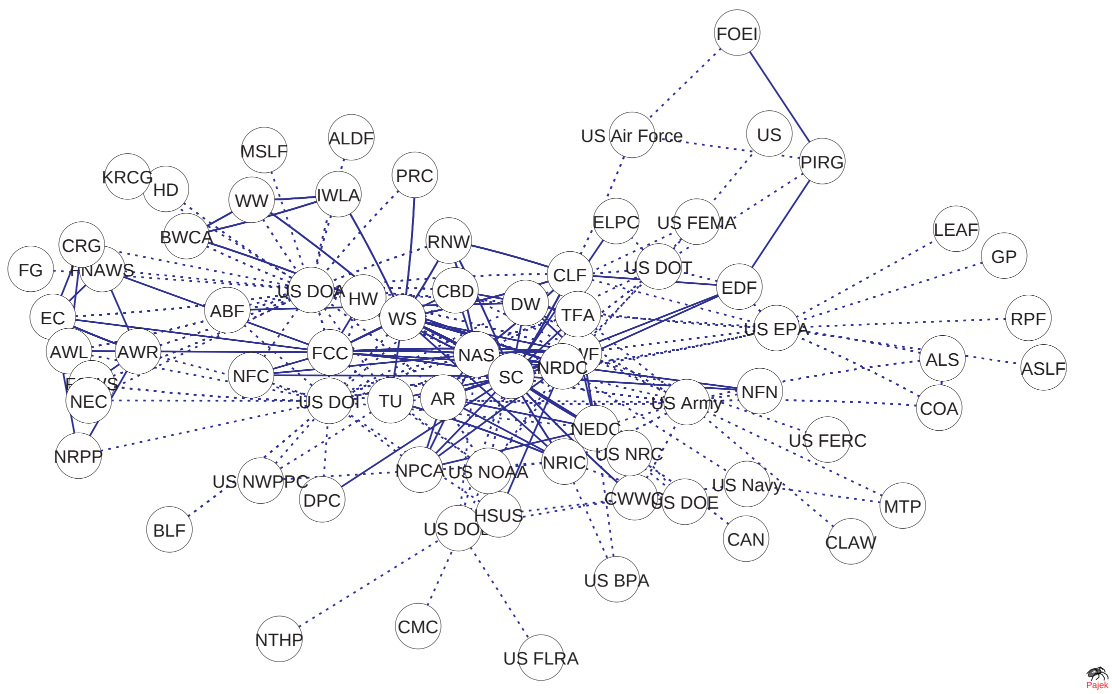
Figure 8.6: Signed Network (Period V: 1986-1989)




*S* (67, 75, 114)

Figure 8.7: Signed Network (Period VI: 1990-1993)

Figure 8.8 displays the signed network of the seventh period. As shown, 73 EORGs were linked through 214 signed ties (91 alliances, 123 lawsuits) in this period. While the network was divided into two components, there were plus-sets found in the network.



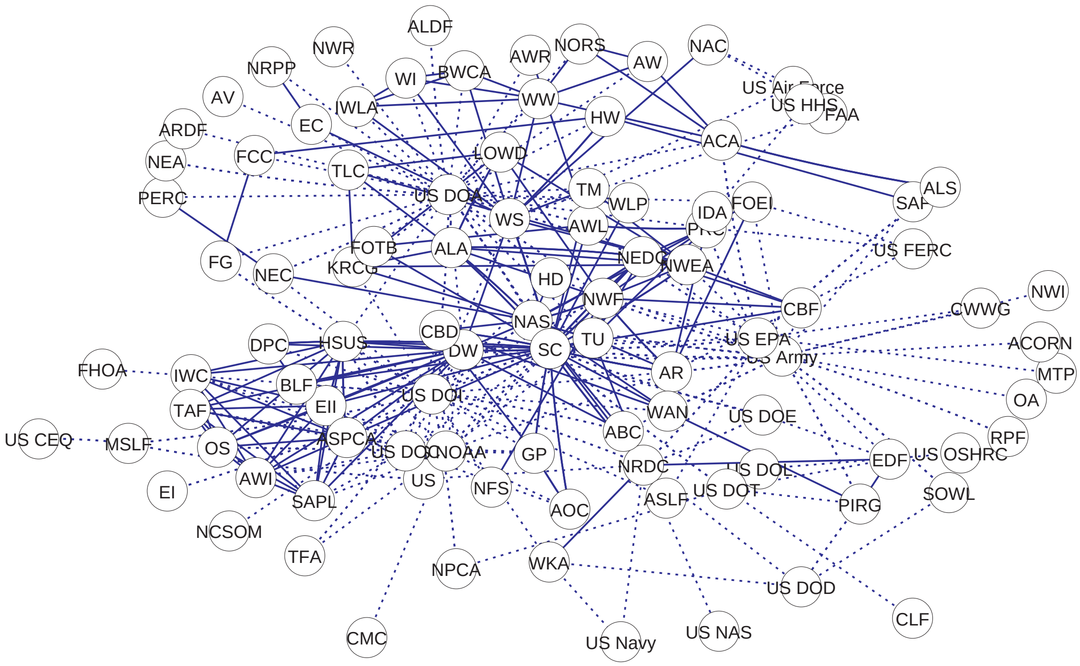

*S* (73, 91, 123)

Figure 8.8: Signed Network (Period VII: 1994-1997)

Finally, Figures 8.9a and 8.9b display the signed network and the imbalanced subgraph of the eighth period when imbalanced triples were found, respectively. As shown in Figure 8.9a, 100 EORGs were linked through 311 ties (147 alliances, 164 lawsuits) in this period. As in the previous periods, there was only one plus-set formed in the network, though the network was divided into three components. The plus-set was composed of 59 EMOs linked through 147 alliance ties. As were in the previous periods, there were EMOs that had common movement opponents. The Sierra Club (SC)–Defenders of Wildlife (DW) alliance tie had most (5) common movement opponents while the alliance tie contending with the US Army (US Army), Department of Agriculture (US DOA), US Department of Interior (US DOI), US National Marine Fisheries Service (NMFS) (NOAA Fisheries Service) (US NOAA), and Department of Commerce (US DOC).

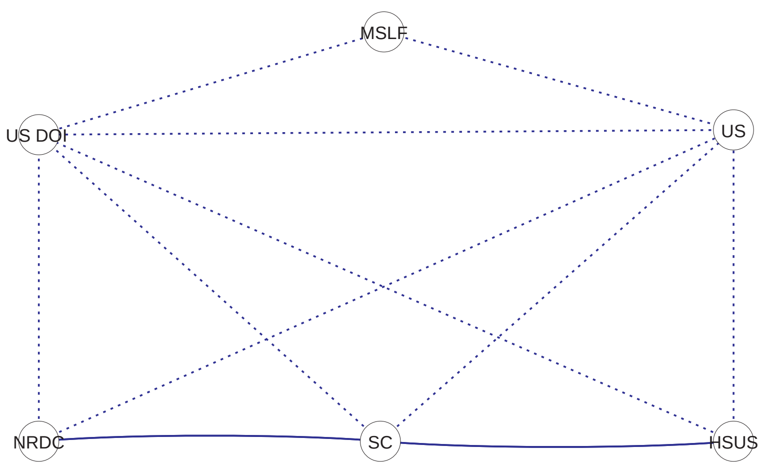
A closer look at the network shows that there were two lawsuit ties between the EGAs (US–US DOI, US DOL–US OSHRC), which involved four EGAs creating four imbalanced triples of six EORGs.[63] Figure 8.9b highlights the imbalanced subgraph in which six EORGs were linked through eleven signed ties. As shown, the negative tie between the United States (US) and the US Department of Interior (US DOI) formed four imbalanced triples with Mountain States Legal Foundation (MSLF), Humane Society of the United States (HSUS), Sierra Club (SC), and Natural Resources Defense Council (NRDC). The structural tension among the involved EORGs created due to the structural imbalance would demand a structural change (i.e., balanced structure) in the following period by making the EGAs (i.e., US–US DOI, US DOL–US OSHRC) remove the ties between themselves to make the structure balanced.

[63] The environmental lawsuits formed between EGAs in the final period are as follows: 1) 1998. *Alexis M. Herman (US DOL)* v. *Occupational Safety & Health Review Commission (US OSHRC)*. 2) 2000. *United States (US)* v. *US DOI (US DOI).*




*S* (100, 147, 164)

Figure 8.9a: Signed Network (Period VIII: 1998-2001)




*I* (6, 2, 9)

Figure 8.9b: Imbalanced Subgraph (Period VIII: 1998-2001)

Note: 4-balanced (Davis, 1967)

As presented above, three imbalanced triples were discovered in the Periods II, IV, and VIII. A comparison of the imbalanced triples in the prior and posterior to those periods confirms the *Fundamental Structural Balance Hypothesis* (*FSBH*) (Doreian and Krackhardt, 2001). A close look at the subgraphs reveals that all imbalanced triples involve two EGAs and an EMO that are negatively connected to each other and the imbalanced triples became balanced by the two occurrences: (*a*) the negative ties–potentially "inconsistent dyads"–between the EGAs disappeared in the next period or (*b*) one or two of the negative ties between the EGAs and the EMO disappeared. That is, in the periods where imbalanced triples were found, all imbalanced triples evolved into balanced triples in the next period and inconsistent dyads (negative inconsistencies) tended to disappear or other negative ties tended to be removed due to the inconsistent dyads. There was no case where the negative ties reversed to the positive ties directly. It seemed that negative ties were removed before they were reversed to positive ties.

