

NETWORKS OF CORPORATE INTERLOCKING: 1962–1995

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Abstract

This paper documents the changing patterns of corporate interlocking among approximately 250 corporations across four time periods—1962, 1973, 1983, and 1995. By utilizing network analyses, we describe several attributes of the overall set of interlocking corporate directors in a period of increasing corporate concentration, economic globalization, and changing regulatory environments. Measures of network density are based on all corporations and are broken-down by the ties formed by single versus multiple interlocking directorates. Three measures of network centralization are based on complete sociomatrixes in which all ties between corporations are non-directional and have been recorded as either present or absent. Finally, we report the number of cliques formed by minimum size across time. Measures of network density, centralization and the number of cliques all underscore that the network of corporate ties in 1995 is less dense, less concentrated, and contain few subgroups. Our analyses at the corporate level demonstrate that these changes occurred primarily among financial corporations and correspond to a period of dramatic changes in the U.S. financial markets. Given our descriptive findings, we conclude that interlocking directorates in the United States are becoming less concentrated, though by no means insignificant.

Networks of Corporate Interlocking: 1962–1995¹

In 1913, three years before he was to be appointed to the United States Supreme Court, Louis D. Brandeis wrote, “The practice of interlocking directorates is the root of many evils. . . . Applied to rival corporations, it tends to the suppression of competition and to violation of the Sherman law. Applied to corporations which deal with each other, it tends to disloyalty . . .” (quoted in U.S. Senate, 1978:1). As the date of this quote indicates, the critique of the corporate ties formed by interlocking directorates is by no means new. However, the domestic and international context in which interlocking directorates exist and operate in the United States is qualitatively different from those existing a hundred years ago.

Specifically, the second half of the Twentieth Century has witnessed three significant changes to the context of capital accumulation. On the one hand, the United States has witnessed a growing concentration of capital. In 1962, the 500 largest industrial corporations in terms of revenues accounted for 39.06 percent of the Gross Domestic Product (GDP). By 1995, the combined revenues of the 500 largest industrial corporations represented 63.38 percent of the nation's GDP.² On the other hand, the U.S. economy has experienced unprecedented change in its financial markets. Davis and Mizruchi (1999) have shown that the declining network centrality of commercial banks over the past twenty years corresponds to a period of exceptional change in the bank industry.³ During the 1980s, commercial banks lost their status as the primary source of lending among industrial corporations. Furthermore, advances in information technologies dispossessed commercial banks from their privileged access to information on potential borrowers and facilitated the internationalization of financial markets. Finally, changes in interstate banking regulations permitted the establishment of powerful regional banks. Taken together, the concentration of capital and the changes within financial markets present profound implications for the structure of corporate interlocks for the period of time between 1962 and 1995.

Internationally, the context in which corporate interlocks operate is one of increasing globalization. By increased globalization, we are adopting Leslie Sklair's fourth use of the term that focuses upon "the structures of an ever-more globalizing capitalism." (1999:155) This approach differs from the World Systems analysis of Wallerstein (1980), or the development of capitalism logic of Dobb (1967). By globalization, we wish to emphasize that the operation, reach, and function of today's corporation is global and therefore distinguishes a qualitatively different set of concepts and processes. One indication of the need for such a reorientation is the increasing power of the world's largest transnational corporations. Anderson and Cavanagh (2000:3) report that in 1983, the combined revenues of the 200 largest corporations in the world accounted for 25.0 percent of the world GDP. By 1999, the combined revenues of the 200 largest global corporations had increased to 27.5 percent. Furthermore, as Sklair (1998) notes, many California-based *Fortune* Global 500 corporations are world-wide in their operations. To begin, corporations such as Chevron and Rockwell operated in over one hundred different countries according to their 1995 annual reports. Even within the electric utility industry—traditionally a national, if not regional industry—Edison International reported that 15 percent of its assets in 1994

were based outside of the United States. Furthermore, when examining the percent of revenues and percent of profits from foreign investments, Sklair's research underscores the extent to which the top corporations in California have adopted a global orientation.⁴ Therefore, whether due to a world-wide-web of consumerism featuring such brand names of Coca-Cola, Sony, Disney and McDonald's (Sklair, 2001:85–9), the increasing number of multilateral trade agreements such as NAFTA, or the transformation of global information technologies and capital flows (Salisbury and Barnett, 1999), it is clear that corporations are increasingly global in their orientation and operation.

Given these changes in the context of capital accumulation, it is reasonable to investigate the patterns of corporate interlocking over the last forty years. It has been twenty years since the *Insurgent Sociologist* published its second special issue on Power Structure Research that included specific data on interlocking directorates.⁵ It is time to revitalize empirical research into the structure of corporate interlocking in the United States. Although our research findings are primarily descriptive, the contributions of this paper lay in the longitudinal nature of this study, the explanation of several network attributes, and the comparison of four data points between 1962 and 1995—a period of increased corporate concentration and globalization within the world economy.

Interlocking Directorates in Contemporary Capitalism

While there is a substantial body of literature on interlocking directorates in historical and comparative perspectives,⁶ it is important that we isolate and frame our descriptive results within a few key aspects of the literature. Broadly speaking, the changing patterns of corporate interlocking between 1962 and 1995 should indicate or reflect changes in the development of contemporary capitalism. While this foundational proposition finds support among many researchers engaged in this area of specialization, the terrain of debate upon which scholars interpret the significance of interlocking directorates is multifaceted. One complication is the fact that research on interlocking directorates often is conducted at three very different levels of analysis and sometimes employs various units of observation. For instance, Scott's (1985) five models of interlocking directorates—the finance capital, the co-ordination and control, the resource dependence, the managerial, and the class cohesion—operate at very different levels of analysis. At one end of the micro-macro spectrum is the research that focuses on the individual directors themselves and documents their myriad business, family, political

and social connections. At the other extreme is the work that focuses on the network of corporate interlocks. Here, interlocking directorates are most informative when examined as a totality. At the intermediate level of analysis, research focuses on the links forged between corporations through interlocking directorates. Important research also transcends these distinctions by integrating both the individual and organizational levels of analyses. Joseph Galaskiewicz and colleagues emphasize that neither corporate attributes such as size or the characteristics of the specific directors (i.e., their prestige) predicted the existence of a particular ties between corporations. Rather, it was an *interaction* between individual and organizational factors that proved to be the best predictors of intercorporate ties. In short, "clout and grace" matter. (Galaskiewicz et al., 1985:422)

While we recognize the limitations of imposing a strict demarcation between the individual, organizational, and structural levels of analyses, this distinction is useful in organizing key developments in the literature. At the individual level of analysis, the empirical and theoretical emphasis of this area of research demonstrates how interlocking directorates contribute to the overall unity of the rich and powerful. Perhaps most identified with C. Wright Mills (1956), G. William Domhoff (1967; 1970; 1983; 1998), and Michael Useem (1984), the class cohesion model focuses upon the mechanisms that generate a common ideology and organizational unity. C. Wright Mills considers how the elite 1) develop a psychological similarity, 2) become structurally situated for regular social interaction, and 3) articulate and pursue common interests. Domhoff extends this theme by demonstrating how such social affiliations are parlayed into political power. Consequently, the frequency of intermarriage, the coincidence of elite school attendance, and the common membership in exclusive social clubs are important not solely because they generate a dominant ideology. Equally important, these social ties are used to influence the political process via lobbying, the "revolving door" between business executives and government officials, and the political influence of interest organizations such as the Council on Foreign Relations. Research by Joseph Galaskiewicz also establishes the importance of the personal relationships between the corporate elite and nonprofit organizations (1985). Finally, Useem develops the concept of "business scan" to argue that corporate ties need not reflect resource dependencies or the domination of finance capital. Instead, interlocking directorates and the connections that emerge are more indicative of the desire among top corporate officials to obtain an overview of "contemporary business practices and the general business environment."