Thus, the third hypothesis [H3], "the environmental government agencies (EGAs) in imbalanced structures have been more likely than the environmental movement organizations (EMOs) to make the structures balanced in the environmental movement sector (EMS) in the United States since 1970" was supported from an investigation of the signed structures over time. There have been inconsistent dyads throughout the entire period and the number reached highest in the late 1980s and the early 1990s. The number of imbalanced triples was highest in the early-mid 1980s when fourteen imbalanced triples were found. All imbalanced triples involved signed ties among two EGAs and an EMO. All imbalanced triples involved two EGAs and an EMO that were negatively connected to each other and the imbalanced triples became balanced by inconsistent dyads (negative inconsistencies) disappearing or other negative ties being removed due to the inconsistent dyads. Importantly, it seems that the EGAs have been more actively attempting to make the EMS without structural tensions than the EMOs have in the contemporary EMS in the United States since 1970.

However, the fourth hypothesis [H4], "the contemporary movement structure in the environmental movement sector (EMS) in the United States can be characterized as disconnected, decentralized, and imbalanced" was not supported from an investigation of the structural dynamics of the signed network. As shown, the main plus-set has existed connected rather than disconnected and hierarchical rather than homogenized throughout the entire period, though the state of (im)balance has changed over time. As in the preceding chapters, the findings are counterintuitive as the EMS has been thought to be structurally uninteresting–i.e., fragmented, decentralized, and imbalanced. Evidence suggests that the movement structure may continue to be connected and hierarchical and yet it may continue to experience structural tensions depending on the changes in environmental litigation in the near future.

Table 8.6: Structural Dynamics in Balance Structure

| Period | Year | Imbalanced | Type | Change | State |
|---|---|---|---|---|---|
| I | 1970-1973 | 0 | n/a | n/a | Balance |
| II | 1974-1977 | 3 | (- - -) | (- 0 -) | Balanced |
| III | 1978-1981 | 0 | n/a | n/a | Balance |
| IV | 1982-1985 | 14 | (- - -) | (- 0 -) | Balanced |
| V | 1986-1989 | 0 | n/a | n/a | Balance |
| VI | 1990-1993 | 0 | n/a | n/a | Balance |
| VII | 1994-1997 | 0 | n/a | n/a | Balance |
| VIII | 1998-2001 | 4 | (- - -) | (- 0 -) | Balanced |
| Total | Total | 24 | | | |

Table 8.7 summarizes the results from balance partitioning arranged by plus-sets, inconsistent dyads (i.e., sources of imbalance), EORGs in inconsistent dyads, imbalanced triples, and EORGs in imbalanced triples. As shown, the number of plus-sets was mostly small except for the third, sixth, and seventh periods where three, two, and two plus-sets were observed, respectively. There have been inconsistent dyads throughout the entire period and the number reached highest in the late 1980s and the early 1990s. Interestingly, the sources of imbalance all came from the inconsistent dyads between the EGAs. For example, in the second period, there were three inconsistent dyads involving four EGAs. In the fourth period, there were two inconsistent dyads involving four EGAs. In the eighth period, there was one inconsistent dyad involving two EGAs. Nonetheless, not all inconsistent dyads translated into imbalanced triples. In some cases, two EGAs in conflict existed unattached to the main component. However, in the second, fourth, and eighth periods, the inconsistent dyads did translate into imbalanced triples (3, 14, and 4 imbalanced triples, respectively) involving a few EORGs (5, 16, and 6, respectively).

Finally, I investigate the structural dynamics of the signed networks by which the partition structures (i.e., equivalent positions) have evolved over time. Of varied methods to partition network structures, I used balance partitioning and structural partitioning in sequence so that equivalent actors can be identified within and between the signed networks. That is, I partition signed networks in a consecutive manner as follows: (*a*) partitioning a signed network into plus-sets and (*b*) partitioning the plus-sets into equivalent positions. Looking at the signed networks, it is not possible to identify equivalent positions across plus-sets when the plus-sets are disconnected from each other.

In fact, several positive dyads disconnected from the main plus-set (e.g., two EORGs linked to each other in an alliance) have been found. However, it is possible to identify equivalent positions within the plus-sets. As discussed above, the EORGs in equivalent positions within a plus-set may be "competitors", while those in non-equivalent positions within the plus-set may be "allies". Similarly, the EORGs in equivalent positions between plus-sets may be "contenders", while those in non-equivalent positions between plus-sets may be simply "others".

No contenders have been found. Each period, however, saw several sets of competing EMOs located within the same plus-set attacking equivalent other EGAs. In the first period, the Environmental Defense Fund (EDF) and the Sierra Club (SC) were located in equivalent positions while attacking equivalent EGAs. In the second period, three sets of EMOs located in equivalent positions were found. The Environmental Defense Fund (EDF)–Friends of the Earth (FOEI), Environmental Defense Fund (EDF)–Sierra Club (SC), and Natural Resources Defense Council (NRDC)–Sierra Club (SC) were located in equivalent positions while attacking equivalent EGAs. In the fourth period, three sets of EMOs located in equivalent positions were found. The Sierra Club (SC)–Friends of the Earth (FOEI), Sierra Club (SC)–Natural Resources Defense Council (NRDC), Natural Resources Defense Council (NRDC)–Friends of the Earth (FOEI) were located in equivalent positions while attacking equivalent EGAs. In the eighth period, the Sierra Club (SC) and the Defenders of Wildlife (DW) were located in equivalent positions while attacking equivalent EGAs.

Table 8.7: Balance Partitioning and Structural Imbalance

| Period | Year | Plus-set | Size of Main Plus-set | Inconsistent Dyad (EGA-EGA) | EORG in Inconsistent Dyad | Imbalanced Triple | EORG in Imbalanced Triple |
|---|---|---|---|---|---|---|---|
| I | 1970-1973 | 1 | *P*(7, 14) | 1 | 2 | 0 | 0 |
| II | 1974-1977 | 1 | *P*(11, 23) | 3 | 4 | 3 | 5 |
| III | 1978-1981 | 3 | *P*(9, 12) | 1 | 2 | 0 | 0 |
| IV | 1982-1985 | 1 | *P*(23, 90) | 2 | 4 | 14 | 16 |
| V | 1986-1989 | 1 | *P* (33, 128) | 4 | 5 | 0 | 0 |
| VI | 1990-1993 | 2 | *P*(24, 74) | 7 | 9 | 0 | 0 |
| VII | 1994-1997 | 2 | *P*(38, 90) | 2 | 4 | 0 | 0 |
| VIII | 1998-2001 | 1 | *P*(59, 147) | 2 | 4 | 4 | 6 |
| Total | 1970-2001 | 1 | *P* (105, 411) | 22 | 15 | 24 | 21 |

Note: Total 21 unique imbalanced triples and 21 EORGs involved

## 8.5 Discussion

This chapter has investigated how organizational and relational characteristics have been associated with each other in the structural dynamics of the signed (i.e., combined litigative and alliance) structure in the EMS and how the signed structure has evolved over time in the United States since 1970. Specifically, this chapter has been concerned with what affects the imbalanced triadic structure to move toward the balanced structure resulting in the emergence of the structural characteristics (e.g., connectedness, balance, and hierarchy) of the contemporary EMS. EMOs have played different roles in creating movement ties depending on their organizational characteristics and locations in the movement structure. The development of triadic (litigation, alliance) substructures was also related to the organizational characteristics and locations, though future research has yet to explicate the extent to which those triadic substructures aggregate to the entire network structures.

Overall, the signed interorganizational structure in the EMS in the United States since 1970 has expanded, connected, hierarchicalized, and balanced over time. As shown, there have been inconsistent dyads (US DOL–US OSHRC, US DOA–US EPA, and US–US DOI) between EGAs. Not all inconsistent dyads led to developing imbalanced structures. The number of imbalanced triples was highest in the early-mid 1980s when fourteen imbalanced triples were found. All imbalanced triples involved two EGAs and an EMO that were negatively connected to each other and the imbalanced triples became balanced by inconsistent dyads (negative inconsistencies) disappearing or other negative ties being removed due to the inconsistent dyads. Importantly, it seems that the EGAs have more actively attempted to make the EMS without structural tensions.