(1984:85) Furthermore, these individuals who generate such an overview "are expected . . . to take a far more active role in promoting their politics." (1984:61) Therefore, in addition to contributing to the cohesion of the capitalist class, the operation of the "inner circle" has both informational and explicitly political ends.⁷

Three of the five models Scott identifies reside at the organizational or inter-organizational level of analysis. The finance capital model argues that financial and industrial capital will become integrated into "money capital." (Scott, 1985:6) Most identified with Hilferding's *Finance Capital*, this perspective emphasizes the extensive set of corporate connections between banks and insurance companies, on the one hand, and industrial corporations on the other. The finance capital perspective predicts distinct spheres of influence that combine both forms of economic capital through the ties formed by individual interlocking directorates. For example, in their study of the corporate relations of 47 finance capitalists, Soref and Zeitlin (1987:77) conclude that "Capital, . . . and the finance capitalist, representing and personifying the coalescence of financial and industrial capital, exercise the decisive power in the nation's top industrial corporations." While the units of observation may be individual capitalists, the focus of their research is on the connections between financial and industrial corporations. This formation of spheres of influence differs from the other two interorganizational models in so far as the relation is not characterized by either competition or cooperation.

Scott's second and third models of corporate interlocks emerged in the 1970s and 1980s when the central question was *not* whether the phenomenon of interlocking directorates represented an important ingredient to the economic and political power of the corporate elite. Rather, the debate focused on the specific ways in which interlocking directorates operated and the potential benefits offered to corporations. Under Scott's heading of co-ordination and control, and in particular, bank control, early studies on interlocking directorates viewed ties between corporations as an inter-organizational means by which to monitor and/or control the behavior of other corporations. Pfeffer (1972) predicted that firms with high debt-equity ratios were more likely to have "outside" (i.e., bank) directors. Allen's research (1974:404) revealed an "integrated structure of elite co-optation among major corporations in which financial institutions increasingly occupy the central positions." Kotz (1978) reported that nearly forty percent of his sample was under "financial control". In their series of stochastic models for the intercorporate networks of 26 firms in Minnesota, Galaskiewicz and Wasserman

(1981) found increasing linkages between nonfinancial and financial corporations between 1969 and 1978. Most recently Stearns and Mizruchi (1993) found that board representation by financial institutions is positively associated to the levels of short-term debt, long term-public debt, and long-term private borrowing.

Establishing the so-called resource dependence perspective, Jeffrey Pfeffer (1987) has forcefully argued that corporate interlocks serve to reduce organizational (i.e., corporate) uncertainty. In examining the composition of electric utility boards, Pfeffer (1974) found that board membership from manufacturing interests was positively related to both the proportion of total employment coming from manufacturing, and the level of electric sales to industrial customers. Earlier, Pfeffer demonstrated in his study of 80 randomly selected corporations that levels of representation by attorneys were positively associated with levels of national regulation experienced by the corporation (1972). Recent organizational research into interlocking directorates has explicitly examined the implications of these co-operative ties. Haunschild and Beckman (1998) found that centrally interlocked corporations depend less on alternate sources for obtaining information concerning acquisitions. In an earlier study, Haunschild (1993) argued that corporate interlocks serve as a medium through which directors learn acquisition strategies. Therefore, corporate interlocks have been linked to a wide array of benefits to firms. Whether a vehicle for collusion, cooptation, monitoring, control, or learning, Mizruchi concludes that "interlock networks matter, and that they influence the behavior of firms." (1996:289)⁸

At the structural level of analysis, three studies emerged in the 1980s that were both ground breaking in their approach and scope. Mizruchi (1982) and Scott and Griff (1984) conducted longitudinal studies encompassing the period between 1904 to the middle of the 1970s. While Mark Mizruchi reanalyzed David Bunting's data for roughly 150 corporations in seven time periods in the United States, John Scott and Catherine Griff looked at patterns of interlocking among a larger number of firms at three time periods in Great Britain. Both studies shared the distinction of utilizing network analyses in the understanding of changes within the intercorporate network of ties. Mizruchi found that although financial corporations, and in particular investment banks became less central in the network prior to the depression, financial corporations by 1974 had come to occupy a more general role in the network due to their central *positions*, rather than the exercise of *power* over specific nonfinancial corporations. Similarly, Scott and Griff found

that intercorporate relations were less a matter of personal power, but rather a function of the “institutional power [i.e., structural positions] of the enterprises with which they were associated.”

A similar conclusion is drawn by Mintz and Schwartz (1985) in their work examining power relations that flow through the interlocking boards of 1,131 corporations in 1962. Wishing to understand how interlocking directorates operate, and why financial institutions consistently appear in the center of intercorporate relations, they begin by conceptualizing the totality of these relations as the source of both discretionary decisions and structural constraint. In short, the very interdependencies of the corporate world produce a structural hegemony in which power is not a matter of one company calling all the shots. “The primary source of this hegemony is control over the direction of capital flows, not direct intervention.” (Mintz and Schwartz, 1985:249) Consequently, interlocking directorates are not merely the manifestation of finance capital exerting “outside” control and usurping the powers of decision making within dependent corporations. Rather, Mintz and Schwartz conclude that “interlocking directorates are . . . a method of managing discretion.” (1985:250) Therefore, the appropriate level of analysis would be the structure of the network itself—its level of concentration, and the degree of connectivity within the set of corporate interlocks.

Given these various theoretical perspectives, we believe our data to be particularly suited for describing the changes in corporate interlocking at both the structural and corporate levels of analyses over the second half of the Twentieth Century. Increasing levels of corporate concentration among our U.S. firms, particularly among financial corporations will lend empirical support to the finance capital model. Alternatively, increasing corporate connectivity among nonfinancial corporations would be consistent with a resource dependence interpretation. However, we cannot assume that the trend among our U.S. corporations will invariably be one of increasing network concentration. Placed within the context of increasing globalization and the changing regulatory environment, it may very well be the case that the pattern of corporate interlocking reveals itself to be quite variable. For cutting across a trend toward increased concentration would be the forces of globalization and a changing regulatory context domestically. The internationalization of capital may reduce domestic interlocking as firms divert social capital from maintaining old ties to forging new ties abroad. Alternatively, Fligstein and Freeland (1995) have argued that patterns of corporate governance are more influenced by their national environments than the dynamic of globalization. Therefore, changes in pat-

terms of corporate interlocking would be reflective of such changes. While we do not formally test hypotheses concerning corporate interlocking over time, the literature certainly suggests a number of possible interpretations for the descriptive results below.

Methodology

This study analyzes the trends in network characteristics at four time periods. Wishing to assemble an array of corporations that capture both the top corporations in the U.S. economy and the leading corporations by industry type, we first incorporated the top four corporations by revenues within the various industry surveys published by Standard and Poor's. We also included into our study any corporation that was in the top 100 of the Fortune 500 in terms of revenues. Finally, given the importance of financial institutions within our economy, we also built into our population of corporations the top 20 commercial banks, and the top 15 insurance companies by assets. This procedure resulted in approximately 250 corporations for each time period. Table 1 presents the number of corporations after classifying them into five broad categories—financial, “top” industrial (the upper 25th percentile of corporations in terms of revenues for each time period), industrial, utility, and transportation.

Table 1: Type of Corporation by Year

	Time Period							
	1962		1973		1983		1995	
	N	Percent	N	Percent	N	Percent	N	Percent
Financial	42	16.2	41	15.4	42	15.6	46	18.0
Top Industrial	48	18.5	51	19.2	51	18.9	45	17.6
Industrial	143	55.0	148	55.6	152	56.3	134	52.5
Utility	14	5.4	14	5.3	13	4.8	14	5.5
Transportation	13	5.0	12	4.5	12	4.4	16	6.3
TOTAL	260	100.1	266	100.0	270	100.0	255	99.9

To be clear, these “populations” do not necessarily represent the same companies, and are not random samples. There is certainly substantial overlap between any two consecutive time periods. However, given our desire to include the top four corporations in the various Standard and Poor's Industry Surveys, the array of corporations in 1995

is quite different than that of 1962. Therefore, this study is essentially a trend study with four cross-sections. Why not pursue a panel study design? Given the number of corporations in our study, their representation across wide-ranging and variable industries, and the turbulent nature of corporate mergers and acquisitions, a trend study is preferable to a panel study.⁹ Consider the contrasting fates of two industries between 1962 and 1995. In 1962, lead and lead smelting was not an insignificant industry—revenues among the top four companies topped 300 million dollars. However, the number of corporations listed by Standard and Poor's under the heading of lead mining and smelting decreased in 1973 and again in 1983. By 1995, Standard and Poor's no longer provided data on the lead industry. In contrast, the 1962 Standard and Poor's industry survey of electronic corporations had no listing for computer software. By 1995, the S&P industry survey listed Unisys, Microsoft, Computer Sciences, and Oracle as the top four software companies in terms of revenues. Clearly what now could be considered "household" names did not exist some thirty-three years earlier. A further disadvantage of a panel study for the examination of the network of corporate ties over time is that by restricting oneself to the same companies, the design would "build-in" stability.

Once we had identified the corporations to be included in our study, the second phase simply involved recording the names of all the directors for these corporations. The primary data sources here were the various Moody's Manuals. In a few cases, we utilized the Standard & Poor's *Register of Directors and Executives*, or used the EDGAR on-line data base for 1995 available through the Securities and Exchange Commission's website. This yielded 4,018 names in 1962, 4,046 in 1973, 4,078 in 1983, and 3,209 in 1995.

The third phase in this research project involved the construction of a series of sociomatrices for each year of this longitudinal study. A sociomatrix is a symmetric matrix in which each column represents a corporation and each row corresponds to the same array of corporations. The combination of a given row and column therefore is equivalent to the interlocking of corporations through common board membership. For example, if corporation 172 interlocked with corporation 235, then the sociomatrix would record a link in Row 172, Column 235, and in Row 235, Column 172. For each of the four time periods, we first generated a set of overlaps based on those directors who sat on only two boards of directors—or those directors involved in "single interlocks". The second sociomatrix for each time period consisted of all the ties formed by the directors who sat on three or more

boards of directors—i.e., directors involved in “multiple interlocks.”¹⁰ Table 2 reports the number of directors who did not form an interlocking directorship, and the number of board members involved in single and multiple interlocks. Once these sociomatrices were read into UCINET V for Windows,¹¹ it was very simple to “add” the matrix of Single Interlocks to the matrix of Multiple Interlocks for each of the four data years.

Table 2: Single and Multiple Interlocks Among All Directorships, 1962-1995

	Time Period							
	1962		1973		1983		1995	
	N	%	N	%	N	% ^t	N	%
Directorships								
not part of an Interlocking Directorate	2,563	63.8	2,694	66.6	2,578	63.1	2,100	65.4
Directorships in Single								
Interlocking Directorates	708	17.6	696	17.2	742	18.2	588	18.3
Directorships in Multiple								
Interlocking Directorates	747	18.6	656	16.2	767	18.8	521	16.2
TOTAL	4,018	100.0	4,046	100.0	4,087	100.0	3,209	99.9

Two final notes with respect to the construction of our various sociomatrices. For the majority of our analyses, the dimensions of the sociomatrices were smaller than the number of corporations in Table 1. This reduction in size is due to the fact that for our analysis of network centrality and corporate clique formation, we excluded any corporation that was not linked to any other corporation. The exclusion of so-called “isolates” reduced the number of corporations by 21, 35, 34, and 29 corporations for the years 1962, 1973, 1983, and 1995 respectively. These exclusions represent between 8.1 and 13.2 percent of the companies from the original set of selected corporations. Second, in constructing the sociomatrices for the four time periods in this project, we originally recorded the actual number of ties between any given pair of corporations based on the data reported in Table 2. However, to allow for the comparison between different forms of network centrality, we used only dichotomized data that essentially record the incidence (presence or absence) of a link between different corporations.

At this point, an example would be helpful. To illustrate several of the methodological points mentioned above, we have constructed a graph

of all ties between 25 select corporations for the year 1995 (Figure 1). Notice first Coastal Corp. in the upper right portion of Figure 1. As can be seen here, the Coastal corporation is not tied to any other corporation in this mini-network and therefore would be excluded when calculating network centrality measures and the formation of subgroups of corporations. As to our definition of “single” and “multiple” interlocks, notice the tie between the Brown Group and ITT Industries formed by Gen. Edward C. Meyer. Since Gen. Meyer only served as a director for these two corporations, he formed a “single” interlocking directorate, or one corporate tie. In contrast, Robert E. Allen was listed as a board member of four different corporations—AT&T Corp., Bristol Meyers Squib, Chrysler Corp., and Pepsico. This individual generated six different ties among these four corporations. In other words, Mr. Allen represents a “multiple” interlocking directorate.