A comparison of the imbalanced triples in the prior and posterior to the focal period confirms the *Fundamental Structural Balance Hypothesis* (*FSBH*) (Doreian and Krackhardt, 2001). Although the main plus-set has existed connected and hierarchical throughout the entire period, the state of (im)balance has changed over time. The findings may be counterintuitive to the popular belief since the EMS has been thought to be structurally fragmented, decentralized, and imbalanced. Evidence suggests that the movement structure may continue to be connected and hierarchical and yet it may continue to experience structural tensions depending on the changes in environmental litigation in the near future.

From a methodological perspective, this chapter attempted a combined use of structural partitioning and balance partitioning of signed networks in a consecutive manner. As shown, the main plus-set was only one in all eight periods. Accordingly, no contenders have been found across plus-sets. Each period, however, saw several sets of competing EMOs located within the same plus-set attacking equivalent other EGAs. While being considered “competitors”, they shared similar organizational attributes in orientation, strategy, region, area, size, and age. For example, in the first period, the Environmental Defense Fund (EDF)–Sierra Club (SC) alliance tie had most common movement opponents while contending with US Army, US DOA, US DOI, and US EPA. The two EMOs were equivalent within the plus-set as they were equivalently negatively tied to the common opponents while the four EGAs were also negatively equivalent for the two EMOs. Similarly, in the eighth period, the Sierra Club (SC) and the Defenders of Wildlife (DW) were located in equivalent positions while attacking equivalent EGAs. An oppositional structure in which the EORGs were negatively tied to each other across plus-sets was not developed. Future research may be directed toward studying the roles that the competitors are playing for movement allies and against movement opponents.

## 8.6 Summary

This chapter has investigated how organizational and relational characteristics have associated with each other in the structural dynamics of the signed (i.e., combined litigative and alliance) structure and how the signed structure has evolved over time in the EMS in the United States since 1970. A longitudinal analysis of the environmental signed ties in the United States showed the findings such as the following: First, there have been conflicting relationships (US DOL–US OSHRC, US DOA–US EPA, and US–US DOI) between EGAs. All imbalanced triples involved two EGAs and an EMO that were negatively connected to each other and the imbalanced triples became balanced by the inter-EGA conflicts disappearing or other negative ties being removed due to the inconsistent dyads. In part, the findings support the hypothesized equivalent roles in signed structures because the two EGAs equivalently tied to an EMO tended to behave in a similar fashion (i.e., dropped the negative tie between them). Importantly, it seemed that the EGAs attempted more actively to make the EMS without structural tensions. Second, a comparison of the imbalanced triples in the prior and posterior to the focal period supported the *Fundamental Structural Balance Hypothesis* (*FSBH*) for some periods (Doreian and Krackhardt, 2001). Although the main plus-set has existed connected and hierarchical throughout the entire period, the state of (im)balance has changed over time. The findings may be counterintuitive to the popular belief that the contemporary EMS is structurally imbalanced as well as fragmented and decentralized. The evidence suggests, however, that the movement structure may continue to be connected and hierarchical and yet it may continue to experience structural tensions depending on the changes in environmental litigation in the near future.

# Part IV

# Concluding Elements

# Chapter 9

# Conclusion

Below, I summarize some of the primary contributions of this dissertation including empirical findings and theoretical/methodological developments. Further, I address some limitations of this dissertation, particularly with respect to its confined scope and limited explication of the structural dynamics. Finally, I present substantive implications for the literature of social movements/collective action and potential directions for future research in studying interorganizational relations in nonprofit sectors.

## 9.1 Empirical Findings

While Zald and McCarthy (1987) pointed out that the literature on social movements lacked systematic analysis of the interaction of social movement organizations (SMOs), this dissertation attempted exclusively at a systematic investigation of the inter-organizational relations in the environmental movement sector (EMS) for the given period. This dissertation found that, as the literature (Handler, 1978; Pellow, 1999) presented, there was a significant increase in litigative ties as well as alliance ties between the EORGs in the EMS in the United States and the increases in both types of inter-EORG ties were not random: organizational characteristics and their locations in the inter-EORG relations mattered in forming (litigation, alliance) ties in the subsequent periods.

Until the early 1990s, environmental litigation had been widely used by the EMOs founded early regardless of their expressed strategies or ideologies. As the literature noted, judicial activism in the 1960s and the 1970s in social movements stimulated and encouraged the use of litigation as a movement strategy, resulting in the increased number of EMOs resorting to litigation. And yet, after the mid-1990s on, young EMOs with limited resources have used litigation more actively than old EMOs, though old EMOs still have played central roles in environmental litigation. As discussed in Chapter 2, there are objectives that the EMOs attempt to obtain from movement conflicts: legitimacy of constituent representation, exclusive membership, symbolic dominance (Zald and McCarthy, 1987).[64] The finding implies that the EMOs founded earlier did not avoid conflicts with the government agencies until the early 1990s whereas the EMOs founded later, since the mid-1990s just as the old EMOs did. It seems clear that the benefits that the EMOs could potentially obtain were more appealing to younger EMOs than to old EMOs for organizational survival and further success. This finding also resonates with that of organizational studies that traditional organizations with abundant resources tend to resort to the strategy of "exploitation" whereas new organizations, "exploration" (March, 1991).

[64] From environmental litigation as a particular type of inter-organizational conflicts, the EMOs must have benefited the following extrajudicial as well as judical outcomes: political leverage, publicity, fund raising, consciousness-raising, and legitimacy (Handler, 1978; Zald and McCarthy, 1987). Handler (1978) contended that extrajudicial uses of the litigation might have been the most important accomplishment of the environmentalists.

As observed in Chapter 6, environmental litigation occurred mostly between the EMOs and the EGAs.[65] Zald and Useem (1987) contends that direct attack by movement organizations against authorities occur because movement organizations are not sufficiently stable to implement major changes in society and, accordingly, they attempt to shift the cost of achieving change from themselves to the government and polity at large. While their argument appears tenable in general, the fact that the EMOs in stable condition such as the Sierra Club (SC), the National Audubon Society (NAS), and the Environmental Defense Fund (EDF) as well as newly started EMOs were active in attacking the EGAs, particularly, before the mid-1990s suggests that their argument cannot be supported throughout the period studied in this dissertation.

Transitive hierarchical structures, which E-state structuralism focused on, were found in only a few periods when dominated EORGs in triadic hierarchical structures tended to be attacked by other EORGs as well. Substantively, a triadic hierarchical structure in litigation implies that an EGA, sued by an EMO for negligence of enforcement of environmental laws/regulations, turns to another EGA and then the EMO, in turn, sues the EGA as well because it looks vulnerable under the assumption that the lawsuits occurred this way in time sequence. Particularly, the Sierra Club (SC) was involved in all the transitive hierarchical structures while attacking the United States (US), US Department of Agriculture (US DOA), US Department of Interior (US DOI), and US Environmental Protection Agency (US EPA) that were most often dominated in the

[65] No significant litigation activities were observed between the anti-environmental groups and the authorities despite the activism by the anti-environmental groups such as the "Wise-Use" group, while a few conservative EMOs were found to attack the EGAs (e.g., Pacific Legal Foundation (PLF) vs. US DOI and US EPA). Thus, models C and D of triadic conflictual structures among movement, counter-movement, and authority by Zald and Useem (1997) were not relevant to explaining the inter-organizational litigation in the current dissertation.

transitive hierarchical structures. The fact that most lawsuits were filed by EMOs against EGAs made the development of the transitive hierarchical structures infrequent. However, the transitive hierarchical structures occurred due to the tendency that the EGAs tended to attack other EGAs whereas the EMOs did not tend to attack other EMOs. As a result, the litigation structure was closed most often by the EGAs rather than by the EMOs, which suggests that the transitive hierarchical structures emerged in part due to the organizational type rather than pure "bystander effect" presented by E-state structuralism (Berger, Wagner, and Zelditch, 1985; Fararo and Skvoretz, 1986).

The most recent litigative structure in the final period (1998-2001), which were thought to represent the contemporary inter-EORG conflictual structure, was connected, except for the two sets of isolated dyadic ties, and hierarchical–a large number of EMOs attacked a small number of EGAs. This provides more structural knowledge of the conflictual relations in the contemporary environmental movement beyond the typical narratives in the literature to show a simple increase in inter-EORG conflicts. The fact that many EMOs were sharing common movement opponents suggests a possibility of forming alliance ties or joint affiliation with collective action in the future. As a result, movement activities (e.g., advancing claims) may be coordinated and resources (e.g., finance, labor) may be mobilized between the EMOs with common movement opponents.

On the other hand, the EMOs have allied with other EMOs in their organizational environment to achieve movement objectives. As noted, the literature identified the factors that served to facilitate alliances between EMOs such as task specialization, external social control, overlapping constituents, and elite/third-party constraints. It seems that the first two factors (e.g., similar goals/tactics; need of resource mobilization) clearly served in promoting inter-EMO alliances in the EMS. Particularly, it was observed that the EMOs with similar ideological "orientation" and movement "strategy," not necessarily in organizational "size" and "age," have allied with each other. That is, in allying for joint litigation, the EMOs worked together regardless of their ages and sizes as long as they shared similar orientation and strategies. For example, the large EMOs that existed for a while in the movement sector allied for joint litigation with the small EMOs founded recently because they were similar in ideological orientation and movement strategies. This might have been unavoidable particularly for unstable EMOs that were newly founded to mobilize resources considering the nature of long-lasting and costly environmental litigation. In principle, this finding resonates with one of the popular rules of preferential attachment, "homophily" (McPherson and Smith-Lovin, 1987; McPherson et al., 2001). Nonetheless, it raises an important question of why the large EMOs, though they could have litigated by themselves, allied with the small EMOs just because they shared similar orientation and strategies. Here, no prompt answers can be given and future research might be able to address this question.