The single lines in Figure 1 illustrate a final methodological point, namely that the sociomatrixes in our analyses record only the presence or absence of a link between two given corporations and ignores the “multicentricity” of corporate ties. For example, McDonald Douglas and Ralston Purina had three ties due to their interlocking directorates, and Pepsico and Nations bank shared two different directors. While the presence of multiple ties between any given pair of corporations is interesting, only 7 out of a possible 276 pairs of the 24 linked corporations demonstrated such multiple links. For our analyses below, we are primarily concerned with the network of corporate ties and bracket the issue of the strength of ties between any given pair of corporations.

The Structure of Corporate Networks

For each of the four time periods, our analyses looked at three different facets of network structure: Network Density, Network Centrality, and the Number of subgroups or cliques. In essence, the analyses address the proportion of possible ties, the relative equality among corporations with respect to their “importance” to the network as a whole, and the potential number of complete subgroups in the network.

Network Density

Perhaps the most straight forward indicator of a network’s connectiveness is its density—or the proportion of actual links to the total possible number of links between pairs of corporations. Consider the number of lines in Figure 1. There are 50 unique links between these 25 cor-

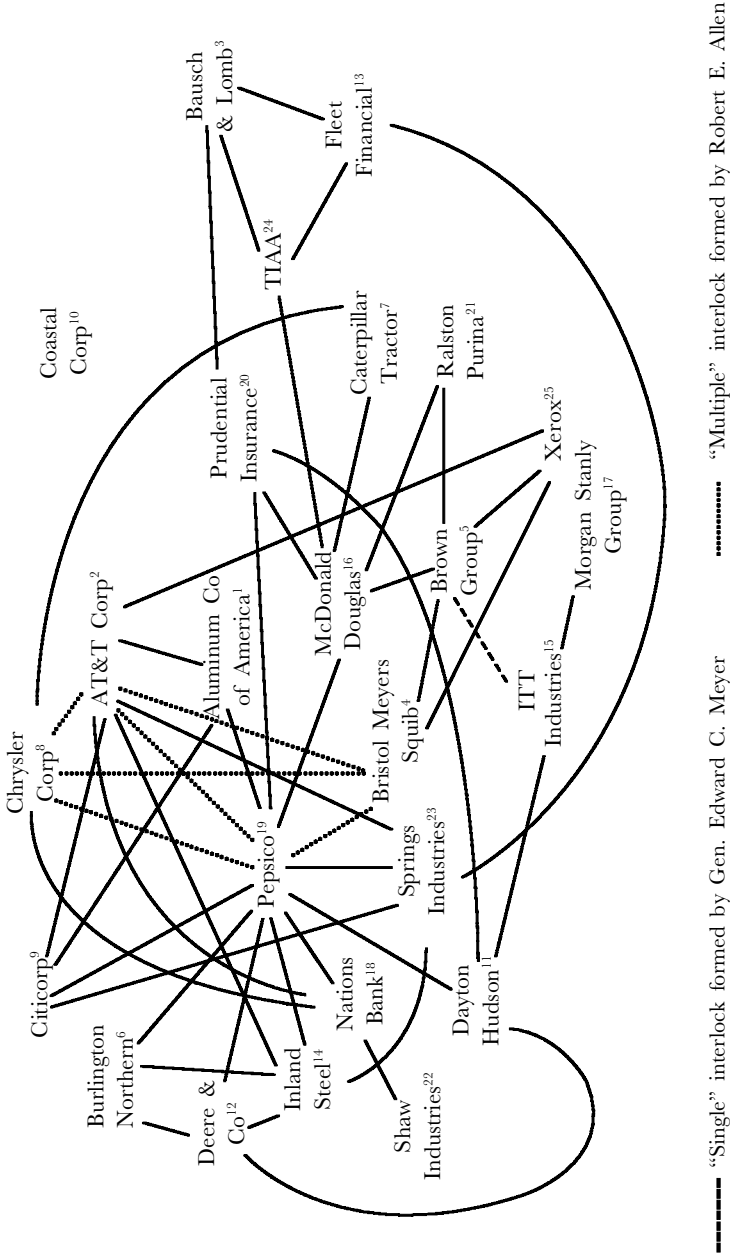


Figure 1: Interlocking Directorates among 25 Corporation in 1995

porations. These connections would yield a network density of 0.1667; or 50 over a possible 300 links. Alternatively, we can calculate the network density after omitting the corporate isolate, the Coastal Corporation: the same 50 existing ties divided by 276 possible ties, or a network density of 0.1812. When dealing with sociomatrixes as large as ours, there are literally tens of thousands of connections between all possible pairs. For each of the four time periods, Table 3 reports the number of ties between all of the corporations, the number of possible links (both with and without isolates), and the network density (again calculated with and without isolates). To be clear, the number of links represents the number of pairs of corporations tied through an interlocking directorate. Since we just recorded the presence or absence of a link, the data in Table 3 will not correspond exactly to the data in Table 2 that includes multiple ties between pairs of corporations.

While one certainly would expect lower levels of network density when calculated with isolates, Table 3 demonstrates that when isolates are included, their presence tends to intensify the changes observed across time periods. Between 1962 and 1973, as well as the trend between 1983 and 1995, the relative declines in network density are sharper with isolates than without. However, the period between 1973 and 1983 exhibits essentially the same increase in density whether we include or exclude corporations not tied to other corporations in the network. In fact, due to the lower decrease in network density when we excluded corporate isolates, the increase between 1973 and 1983 exceeds the density observed in 1962. Certainly there was a reversal in the trend of decreasing density within the network without isolates. However, the increase did not surpass the initial proportion of possible

Table 3: Network Density by Single, Multiple, and Total Ties, 1962–1995

	Time Period			
	1962	1973	1983	1995
<i>Number of Corporate Interlocks</i>	1,109	1,002	1,180	840
<i>Network Properties Including Corporate "Isolates"</i>				
Number of Corporations	260	266	270	255
Number of Possible Ties"	33,670	35,245	36,315	32,385
Network Density	0.0329	0.0284	0.0325	0.0259

Table 3 (*cont.*)

	Time Period			
	1962	1973	1983	1995
<i>Network Properties Excluding Corporate "Isolates"</i>				
Number of Corporations	239	229	235	226
Number of Possible Ties"	28,441	26,106	27,495	25,425
Network Density	0.0390	0.0384	0.0429	0.0330

ties in 1962. In short, by excluding corporate isolates, the changes across time tend to be softened, but certainly not altered. The overall trend in network density both with and without isolates are quite similar.

Our methodology also allows us to disaggregate the total number of ties into those formed by single and multiple interlocking directorates. Table 4 presents the total number of corporations (excluding isolates) and the total number of possible ties. The middle panel of Table 4 reports the ties attributed to single and multiple interlocking directorates. Finally, the bottom section of the table presents the network density on the basis of only single interlocks, only multiple interlocks, and the combined set of corporate ties. Focusing attention on the bottom portion of Table 4, the data for links generated by single interlocks appears fairly stable across the four time periods. However, although the network density for only multiple interlocking directorates hovers around .03 for the first three time periods, the data for 1995 exhibits a sizeable decline. Given the relative importance of multiple interlocking directorates in generating links between corporations, it is understandable that the density for the network from both single and multiple interlocks will closely mirror the trend for density from multiple interlocks alone. However, when we take into consideration the ties formed by single interlocks in this last time period, the overall network density does not fall below 3.3 percent. In short, the data indicate that both single and multiple interlocking directorates are important and that together, despite a trend toward decreasing network density, the level of corporate connectivity across these four time periods remains above 3 percent.

Table 4: Network Density by Single, Multiple, and Total Ties, 1962–1995

	Time Period			
	1962	1973	1983	1995
<i>Network Properties Excluding Isolates</i>				
Number of Corporations	239	229	235	226
Number of Possible Ties	28,441	26,106	27,495	25,425
<i>Number of Interlocks</i>				
Formed by Single Ties	318	326	349	278
Formed by Multiple Ties	868	741	888	598
Formed by Total Ties ¹	1,109	1,002	1,180	840
<i>Network Density</i>				
Due to Single Ties	0.0112	0.0125	0.0127	0.0109
Due to Multiple Ties	0.0305	0.0284	0.0323	0.0235
Due to Total Ties ¹	0.0390	0.0384	0.0429	0.0330

¹ Totals will not equal the sum of the binary ties from single and multiple interlocks since a proportion of the ties become redundant when the two sociomatrixes are added.

Network Centrality

In this section, we examine three measures of network centrality over time. Taken at the corporate level of analysis (as opposed to the entire network of corporate interlocking), measures of centrality operationalize the importance of a given corporation in the network. On the other hand, measures of network centrality serve as indicators of the variation among the corporations with respect to their corporate centralities. For example, return to Figure 1. Here it is fairly clear that Pepsico is a prominent corporation within the network of 24 interlocked corporations. In contrast, Shaw Industries in the bottom right is relatively unimportant in this mini network. This variability in network importance will be captured by the overall network centrality measures. A more extreme example would be to focus on Pepsico and its direct links to 13 other corporations. In this example of maximum variability, Pepsico would clearly be the most important, while the other corporations are equally unimportant (ignoring their ties to other corporations). In short, to gain an understanding of the various measures of network centrality, one must move between the corporate and network levels of analyses.

For these descriptive analyses of network centralization, we use three

of Freeman's definitions of network centrality (1977, 1979)—degree centrality, closeness centrality, and betweenness centrality.¹² At the corporate level of analysis, degree centrality is the most straight-forward measure and is simply based on the total number of direct ties between a given corporation and all others. Recalling again Figure 1, it is fairly obvious that in this micro network of 24 corporations, Pepsico is more central than say TIAA or McDonald Douglas. The measure of network centralization, or the variability among corporations with respect to their degree centrality is the sum of the differences between the maximum corporate degree centrality score and each individual corporation's degree centrality score, all divided by the possible number of ties with other corporations.

The second measure of network importance or centrality is closeness centrality. At the corporate level of analysis, closeness centrality is based on the notion that important corporations in a network are able to quickly communicate with all other corporations. This alternative view sees "important" corporations in a network as having 'minimum steps' when relating to all other corporations. Conversely, a corporation that needs to go through many other corporations would not be viewed as very "important" in a network of all corporations. At the level of each individual corporation, closeness centrality is measured by first taking the inverse of the sum of shortest distances between a given corporation and all others. Then, one multiplies this value by the total number of corporations minus 1, all multiplied by 100. In calculating closeness centrality, it is important to note that one initially sums the shortest distances between a particular corporation and all others. For example, take two possible paths between the Brown Group and Pepsico in Figure 1. One passes through McDonald Douglas (two steps), while the other must travel through ITT Industries and Dayton Hudson for a total of three steps. Again, the formal measurement of corporate centrality corresponds closely with one's intuitive sense of the concept, since Pepsico (the corporation with the highest closeness centrality score) would have far fewer steps to reach all the other corporations than would TIAA in Figure 1. To measure network centrality based on corporate "closeness", one again needs to develop a measure of variability. For network closeness centrality, we sum the differences between the most central and each individual corporation, and then divide by the maximum possible distances between all the possible pairs of corporations.

Finally, one can create a measure of corporate importance that conceptualizes centrality as an indicator of how important a particular corporation is in linking a given pair of corporations. In other words, a

corporation is central if it is a conduit between as many possible pairs of corporations in a network as possible. This third form of network centrality is referred to as betweenness centrality and is essentially the proportion of paths between all possible pairs of corporations involving and not involving the corporation of interest. More formally, betweenness centrality represents the total number of paths between a pair of corporations involving a given corporation divided by the total number of paths between this pair of corporations (not including the corporation in question). The measure of network centralization based on corporate “betweenness” is simply the sum of the differences between the most central and each individual corporation, divided by the number of corporations in the network minus 1. Again, a relatively high value for network betweenness centrality would indicate that there are relatively few, but very important corporations in the network serving as key linkages.

One final note as to these measures of corporate and network centrality. It is important to appreciate that both closeness and betweenness centrality incorporate indirect interlocking between potential competitors. Theoretically, this nuance is critical in understanding the potential impact of interlocking directorates. As noted by many scholars, while direct links have been forbidden under the Clayton Anti-Trust Act of 1914, indirect interlocks between competitors are exempt from this prohibition.

In Table 5 below, we present the descriptive statistics for three measures of network centrality at our four points in time. While our discussion focuses on the three network centrality measures described above (shaded lines in Table 5), we follow Wasserman and Faust’s suggestion (1994:182) and report the mean level of centrality and the variance of centrality scores across the corporations comprising the network.

Let us first consider degree centrality—the measure of network centralization based on the number of direct ties a corporation has to all other corporations in a network. The mean corporate degree centrality, the first line of Table 5, shows a fairly steady extent of interlocking between the years of 1962 and 1983—roughly 9 links per corporation; however by 1995, the average number of direct ties had fallen to 7.4. More importantly, both the corporate degree variance measure and the network degree centrality measure indicate that the network of corporate ties had become noticeably less concentrated in the last time period. In other words, the overall level of corporate concentration with respect to direct ties appears to have decreased between 1962 and 1995, most dramatically between 1983 and 1995.