The EMOs located in most constrained positions (i.e., embedded in alliance triads) (e.g., EDF, SC, NAS, and NRDC) in a period were still located in most constrained positions in the subsequent period. On the other hand, the EMOs located in least constrained positions in a period either closed alliance triads (e.g., FOEI, HSUS) or disappeared (e.g., CBE) in the subsequent period. In fact, a number of the EMOs in marginal locations simply disappeared in alliance structures. While the literature in network analysis contended that network closure is one of the mechanisms to increase social capital (Burt, 1992, 2001) and achieved by the actors in least constrained locations, an analysis of the dynamics in alliance formation informs that network closure and subsequent increase in social capital has been achieved by the already most embedded EMOs, which is somewhat counterintuitive.

The most recent alliance structure for the final period (1998-2001), which were thought to represent the contemporary inter-EORG alliance, was connected and hierarchical–a large number of EMOs allied with a small number of EMOs. As in the litigation structure, this provides more structural knowledge of the alliance relations in the contemporary environmental movement beyond the typical narratives in the literature to show a simple increase in inter-EMO alliances. Although the "connectedness" may not necessarily suggest "solidarity" in social movements/collective action, the fact that all EMOs, as long as they litigate, were connected to each other as a collectivity suggests a possibility of joint affiliation with collective action in the future. Accordingly, movement activities (e.g., advancing claims) may be coordinated and resources (e.g., finance, labor) may be mobilized between the EMOs in alliance relations.

Finally, several cases of inter-EGA conflicting relations have been repeatedly observed throughout the period (US DOL–US OSHRC, US DOA–US EPA, and US–US DOI). Not all of these inter-EGA conflicts led to imbalanced structures from a balance-theoretic perspective. The number of (Heiderian) imbalanced triples was highest in the early to mid-1980s when fourteen imbalanced triples were found. All imbalanced triples involved two EGAs and an EMO that were negatively tied to each other in litigation and the imbalanced triples became balanced by the inter-EGA conflicts disappearing due to the structural tension among the EORGs involved or the EMOs themselves disappearing. An observation of the dynamics of the triadic imbalanced structures implies that the

EGAs have attempted more actively to make the movement sector without structural tension.

A comparison of the imbalanced triples across periods supported partially the *Fundamental Structural Balance Hypothesis* (*FSBH*) (Doreian and Krackhardt, 2001). Although the main plus-set (i.e., alliance structure) has existed connected and hierarchical, the state of (im)balance has alternated throughout the period. This finding may seem counterintuitive to the popular belief regarding the contemporary movement structure that it is structurally imbalanced (i.e., shifting allies and enemies) as well as fragmented and decentralized. The evidence implies, however, that the inter-EORG structure has continued to be connected and hierarchical and yet it has experienced structural tension on and off.

## 9.2 Theoretical/Methodological Contributions

In addition to investigating empirical questions regarding the inter-organizational (litigation, alliance) relations in the EMS, I have also attempted to add to the theoretical and methodological literatures on social network analysis, organization theory, and social movement/collective action. The basic contributions may be summarized as follows:

This dissertation considered EMOs as "open" systems embedded in the organizational environment in which they operate (Aldrich, 1979; Galaskiewitz, 1979). Even as open systems, the EMOs were selective in forming (and removing) interorganizational ties when the ties were "costly" such as litigation and alliances for which they had to pay the costs for potential benefits. The current work discovered some conditions under which the EMOs have switched interorganizational ties. It further asks for an exploration of more (attributal, relational) conditions under which organizations manage inter-organizational ties in both non-profit and for-profit sectors.

This dissertation exemplified a network-structural analysis of the EMS (particularly, its alliance structures for opposition) in the United States, 1970-2001. The theoretical and methodological framework used in the current work is useful to the resource mobilization approach in particular that has aimed to explicate mobilizing structures in social movements/collective action. The current work provided some knowledge of the structural characteristics that may facilitate (or constrain) resource mobilization in the contemporary environmental movement. Analysis of the extent to which those structural characteristics contributed to the success of resource mobilization belongs to future research.

Finally, this dissertation has illustrated how dyadic and triadic (litigation, alliance) substructures develop by investigating inter-EORG relations in the EMS in the United States. While research practices in studying social movements/collective action have largely neglected systematic analysis of interaction of the organizations in studying movement structures, this dissertation has represented and explicated the structure and dynamics of the environmental social movement by employing systematic network methods. The current work also addressed the importance and difficulty of explicating structural dynamics beyond formation of triadic structures to fully explain the emergence of the structural characteristics of the contemporary movement structure (e.g., connectedness, hierarchy, and balance). This dissertation suggests that future research consider models of network dynamics beyond the models of “triadic completion.”

## 9.3 Limitations

Since the current work is concerned with the EORGs that have been involved in environmental litigation between 1970 and 2001 in the United States, the data set did not include the EORGs that have not litigated: i.e., EMOs, while still active, that have not used litigation as a movement strategy were excluded in data collection. Currently, it is not known how many national EORGs have existed without being involved in environmental litigation so far. The inter-EORG relations in this dissertation to represent the movement structure might have represented rather combative part of the environmental movement sector.

Second, I did not attempt to explain what has made the EORGs employ litigation as a movement strategy among other strategies. As a result, the findings do not directly answer why the EORGs that were active in litigation have employed litigation, not other strategies. The current work can only note, according to the literature, that active environmental legislation since the 1960s have provided environmental standards that allowed the EORGs to use litigation. Moreover, the current work did not study what structural outcomes the success or failure of the environmental litigation has brought about in the movement sector. Since the focus of this dissertation was only on legal activities, the current work cannot be used to explain or evaluate whether or not the environmental movement has shifted from the "contentious" movement to the "conflict" movement over the past decades in the United States.

Third, the current work did not consider organizational environments other than the interorganizational relations in which the EMOs were embedded. Those organizational environments may include technical or normative environments

(DiMaggio and Powell, 1983). In environmental movements, recent historical events have also played important roles in organizational environments. For example, the current work started from an analysis of the period beginning in 1970 when the first Earth Day was observed. In dividing the entire period into subperiods, however, this dissertation did not use historical events in the development of the contemporary environmental movement. For example, it might have been appropriate to use historical events (e.g., the global summit to set the protocol for controlling ozone gases in 1997 in Kyoto, Japan) as criteria to divide the periods and then construct network structures as such.

Finally, it was not clearly shown what structural mechanisms have brought about the contemporary litigative and alliance structures, though this dissertation did investigate the structural dynamics thereby dyadic and triadic substructures emerged over time. As a result, to a large extent, the current work had to be satisfied with describing the network changes rather than explaining it. Recent advances in structural theorization, methodological approaches, and computer packages may help discover the structural mechanisms by which the complicated contemporary social movement has emerged (Doreian and Stokman, 1997; Hedstrom and Swedberg, 1998; ICS, [2002] 2007).

## 9.4 Implications

Beyond the findings presented above, this research has some implications for the study of interorganizational relations in social movement/collective action. Here, I briefly present such implications. It is hoped that the implications below are useful for others pursuing research in this area.

The findings allow us to consider the differing roles of the EMOs in the expansion and continuity of the movement structure over time in the EMS in the United States. Taken together, the findings reveal that the "expansion" of the inter-EORG structure has been achieved by the young EMOs that actively adopted litigation as a movement strategy and that widely allied with other EMOs with similar movement orientation and strategies. Nonetheless, the "continuity" of the inter-EORG structure has been achieved by the old EMOs that have used litigation and that have allied with other EMOs. The new EMOs have tended to be intermittent in the inter-EORG structure. It may need a further thought to assess which of expansion and continuity has been more important in strengthening the EMS in the United States over the past decades.

The findings also allow us to think the extent to which the connected yet hierarchical inter-EMO structure in the EMS may be efficient in future resource mobilization. As described, the inter-EMO alliance structure has been composed of a few embedded EMOs in the core and the marginal EMOs in the periphery. The fact that the contemporary inter-EMO structure is "connected" implies that resources may flow throughout the network structure whereas that the inter-EMO structure is "hierarchical" implies that the flow of resources may be controlled by the EMOs located in the core. It may need further thought to suggest the ways to make the inter-EMO structure more connected and less hierarchical, if this would be more efficient.