Table 5: Measures of Network Centrality, 1962–1995

	<i>Year</i>			
	1962	1973	1983	1995
<i>Centrality Measure</i>				
Mean Corporate Degree	9.280	8.742	10.043	7.434
Corporate Degree Variance	51.055	43.536	55.045	28.936
Network Degree Centrality	14.29	15.16	13.77	8.33
N of Corporations	239	229	235	226
Mean Corporate Closeness	35.874	35.486	35.804	32.131
Corporate Closeness Variance	21.761	22.438	27.093	24.396
Network Closeness Centrality	23.41	26.64	22.89	22.93
N of Corporations	239	229	235	226
Mean Corporate Betweenness	218.586	213.493	217.647	246.916
Corporate Betweenness Variance	110761	106079	69270	80419
Network Betweenness Centrality	8.13	9.14	5.19	5.73
N of Corporations	239	229	235	226

Turning next to closeness centrality, recall that a prominent corporation is one that is located near as many corporations as possible in the network. In contrast to the story told regarding degree centrality, the middle panel of Table 5 suggests a constant level of overall corporate closeness. The average closeness centrality score across all corporations over the four time periods ranges between 36 and 32. Similarly, the variance across corporations also moves within a fairly tight band between 21 and 27. Finally, the network measure of closeness also shows a fairly consistent level of closeness centrality with the relatively minor exception of 1973. In short, corporations maintained their overall levels of closeness to each other over the period between 1962 and 1995.

Turning lastly to the measures of betweenness centrality, we see increasing divergence between the numbers across time. At the corporate level, there is a noticeable increase in the mean betweenness score across corporations. This suggests that on average, corporations increased in their importance in terms of serving as conduits between other corporations. Although the bottom portion of Table 5 reports an overall increase in corporate betweenness from 1983 to 1995, it is also the case that the amount of variance between corporate betweenness decreases from 1973 to 1983. This means that corporations were becoming more similar with respect to their intermediary roles. Finally, the overall level of corporate network betweenness also demonstrates that

between 1962 and 1995, corporations were becoming more similar with respect to betweenness centrality.

To summarize, focus, and conclude this section on network centrality, let us compare the trajectories of the three measures of network centrality over time. Perhaps the most striking feature of Table 5 is the decrease in network degree centrality (i.e., corporations are becoming more similar with respect to the number of direct interlocks between corporations), and the similar pattern of change for both closeness and betweenness centrality. From 1962 to 1973, there was a slight increase in the importance of some corporations with respect to being close to and between other corporations. The ten years between 1973 and 1983 exhibit a noticeable decrease in these two network centrality measures while the last segment demonstrates relative stability. In other words, corporations have become more similar to each other with respect to closeness and betweenness, especially for the period from 1973 to 1983. Given the structural significance of indirect interlocks, it is important to note that the two measures of network centrality that tap secondary connections also demonstrate a similar pattern of change over time. Taken together, these findings on network centrality suggest that the patterns of corporate interlocking are becoming less concentrated, while on the other hand, the corporations that comprise these networks are becoming more similar in terms of connecting the network as a whole. From 1962 to 1995, corporations maintain a fairly tight knit set of connections; but by the latter time period, these corporate ties are distributed more evenly and appear to be less dominated by fewer heavily interlocked corporations.

Before we present our findings on corporate clique formation, let us shift our level of analysis away from the network as a whole and focus briefly on differences between corporations. Given the variable trends in network centrality, do the corporations in our study experience similar or disparate trends in their levels of corporate centrality? Turning first to degree centrality, Table 6 presents the average corporate degree centrality by type of corporation—financial, top industrial, industrial, utility, and transportation. Between 1962 and 1995, the most dramatic decline in average centrality is found in the financial corporations. In fact, this decline is even more pronounced than the decline in overall network centrality. Transportation corporations also demonstrate a decline in their average degree centrality between 1962 and 1995. In contrast, both industrial and top industrial corporations post fairly stable levels of degree centrality, if not actual increases.

Considering briefly the average closeness centrality scores by type of corporation, Table 6 indicates relatively homogeneous results. Between 1962 and 1983, the average level of closeness centrality remained fairly constant. However, between 1983 and 1995, all corporations, regardless of their classification, exhibited a sizeable drop in average corporate closeness centrality. Again, the data in Table 6 indicate that the drop in the average corporate closeness centrality was greatest among the 41 financial corporations. We also note that among the transportation corporations, there is a steady decrease in this form of corporate centrality. Between 1962 and 1995, transportation companies would increasingly have to make a greater number of steps when wishing to contact other corporations in the network.

Table 6:
Mean Corporate Centrality Scores by Year and Type of Corporation

<i>Mean Corporate Degree</i>				
<i>Centrality</i>	<i>Year</i>			
<i>Corporation Type</i>	<i>1962</i>	<i>1973</i>	<i>1983</i>	<i>1995</i>
Financial	15.195	14.895	14.184	8.048
Top Industrial	11.000	10.500	12.560	11.000
Industrial	6.477	6.000	7.770	5.791
Utility	11.714	10.000	9.923	8.286
Transportation	10.500	8.600	9.667	6.563
<i>Mean Corporate Closeness</i>				
<i>Centrality</i>	<i>Year</i>			
<i>Corporation Type</i>	<i>1962</i>	<i>1973</i>	<i>1983</i>	<i>1995</i>
Financial	38.613	38.329	37.654	32.597
Top Industrial	37.606	37.729	37.807	35.544
Industrial	34.160	33.607	34.553	30.511
Utility	37.591	35.881	35.835	33.254
Transportation	36.890	36.177	34.280	31.677
<i>Mean Corporate Betweenness</i>				
<i>Centrality</i>	<i>Year</i>			
<i>Corporation Type</i>	<i>1962</i>	<i>1973</i>	<i>1983</i>	<i>1995</i>
Financial	528.054	541.157	398.955	282.792
Top Industrial	225.846	238.058	242.790	410.054
Industrial	106.076	101.299	138.492	169.200
Utility	273.615	208.147	254.220	288.487
Transportation	303.403	214.434	303.855	202.035

Finally, consider the change in betweenness centrality by type of corporation for the years 1962 through 1995. Again, the relative decline in average levels of betweenness centrality is most evident among financial corporations. However, top industrial, industrial, and utility corporations show increases in average levels of betweenness centrality, especially between 1983 and 1995. In fact, top industrial corporations are clearly the most important in the network in terms of betweenness centrality by the last year of this study.

These results at the corporate level of analysis demonstrate that much of the decline in network centralization is due to the considerable decreases in the centralization of financial corporations. While the changing role of banks and insurance corporations in the network have direct effect on degree centralization, they appear to have the strongest effect on closeness centrality, and the least impact on betweenness centrality. Had we focused exclusively on the network level, we would have failed to detect important variation between corporations. These findings suggest that between 1962 and 1995, financial and top industrial corporations have partially exchanged roles within their networks.

Clique Analyses

The final set of analyses of our networks of corporate interlocks involves identifying the number of cohesive subgroups or "cliques." A clique is formally defined as a "maximal complete subgraph of three or more [corporations]." (Wasserman and Faust, 1994:254). Put plainly, what this means is that a clique is formed if three or more corporations have ties to every other corporation in that clique. Consider the set of ties linking TIAA, Fleet Financial and Bausch & Lomb on the right side of Figure 1. These three ties meet the criteria for a clique of size 3. Each of these three corporations in this subgroup are directly linked to the two other corporations. Now, examine the set of ties formed by Robert Allen between AT&T, Bristol Meyers Squib, Chrysler Corp. and Pepsico. As in the first example, every corporation is directly tied to all others in this subgroup. AT&T is tied to Bristol Meyers Squib, Chrysler, and Pepsico; Bristol Meyers Squib is directly tied to AT&T, Chrysler, and Pepsico; Chrysler Corp. is tied to AT&T, Bristol Meyers Squib, and Pepsico; and finally, Pepsico is tied to AT&T, Bristol Meyers Squib, and Chrysler. This tightly knit subgroup is an example of a clique with a size of four. It is clear from these two examples that it becomes extremely difficult to form cliques as the minimum size

increases due to the fact that every tie must be present and there are many more possible ties as the clique size increases. The second example also highlights a direct implication of applying clique analyses to the study of interlocking directorates. Namely, clique formation will mirror the individual subgroups formed by multiple interlocks since each multiple interlocking directorate will by definition, form a clique. But when one analyses the entire set of connections formed by multiple interlocks, as well as incorporating the ties formed by single interlocks, additional subgroups are sure to emerge.

Table 7 lists the number and percent of each clique size by year. To underscore the strict criteria of forming a clique, Table 7 also notes the number of requisite ties needed to form a clique of a given size. Before we focus on the number of cliques across time, it is important to appreciate the total number of cohesive subgroups in all four time periods. In 1962, we identified 413 cliques. Although the number decreased to 363 by 1973, the number of corporate cliques grew to 502 by 1983. Finally, although the number of subgroups is lowest in 1995, there are still nearly 300 subgroups. In other words, while we will note the variation in the number of cliques below, it is important not to lose sight of the general fact that all of these networks of corporate ties exhibit a high level of subgroup cohesiveness.

Considering next the change in the number of cliques formed between 1962 and 1995, let us begin with the smallest clique of size 3. While the number of cohesive subgroups size 3 changes over time, it is interesting to note that for the years 1962 through 1983, the percentage of cliques sized 3 remained fairly steady. It is only in 1995 that we see a sharp decrease in the number of three member cliques. Furthermore, despite this lower number of cliques, it is also the case that there was an increase in the proportion of cliques with three members when compared to all cliques. This pattern of a comparable number of cliques between 1962 and 1973, followed by a large increase by 1983, and a subsequent decline by 1995 is also evident in the number of cliques consisting of four corporations.

Table 7: Corporate Clique Formation, 1962–1995

Clique Size	Requisite Ties	1962		1973		1983		1995	
		N	%	N	%	N	%	N	%
3	3	261	62.2	236	65.0	329	65.5	215	75.7
4	6	120	29.1	113	31.1	146	29.1	59	20.8
5	10	25	6.1	13	3.6	22	4.4	7	2.5
6	15	5	1.2	1	0.3	4	0.8	2	0.7
7	21	2	0.5	0	0.0	0	0.0	1	0.4
8	28	0	0.0	0	0.0	0	0.0	0	0.0
9	36	0	0.0	0	0.0	1	0.2	0	0.0
10	45	0	0.0	0	0.0	0	0.0	0	0.0
Totals		413	100.1	363	100.0	502	100.0	284	100.1

Finally, let us conclude our discussion of clique formation with a focus on large subgroups, those consisting of 5 or more corporations. In considering the number of cliques formed size 5 or greater, Table 7 exhibits several dramatic changes over time. In the first time period, there were 32 cohesive subgroups of 5 or more corporations—five of which consisted of 6 members. In 1973, there were far fewer large cliques, 13 subgroups of size 5 and only 1 group consisting of 6 corporations. 1983 demonstrates a rebound with respect to the number of large subgroups. There were 22 complete subgroups of 5 corporations in 1983, as well as 4 sets of 6 corporations. Also noteworthy is the presence of a clique with 9 members. This clique was formed by Juanita M. Kreps, the former Secretary of Commerce within the Carter Administration. Lastly, Table 7 clearly underscores the relative absence of cliques size 5 or greater in 1995. Taken as a whole, there appears to be an overall decrease in the number of cohesive subgroups between 1983 and 1995. Furthermore, the percentage of cliques with the minimum size of three grew between 1983 and 1995. In other words, the network of corporate ties appears to be comprised of fewer and smaller subgroups.

Conclusions

From our descriptive results, we conclude there has been a general decrease in network centralization between 1962 and 1995 among our 250 corporations. Over this thirty-three year time period, measures of network density, centralization, and the number of cliques all under-

score that by 1995, the pattern of corporate ties was one of decreasing concentration. While there appears to be greater variability both across time and between measures for the years 1962, 1973, and 1983, our data clearly indicate that the network of corporate ties in 1995 was less dense, less concentrated, and contained few subgroups.

One possible explanation of the relative decline in overall corporate interlocking is that in this age of mega-mergers, interlocks have become less important as a vehicle for cooptation, control, or collusion. With specific reference to the last year of our study, *The Wall Street Journal* reported five notable mergers/acquisitions. In July of 1995, Westinghouse Electric Company made public its plans to purchase CBS Inc. for \$5.4 billion. On August 1st, the Walt Disney Co. announced plans to acquire Capital Cities/ABC Inc. for \$19 billion in cash and stock (at that time, the second largest merger in the history of the U.S.). By the End of August, Chemical Banking Corp. and Chase Manhattan Corp. announced that they were merging in a \$10 billion deal to create the fourth largest capitalized bank in the world with nearly \$300 billion in assets. Finally, on October 19th, 1995, Wells Fargo initiated its hostile takeover of First Interstate Bank Corp. in a \$10.84 billion dollar bid to create the eighth largest bank in the United States. However, while such mergers and acquisitions have undoubtedly affected the network of corporate ties—there is no longer a need to maintain an interlocking directorate between Westinghouse Electric and CBS or indirect links between Chemical Banking Corp. and Chase Manhattan—our analysis of corporate centrality suggest that changes in network structure may be due to changes among financial corporations. Recall as well Davis and Mizruchi's 1999 study that demonstrated a link between decreasing centrality among financial corporations and the general changes within the financial sector in the United States since the 1980s.

It is also plausible that the increasing globalization of capital is having a profound effect on the structure of interlocking directorates in a specific country. It may be the case that any study that focuses on the patterns and structure of corporate ties for a single country will exhibit relative declines in terms of network density, centralization, and the number of cliques. While such potential results would indicate a relative weakening of corporate ties *within* a particular country, it is possible that corporate ties *between* advanced capitalist economies may exhibit countervailing trends. Indeed, as noted in our literature review, international interlocking does occur. Most recently, Carroll and Alexander (1999) found that while Canada exhibits a high concentration of corporate interlocking in the finance-capital sector, Australia was less con-

centrated and displayed more international interlocking. Unfortunately, we cannot offer empirical evidence that directly bears on this question. While the work on the formation of a transnational capitalist class and the evidence of international interlocking in other countries make this a reasonable interpretation of the trends we observe, we will need to reserve this specific question for further research.