## 9.5 Future Directions

To fully explain the formation of dyadic ties based on both organizational characteristics and relational properties, future research may have to use conditional logit model

(McFadden, 1973, 1981; Ben-Akiva, and Lerman, 1989) as well as exponential random graph models (ERGM) or *p*-star logit models. The conditional logit models are more advantageous when the research aims to consider as variables the organizational characteristics of the focal parties involved, the parties' neighbors, the parties' neighbors' neighbors', and so on. Although the development of such models may require skills such as programming and data management, it seems clear that future research in this line will benefit more from them.

More data may need to be collected in future research regarding the EORGs at the regional and local levels and other types of EORGs. Currently, there is no knowledge of what inter-EORG structures might look like at the regional and local levels, let alone the overall network structure when all the EORGs at those three different levels were aggregated. In addition, future research may have to include other types of organizations such as trade associations, corporations, labor unions other than EMOs and EGAs since they have also played essential roles in EMS in the United States.

Future research might also have to consider more types of ties (e.g., interlocking, event affiliation, etc.) among more diverse types of entities (such as personnel, ideologies, resources, events, etc.). In this regard, tripartite structural analysis (Fararo and Doreian, 1984) and meta-network analysis (Krackhardt and Carley, 1998; Carley and Hill, 2001) may be useful in investigating the multi-modal multiplex structures. They are an effective scheme to represent and analyze the macrostructure of the inter-EORG relations in which multiple (e.g., social, cultural, and behavioral) substructures are interdependent on each other. While analysis of multiplex ties of multiple forms of nodes may be computationally challenging, advances in the development of network packages such as *ORA* allow analysis feasible today (Carley, [2001] 2007).

## 9.6 Final Thoughts

In closing, while network has been used as a representation and analytical scheme, its use has been mainly toward social structures. Cultural structures also await network and the task seems not completely impossible because early cultural analysts were already conceptualizing cultural structures from a relational (and dynamic) perspective as follows: [66]

> "[T]he culture concept … denotes an historically transmitted pattern of meanings embodied in symbols, a system of inherited conceptions expressed in symbolic forms by means of which men communicate, perpetuate, and develop their knowledge about and attitudes toward life."
> (Geertz, [1966] 1973)

Yet, it seems essential to study the dynamics–how a cultural structure emerges, sustains, and dissolves and what each process means to the people who conduct their lives while embedded in the structure. A long journey is before us.

[66] In a similar fashion, while defining social network, White (1992) contends that "a social network is a network of meanings."

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# Appendix

## A. List of Environmental Movement Organizations

| ID | Short | Organization |
|---|---|---|
| e1 | ABC | American Bird Conservancy (ABC) |
| e2 | ABF | American Buffalo Foundation |
| e3 | ACA | American Canoe Association (ACA) |
| s1 | ACORN | Association of Community Organizations for Reform Now (ACORN) |
| e4 | AHPA | American Horse Protection Association |
| e5 | AIANA | Asbestos Information Association/North America (AIANA) |
| e6 | ALA | American Lands Alliance |
| e7 | ALDF | Animal Legal Defense Fund (ALDF) |
| e8 | ALS | Americal Littoral Society |
| e9 | ANS | Association of Northwest Steelheaders |
| e10 | AOC | American Oceans Campaign |
| e11 | APHA | American Public Health Association |
| e12 | API | Animal Protection Institute |
| e13 | AR | American Rivers |
| e14 | ARC | Animal Rights Coalition |
| e15 | ARDF | Alternatives Research & Development Foundation |
| e16 | ASLF | Atlantic States Legal Foundation |
| e17 | ASPCA | American Society for the Prevention of Cruelty to Animals |
| e18 | AV | Appalachian Voices |
| e19 | AVAR | Association of Veterinarians for Animal Rights |
| e20 | AW | American Whitewater Affiliation (AW) |
| e21 | AWI | Animal Welfare Institute (AWI) |
| e22 | AWL | American Wildlands (AWL) |
| e23 | AWR | Alliance for the Wild Rockies |
| e24 | BLF | Biodiversity Legal Foundation |
| e25 | BWCA | Friends of the Boundary Waters Wilderness (BWCA) |
| e26 | CAN | Citizens Awareness Network (CAN) |
| e27 | CAS | Center for Auto Safety |
| e28 | CBD | Center for Biological Diversity |
| e29 | CBE | Citizens for a Better Environment (CBE) (MCESPP) |
| e30 | CBF | Chesapeake Bay Foundation |
| s2 | CC | Common Cause |
| s3 | CEI | Competitive Enterprise Institute (CEI) |
| s4 | CFA | Consumer Federation of America |
| e31 | CLAW | Constitutional Law Foundation (CLF) |

| | | |
|---|---|---|
| e32 | CLF | Conservation Law Foundation (CLF) |
| e33 | CMC | Center for Marine Conservation (CMC) |
| s5 | CNI | Community Nutrition Institute (CNI) |
| e34 | CNR | Committee for Nuclear Responsibility |
| e35 | COA | Clean Ocean Action (COA) |
| e36 | CRG | Cabinet Resource Group (CRG) |
| e37 | CWA | Clean Water Action (Clean Water Fund) |
| e38 | CWF | Canadian Wildlife Federation |
| e39 | CWWG | Chemical Weapons Working Group (CWWG) (KEF) |
| e40 | DPC | Desert Protective Council (DPCINC) |
| e41 | DW | Defenders of Wildlife |
| e42 | EC | Ecology Center |
| e43 | EDF | Environmental Defense Fund |
| s6 | EI | Edmonds Institute |
| e44 | EII | Earth Island Institute |
| e45 | ELF | Environmental Law Foundation |
| e46 | ELPC | Environmental Law & Policy Center of the Midwest (ELPC) |
| e47 | FCC | Forest Conservation Council |
| e48 | FG | Forest Guardians |
| e49 | FHOA | Foundation for Horses & Other Animals (FHOA) |
| e50 | FNAWS | Foundation for North American Wild Sheep |
| e51 | FOEI | Friends of the Earth (FOEI) |
| s7 | FOET | Foundation on Economic Trends |
| e52 | FOTB | Friends of the Bow (Biodiversity Associates) |
| e53 | FOWS | Friends of the Wild Swan (FOWS) |
| e54 | GP | Greenpeace, USA (Greenpeace Fund) |
| e55 | HD | Heartwood |
| e56 | HSUS | Humane Society of the United States (HSUS) |
| e57 | HW | Headwaters |
| e58 | IDA | In Defense of Animals (IDA) |
| e59 | IFAW | International Fund for Animal Welfare (IFAW) |
| e60 | IPPL | International Primate Protection League (IPPL) |
| e61 | ISAR | International Society for Animal Rights (ISAR) |
| e62 | IWC | International Wildlife Coalition (IWC) |
| e63 | IWLA | Izaak Walton League (IWLA) |
| e64 | KRCG | Kettle Range Conservation Group |
| e65 | LEAF | Legal Environmental Assistance Foundation (LEAF) |
| e66 | LOWD | League of Wilderness Defenders (LOWD) (BMBP) |
| s8 | LWV | League of Women Voters (LWV) |
| s9 | MSLF | Mountain States Legal Foundation (MSLF) |
| e67 | MTP | Military Toxics Project (MTP) |
| e68 | NAC | National Airspace Coalition |
| e69 | NAS | National Audubon Society |
| e70 | NAWPF | North American Wildlife Park Foundation |
| e71 | NCAMP | National Coalition against Misuse of Pesticides (NCAMP) |
| e72 | NCAP | Northwest Coalition for Alternatives to Pesticides (NCAP) |
| e73 | NCPL | National Center for Preservation Law |
| e74 | NCSOM | National Coalition to Save Our Mall |