The descriptive results of this paper reinforce the general notion that interlocking directorates remain an important feature in the study of advanced capitalism. Our data indicate that despite a decline in network centralization, there is also a fair bit of continuity within the overall structure of corporate interlocks between 1962 and 1995. Furthermore, we have traced the changes in the structure of corporate interlocks to the precipitous decline in centrality of our financial corporations. Given these results on the structure of corporate networks between 1962 and 1995, as well as the changing positions of banks and insurance companies in the 1995 network, we certainly reject any suggestion that interlocking directorates have become unimportant. Rather, these results indicate that the role and status of interlocking directorates as a mechanism of capitalist class cohesion may in fact be experiencing significant transformations in this age of economic concentration, globalization, and changing regulatory environments. Therefore, we believe that interlocking corporate directorates must remain an important component to a critical understanding of corporate power. As investigations continue into the Twenty-First century on the meaning and importance of corporate interlocks, research must specify more clearly the internal political economy in which corporations interlock and expand the geo-political boundaries to make the research transnational in scope. In short, the reconciliation of our descriptive results and these larger economic trends may only be a matter of expanding our field of vision.

Notes

1. We would like to thank William K. Carroll, and the anonymous reviewers of *Critical Sociology* for their helpful comments and criticisms. Support for this research has been provided by several Research Initiative Partnership grants through the Office of Research, University of Michigan-Flint. We also wish to acknowledge the research assistance of John Wells, Ami Baker, and Steve Ward.

2. Data for Gross Domestic Product in 1962 and 1995 are from the Bureau of Economic Analysis, Department of Commerce, "National Income and Product Accounts." The combined revenues of the 500 largest industrial corporations are from *Fortune*, July, 1963, and *Fortune*, April 29, 1996.

3. To be sure, changes in patterns of interlocking directorates are not restricted to changes in the financial sector. For example, Jeffery Pfeffer (1974:337) demonstrated how

board membership consistently reflected the so-called “demographic characteristics” of its environment. More recently, Lang and Lockhart (1990) found an increase in direct and indirect interlocking within the airline industry during the period of airline deregulation of the 1970s.

4. Among the fifteen corporations reported in Sklair (1998), the average percent of revenues from non-US sources was 26.3. Hewlett-Packard and Intel reported over half of their revenue in 1994 was from foreign markets. The percent of profits from foreign investments is even more impressive. The average percent of total profits from non-US sources was 30.8 among the twelve corporations in his study of the California Fortune Global 500. Particularly noteworthy is that 79 percent of Chevron’s profits, 70 percent of the profits for the medical supplies corporation McKesson, and 61 percent of Hewlett-Packard’s profits, all came from non-US sources.

5. Domhoff, G. William (Ed.) *The Insurgent Sociologist. Special Double Issue: Power Structure Research II*. Vol. 9, No. 2–3, Fall 1979–Winter 1980. More recently under the editorship of Val Burris, *Critical Sociology* published a special issue on power structure research in Summer/Fall of 1989.

6. Corporate ties through sharing board members have a long history in Europe and North America. For example, David Bunting (1983) presents evidence as to the extent of corporate interlocks during the Nineteenth Century in the United States. Turning to the Twentieth Century, William Roy (1983) examined the formation of corporate cliques that support the perspective that corporate ties were generated through resource dependencies among the railroads, coal companies and financial institutions. In Europe, Fohlin (1999) documents the rise of interlocking directorates in Imperial Germany between 1880 and 1910, and Ottosson (1997) examines the emergence of interlocking directorates in Sweden from 1903 to 1939.

7. It should also be noted that important work has been conducted on the formation of a transnational capitalist class. If capital is becoming more globalized, it is reasonable to expect that intra-class relations are becoming increasingly global. To begin, Kees van der Pijl documents the transition from “imagined communities” such as the Freemasons to transnational planning groups as the Business Council for Sustainable Development and the World Economic Forum (1998). In this fascinating historical account, the changing mechanisms of class formation underscore the extent to which a transnational capitalist class has become truly global. Focusing on networks of interlocking directorates, Fennema (1982) examines patterns of corporate concentration both within and *between* advanced capitalist economies. This research, the first true study of international interlocking, demonstrates the imperialistic dimension of the integration of industrial and financial capital. In particular, between 1970 and 1976, the network of approximately 200 corporations across 14 countries demonstrated increasing bank centralization. Finally, in his examination of the members of the transnational capitalist class—the executives of transnational corporations, as well as globalizing bureaucrats, politicians, professionals, merchants and media—Sklair (2001) has argued that corporations and the capitalist class are increasing “global” in their orientation, operation, and that consumption has acquired an increasingly global character.

8. Recently, Galaskiewicz and Zaheer (1999) generated a typology of interorganizational relationships that includes equitable exchange (i.e., cooperation), collusion, exploitation, and competition. However, by integrating the individual, organizational, and network levels of analyses, they note that these relationships are dependent upon the interlocking directors themselves and therefore are not simply a matter of network structure or organizational strategies.

9. We acknowledge important work on interlocking directorates that has analyzed the same corporations over time. However, given the inherent problem of attrition in panel studies, this research is somewhat limited in scope. For example, while Galaskiewicz et al. (1985) analyzed the network of 116 corporations, these corporations were restricted to the Minneapolis-St. Paul area and covered only three consecutive years. In contrast, Carroll’s (1986) examination of continuity and change within the “inner circle” of the

largest Canadian corporations over a thirty year time span included only 21 corporations (given his selection criteria).

10. We acknowledge that this distinction between individual and multiple directors departs from the established practice of distinguishing so-called "big-linkers" from other interlocking directors. Originally used by the Dutch researcher Meindert Fennema, the concept of a "big linker" underscores the structural importance of individuals who sit on four or more boards of directors. While useful insights have been generated regarding the formation of a European network of corporate interlocks (Fennema, 1982; Fennema and Schijf, 1985) and the changes within the major enterprise groups in Canada between 1976 and 1986 (Carroll and Lewis, 1991), we have departed from this tradition for two reasons. First, there is a qualitative difference between those directors who sit on only two boards, and those who sit on three or more in so far as the former not form a clique of corporations. Secondly, the percentage increase in the number of direct ties formed is greatest moving from two directorships to three.

11. Borgatti, S.P., M.G. Everett, and L.C. Freeman. 1999. *UCINET 5.0 Version 1.00*. Natick: Analytic Technologies.

12. We have made a conscious effort to present our measures of network centrality in a non technical fashion. For readers who are interested in knowing the precise formulas or those who desire an in-depth treatment of network analyses, two very good sources are Wasserman and Faust (1994) and Knoke and Kuklinski (1982).

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