| | | |
|---|---|---|
| e75 | NEA | Northwest Environmental Advocates |
| e76 | NEAVS | New England Anti-Vivisection Society (NEAVS) |
| e77 | NEC | Northcoast Environmental Center (NEC) |
| e78 | NECNP | New England Coalition (on Nuclear Pollution) (NECNP) |
| e79 | NEDC | Northwest Environmental Defense Center (NEDC) |
| s10 | NELF | New England Legal Foundation (NELF) |
| e80 | NEPI | National Environmental Policy Institute (NEPI) |
| e81 | NFC | Native Forest Council |
| e82 | NFN | Native Forest Network |
| e83 | NFS | Native Fish Society |
| e84 | NIRS | Nuclear Information & Resource Service (NIRS) |
| e85 | NORS | National Organization for Rivers (NORS) |
| e86 | NPCA | National Parks Conservation Association (NPCA) |
| e87 | NRC | National Recycling Coalition (NRC) |
| e88 | NRDC | Natural Resources Defense Council (NRDC) |
| e89 | NRIC | Northwest Resource Information Center (NRIC) |
| e90 | NRPP | Northern Rockies Preservation Project (NRPP) |
| e91 | NTHP | National Trust for Historic Preservation |
| e92 | NWEA | Northwest Ecosystem Alliance (NWEA; Now, CNW) |
| e93 | NWF | National Wildlife Federation |
| e94 | NWI | National Wilderness Institute |
| e95 | NWR | Northwoods Wilderness Recovery |
| e96 | NWRA | National Wildlife Refuge Association (NWRA) |
| e97 | OA | Ocean Advocates |
| e98 | OS | Oceanic Society |
| e99 | PAWS | Progressive Animal Welfare Society (PAWS) |
| s11 | PC | Public Citizen (Public Citizen Foundation) |
| e100 | PCA | Project on Clean Air |
| e101 | PERC | Pacific Environment and Resources Center |
| e102 | PETA | People for Ethical Treatment of Animals (PETA) |
| s12 | PIRG | U.S. Public Interest Research Group (PIRG) |
| s13 | PLF | Pacific Legal Foundation |
| e103 | PRC | Pacific Rivers Council (PRC) |
| s14 | PSR | Physicians for Social Responsibility (PSR) |
| e104 | RNW | RESTORE: The North Woods |
| e105 | RPF | Raymond Proffitt Foundation (RPF) |
| e106 | SAF | Save America's Forests (Fund) |
| e107 | SAPL | Society for Animal Protective Legislation (SAPL) |
| e108 | SC | Sierra Club (Sierra Club Foundation) |
| e109 | SCAPL | Seacoast Anti-Pollution League (SAPL) |
| e110 | SCI | Safari Club International (SCI) |
| s15 | SIPI | Scientists' Institute for Public Information (SIPI) |
| e111 | SOWL | Save Our Wetlands (SOWL) |
| e112 | STB | Save the Bay |
| e113 | TAF | The Animal Fund (TAF) |
| e114 | TDP | The Dolphin Project |
| e115 | TFA | The Fund for Animals |
| e116 | TLC | The Lands Council (TLC) |

| | | |
|---|---|---|
| e117 | TM | The Mountaineers |
| s16 | TRS | The Ripon Society |
| e118 | TU | Trout Unlimited (TU) |
| e119 | UAN | United Animal Nations |
| e120 | UCS | Union of Concerned Scientists (UCS) |
| e121 | WAN | Wetlands Action Network |
| e122 | WI | Wilderness Inquiry |
| e123 | WKA | Waterkeeper Alliance |
| e124 | WLP | Western Lands (Exchange) Project |
| e125 | WS | Wilderness Society |
| e126 | WW | Wilderness Watch |
| e127 | WWF | World Wildlife Fund (WWF) |

# B. List of Environmental Government Agencies

| ID | Short | Organization |
|---|---|---|
| g1 | US | United States |
| g2 | US Air Force | US Department of Air Force |
| g3 | US Army | US Army Corps of Engineers |
| g4 | US BPA | US Bonneville Power Administration |
| g5 | US CEQ | US Council of Environmental Quality (CEQ) |
| g6 | US DOA | US Department of Agriculture (DOA) |
| g7 | US DOC | US Department of Commerce |
| g8 | US DOD | US Defense Nuclear Facilities Safety Board (DNFSB) (DOD) |
| g9 | US DOE | US Department of Energy (DOE) |
| g10 | US DOI | US Department of Interior (DOI) |
| g11 | US DOL | US Department of Labor (DOL) |
| g12 | US DOS | US Department of State |
| g13 | US DOT | US Department of Transportation (DOT) |
| g14 | US EPA | US Environmental Protection Agency (EPA) |
| g15 | US FAA | US Federal Aviation Administration |
| g16 | US FDA | US Federal Drug Administration |
| g17 | US FEMA | US Federal Emergency Management Agency |
| g18 | US FERC | US Federal Energy Regulatory Commission (FERC) |
| g19 | US FLRA | US Federal Labor Relations Authority (FLRA) |
| g20 | US FMSHRC | US FMSHRC |
| g21 | US GSA | US General Services Administration |
| g22 | US HEW | US Department of Health, Education & Welfare (HEW) |
| g23 | US HHS | US Department of Health & Human Services (HHS) |
| g24 | US HUD | US Department of Housing & Urban Development (HUD) |
| g25 | US NAS | US National Academy of Science |
| g26 | US Navy | US Department of Navy |
| g27 | US NIH | US National Institute of Health |
| g28 | US NOAA | US National Marine Fisheries Service (NMFS) (NOAA Fisheries Service) |
| g29 | US NPS | US National Park Services |
| g30 | US NRC | US Nuclear Regulatory Commission (NRC) |
| g31 | US NRP | US National |
| g32 | US NSF | US National Science Foundation |
| g33 | US NWPPC | US NWPPC |
| g34 | US OSHRC | US Occupational Safety & Health Review Commission |

# C. Estimation from Exponential Random Graph Model (ERGM or p-star)

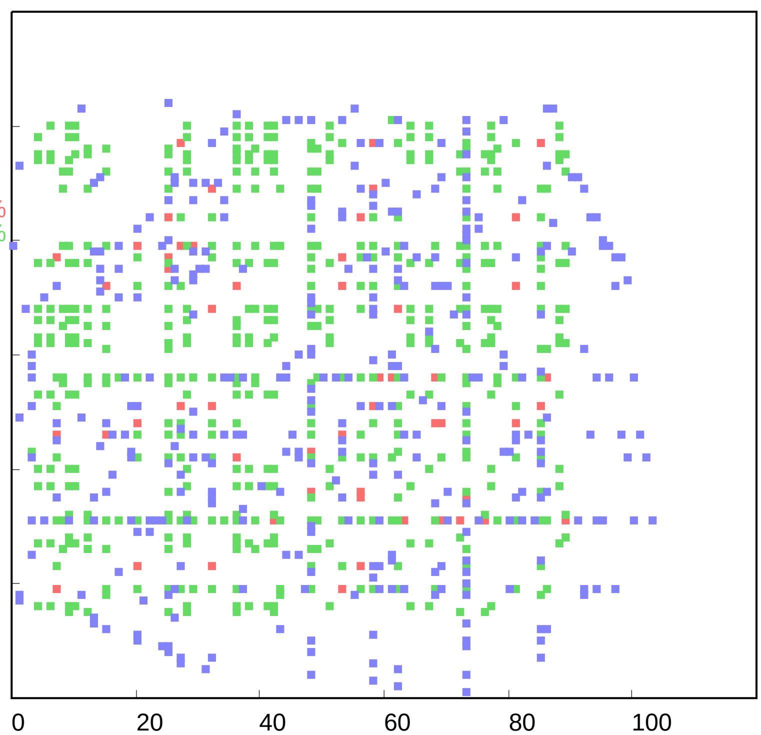
**1. No attributes selected.**

```
LINK: "PARTNERSHIP"  LINKS =    814  NODES =  104  (DIAGONAL NOT INCLUDED)

 -2 Log PseudoLikelihood =            2669.693
         Goodness of Fit =            9255.662
       Model Chi-squared =           12180.292     df = 3

FIT AT P = 0.5                          RESIDUALS
               PRED             529
            <P   ¦   >P                 Absolute =          671.603
        ------------------              Squared  =          338.936
      0 ¦    9845¦       53  10.0%
OBS     |---------|---------  -----
      1 ¦     338¦      476  90.0%
        ¦        ¦
814     ¦    41.5%¦    58.5%

  PARM BLOCK            b    "Std.Err"      PLWald   p(df=1)     exp(b)      Counts     Errors
     1            -4.7027       0.0987   2269.4225    < 0.01       0.01         814    0.00000
     3             0.0167       0.0055      9.2957    < 0.01       1.02       12580    0.00000
     6             0.2773       0.0087   1024.6482    < 0.01       1.32       16938    0.00000
```

LINK: PARTNERSHIP
NODE: <NONE>
Permutation: OFF

-2 * Log PL = 2669.7

| P = 0.5 | | PREDICTED | | 529 |
|---|---|---|---|---|
| | | <P | >P | |
| OBS | 0 | 9845 | 53 | 10.0% |
| | 1 | 338 | 476 | 90.0% |
| | 814 | 41.5% | 58.5% | |




**2. "Age" selected.**

```
LINK: "PARTNERSHIP"  LINKS =    814  NODES =  104  (DIAGONAL NOT INCLUDED)
NODE = "Age      "
BLOCKING
   1    0    0    0
   0    1    0    0
```

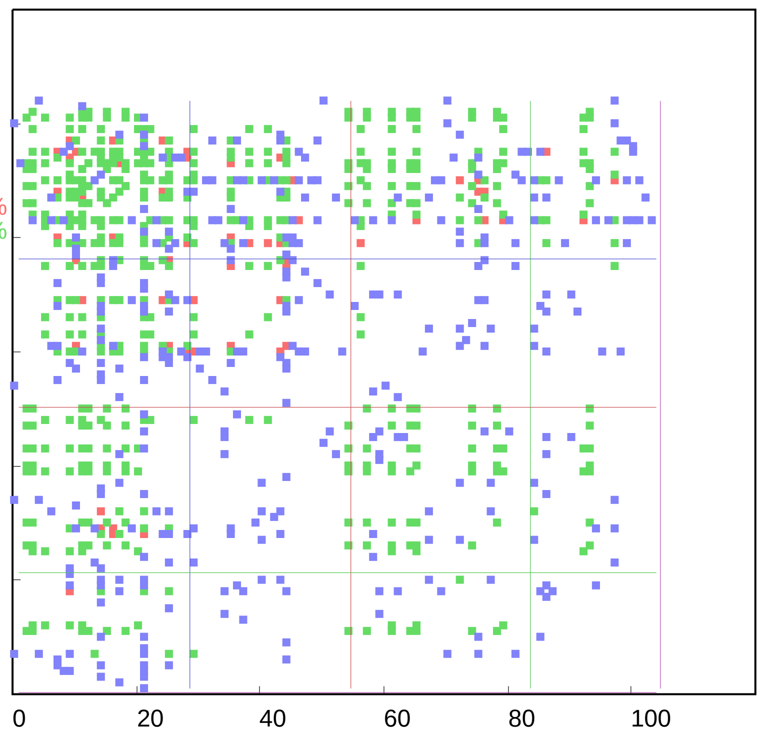
```
   0    0    1    0
   0    0    0    1

 -2 Log PseudoLikelihood =              2666.165
         Goodness of Fit =              9320.294
       Model Chi-squared =             12183.820      df = 6

FIT AT P = 0.5                          RESIDUALS
               PRED           534
            <P   ¦   >P                 Absolute =          671.052
        ------------------              Squared  =          338.300
     0 ¦    9842¦       56  10.5%
OBS    ¦--------¦--------  -----
     1 ¦     336¦      478  89.5%
       ¦        ¦
814    ¦   41.3%¦    58.7%

  PARM BLOCK           b    "Std.Err"      PLWald    p(df=1)     exp(b)       Counts     Errors
     1     1      0.2376       0.2212      1.1537     > 0.10       1.27          270    0.00000
     3     1     -0.0130       0.0132      0.9707     > 0.10       0.99         4523    0.00000
     6     1     -0.0189       0.0188      1.0078     > 0.10       0.98         6696    0.00000
```

LINK: PARTNERSHIP
NODE: Age
Permutation: ON

-2 * Log PL = 2666.2

| P = 0.5 | | PREDICTED | | 534 |
|---|---|---|---|---|
| | | <P | >P | |
| OBS | 0 | 9842 | 56 | 10.5% |
| | 1 | 336 | 478 | 89.5% |
| | 814 | 41.3% | 58.7% | |

Age
1 1968 or belo
2 1969-1976
3 1977-1988
4 1989 or abov




**3. "Size" selected.**

```
LINK: "PARTNERSHIP"  LINKS =    814  NODES =  104  (DIAGONAL NOT INCLUDED)
NODE = "Size    "
BLOCKING
   1   0
   0   1

 -2 Log PseudoLikelihood =              2656.631
         Goodness of Fit =              9515.101
       Model Chi-squared =             12193.354      df = 6

FIT AT P = 0.5                          RESIDUALS
               PRED           526
            <P   ¦   >P                 Absolute =          669.104
        ------------------              Squared  =          337.102
     0 ¦    9848¦       50   9.5%
OBS    ¦--------¦--------  -----
```

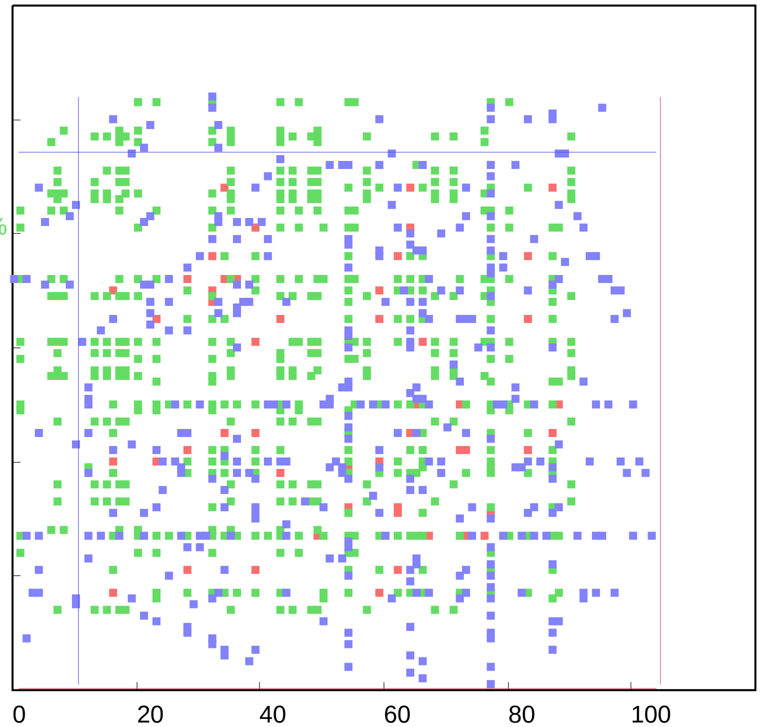
```
     1 ¦      338¦      476   90.5%
       ¦         ¦
814    ¦    41.5%¦     58.5%

  PARM BLOCK            b    "Std.Err"       PLWald    p(df=1)     exp(b)       Counts     Errors
     1     1       0.8025       0.3374       5.6563     < 0.02       2.23          714    0.00000
     3     1       0.0223       0.0208       1.1550     > 0.10       1.02        11326    0.00000
     6     1      -0.0684       0.0281       5.9123     < 0.02       0.93        14826    0.00000
```

LINK: PARTNERSHIP
NODE: Size
Permutation: ON

-2 * Log PL = 2656.6

| P = 0.5 | | PREDICTED | | 526 |
|---|---|---|---|---|
| | | <P | >P | |
| OBS | 0 | 9848 | 50 | 9.5% |
| | 1 | 338 | 476 | 90.5% |
| | 814 | 41.5% | 58.5% | |

Size
1 Small
2 Large




**4. “Orientation” selected.**

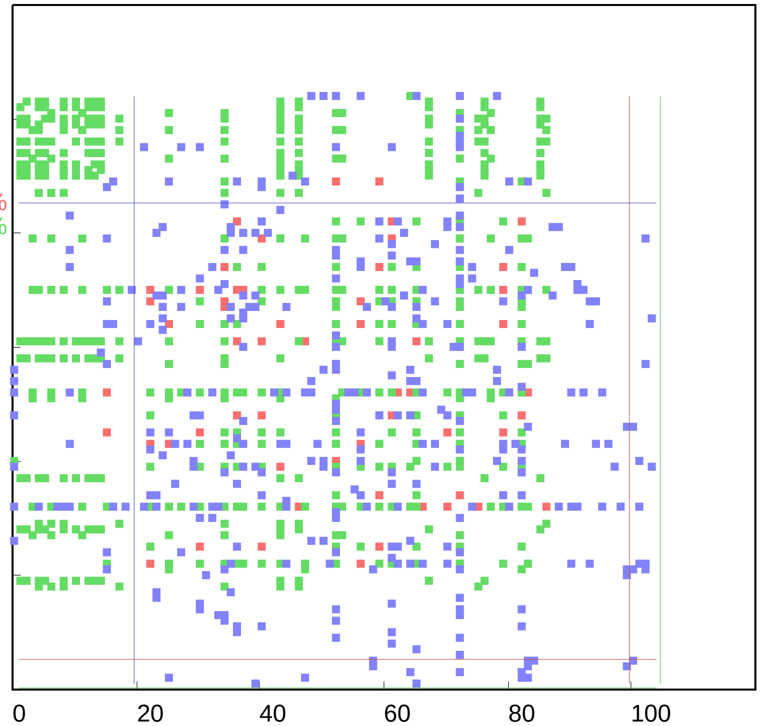
```
LINK: "PARTNERSHIP"  LINKS =    814  NODES =  104   (DIAGONAL NOT INCLUDED)
NODE = "Orient "
BLOCKING
   1    0    0
   0    1    0
   0    0    1

 -2 Log PseudoLikelihood =             2630.246
         Goodness of Fit =             9407.740
       Model Chi-squared =            12219.739     df = 6

FIT AT P = 0.5                        RESIDUALS
               PRED            531
            <P    ¦    >P             Absolute =         667.422
         ------------------           Squared  =         336.636
      0 ¦     9842¦       56   10.5%
OBS     ¦---------¦---------   -----
      1 ¦      339¦      475   89.5%
        ¦         ¦
814     ¦    41.6%¦     58.4%

  PARM BLOCK            b    "Std.Err"       PLWald    p(df=1)     exp(b)       Counts     Errors
     1     1       1.0303       0.2534      16.5294     < 0.01       2.80          566    0.00000
     3     1       0.0270       0.0141       3.6596     < 0.10       1.03         9020    0.00000
     6     1      -0.0999       0.0222      20.2238     < 0.01       0.90        11046    0.00000
```

LINK: PARTNERSHIP
NODE: Orient
Permutation: ON

-2 * Log PL = 2630.2

| P = 0.5 | | PREDICTED | | 531 |
|---|---|---|---|---|
| | | <P | >P | |
| OBS | 0 | 9842 | 56 | 10.5% |
| | 1 | 339 | 475 | 89.5% |
| | 814 | 41.6% | 58.4% | |

Orient
1 Leftist
2 Mainstream
3 Conservative




**5. "Strategy" selected.**

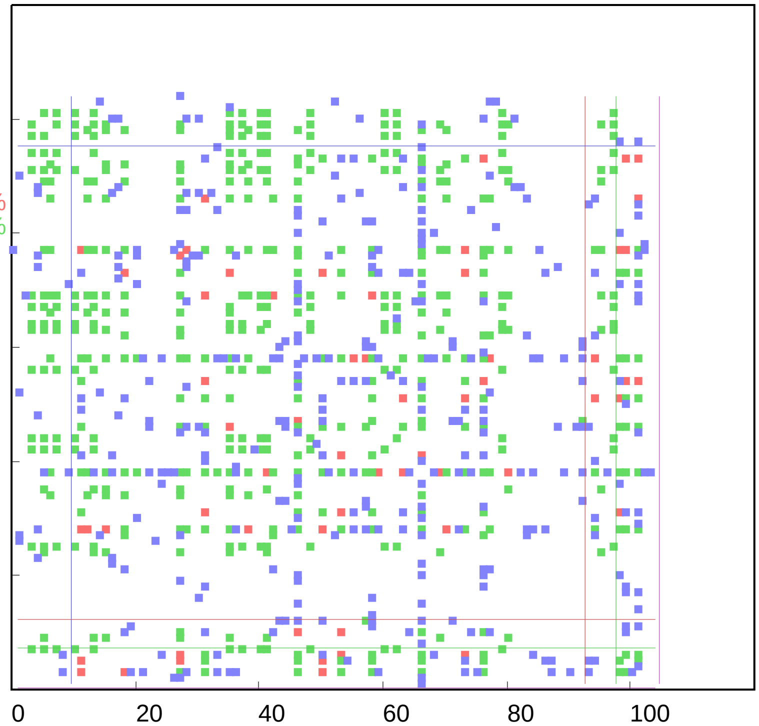
```
LINK: "PARTNERSHIP"  LINKS =    814  NODES =  104  (DIAGONAL NOT INCLUDED)
NODE = "Strategy          "
BLOCKING
   1   0   0   0
   0   1   0   0
   0   0   1   0
   0   0   0   1

 -2 Log PseudoLikelihood =            2663.769
         Goodness of Fit =            9374.990
       Model Chi-squared =           12186.216     df = 6

FIT AT P = 0.5                        RESIDUALS
               PRED           536
            <P   ¦   >P               Absolute =         669.673
        ------------------            Squared  =         337.964
      0 ¦    9839¦      59  11.0%
OBS     |--------¦--------  -----
      1 ¦     337¦     477  89.0%
        ¦        ¦
814     ¦   41.4%¦    58.6%

  PARM BLOCK          b    "Std.Err"      PLWald    p(df=1)     exp(b)       Counts     Errors
     1     1    -0.2121      0.2080      1.0402     > 0.10       0.81          524    0.00000
     3     1     0.0227      0.0133      2.9293     < 0.10       1.02         8573    0.00000
     6     1     0.0105      0.0181      0.3372     > 0.50       1.01        10728    0.00000
```

LINK: PARTNERSHIP
NODE: Strategy
Permutation: ON

-2 * Log PL = 2663.8

```
P = 0.5      PREDICTED       536
             <P          >P
OBS  0      9839         59    11.0%
     1       337        477    89.0%

   814      41.4%       58.6%
```

Strategy
1 Research and
2 Public Aware
3 Policy and L
4 Litigation




**6. “Area” selected.**

```
LINK: "PARTNERSHIP"  LINKS =    814  NODES =  104  (DIAGONAL NOT INCLUDED)
NODE = "Area     "
BLOCKING
    1    0    0    0    0    0    0    0
    0    1    0    0    0    0    0    0
    0    0    1    0    0    0    0    0
    0    0    0    1    0    0    0    0
    0    0    0    0    1    0    0    0
    0    0    0    0    0    1    0    0
    0    0    0    0    0    0    1    0
    0    0    0    0    0    0    0    1

 -2 Log PseudoLikelihood =             2646.206
         Goodness of Fit =             9217.507
       Model Chi-squared =            12203.779      df = 6

FIT AT P = 0.5                          RESIDUALS
               PRED           532
            <P    ¦    >P               Absolute =         670.305
        ------------------              Squared  =         337.339
      0 ¦     9843¦      55   10.3%
OBS     |---------|---------  -----
      1 ¦      337¦     477   89.7%
        ¦         ¦
814     ¦    41.4%¦    58.6%

  PARM  BLOCK            b    "Std.Err"      PLWald    p(df=1)     exp(b)       Counts     Errors
     1      1       0.7861       0.2062     14.5306    < 0.01       2.19          388    0.00000
     3      1      -0.0186       0.0125      2.2055    > 0.10       0.98         5384    0.00000
     6      1      -0.0069       0.0184      0.1413    > 0.50       0.99         8880    0.00000
```

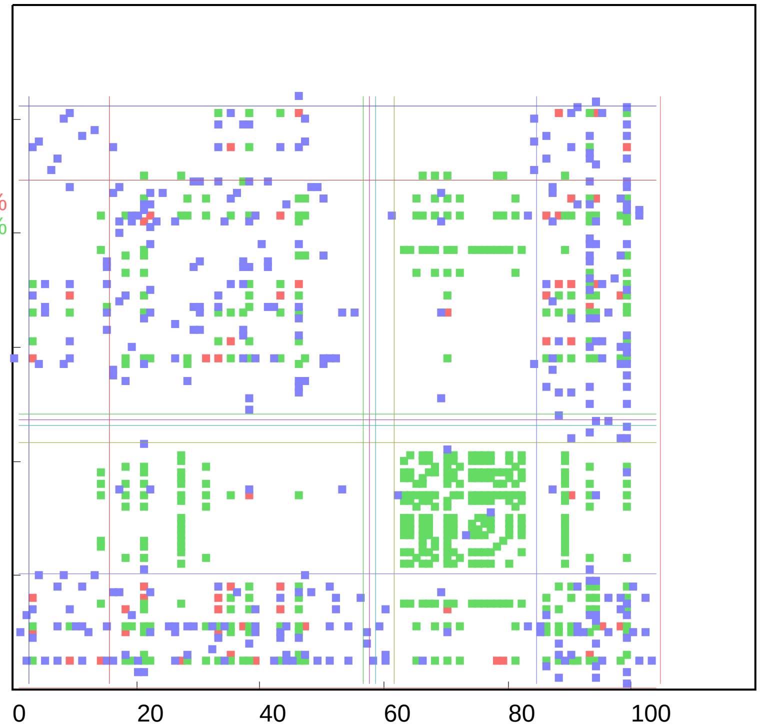
LINK: PARTNERSHIP
NODE: Area
Permutation: ON

-2 * Log PL = 2646.2

```
P = 0.5      PREDICTED       532
             <P        >P
OBS  0      9843       55    10.3%
     1       337      477    89.7%

     814   41.4%    58.6%
```

Area

1 Air climate
2 Ocean river
3 Wildlife lan
4 Historic pre
5 Recycle ener
6 Public trans
7 Toxics nucle
8 Animal right
9 Public healt
10 general




**7. "Region".**

```
LINK: "PARTNERSHIP"  LINKS =    814  NODES =  104  (DIAGONAL NOT INCLUDED)
NODE = "Region "
BLOCKING
    1    0    0    0
    0    1    0    0
    0    0    1    0
    0    0    0    1

 -2 Log PseudoLikelihood =             2639.636
         Goodness of Fit =             9435.053
       Model Chi-squared =            12210.349     df = 6

FIT AT P = 0.5                          RESIDUALS
               PRED             539
            <P   ¦   >P                 Absolute =          666.993
        -------------------             Squared  =          336.703
      0 ¦    9836¦      62  11.5%
OBS     |--------|--------  -----
      1 ¦     337¦     477  88.5%
        ¦        ¦
814     ¦   41.4%¦   58.6%

  PARM BLOCK           b    "Std.Err"      PLWald   p(df=1)     exp(b)       Counts     Errors
     1     1      0.8942      0.1981     20.3820    < 0.01       2.45          300    0.00000
     3     1     -0.0195      0.0113      2.9636    < 0.10       0.98         4157    0.00000
     6     1     -0.0108      0.0184      0.3428    > 0.50       0.99         5580    0.00000
```

LINK: PARTNERSHIP
NODE: Region
Permutation: ON

-2 * Log PL = 2639.6

| P = 0.5 | | PREDICTED | | 539 |
|---|---|---|---|---|
| | | <P | >P | |
| OBS | 0 | 9836 | 62 | 11.5% |
| | 1 | 337 | 477 | 88.5% |
| | 814 | 41.4% | 58.6% | |

Region
1 Northeast
2 Midwest
3 South
4 West