

TESTING A STRUCTURAL THEORY OF CORPORATE COOPTATION: INTERORGANIZATIONAL DIRECTORATE TIES AS A STRATEGY FOR AVOIDING MARKET CONSTRAINTS ON PROFITS*

RONALD S. BURT
University of California, Berkeley

KENNETH P. CHRISTMAN
University of California, Berkeley

HAROLD C. KILBURN, JR.
State University of New York, Albany

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Moving away from description of directorate ties as a cooptive device, we test a theory explicitly predicting cooptive uses of corporate directorates from the structure of the market in which firms operate. The theory is based on a network model of structural autonomy. It takes as exogenous information the sales and purchase transactions between establishments in sectors of the economy, locates those sectors most constraining pricing discretion within each sector, then predicts where establishments should be connected by interorganizational relations if such relations are intended to coopt market constraints. Using data on interorganizational relations as directorate ties (establishments connected through corporate boards by ownership, direct interlocking, and/or indirect financial interlocking) in the 1967 American economy, we find the theory's predictions to be accurate. Each of the three types of directorate ties tends to occur where there is market constraint and tends not to occur in the absence of constraint. Further, the three types of ties are coordinated as multiplex directorate ties. Where establishments in one sector constrain those in another, there is a strong tendency for all three types of directorate ties to exist between the two sectors. Where there is no such constraint, all three tend to be absent. Support is weaker for intrasector in comparison to intersector cooptation via directorate ties. Whatever the cooptive intent of the directorate ties described, they are patterned as if they were intended to coopt market constraints on corporate pricing discretion.

If two firms have interlocked directorates (one or more persons sitting on the board of directors for both firms) and such a connection allows either firm to coopt the ostensibly competitive market transactions the firms have with one another, then the presence of directorate ties on a large scale within an economy is evi-

dence of an integrated economic elite. Wary of such connections in the United States, social scientists have devoted years of research to describing the cooptive potential of the corporate board. A summary empirical generalization from this research is the following: There is extensive corporate interlocking in the United States, particularly in urban corporate centers such as New York, Chicago or Los Angeles, and those firms most likely to be involved in it are large firms operating in capital intensive industries where the firm is controlled by diffuse interest groups (for comprehensive literature review, see Aldrich and Pfeffer, 1976; Aldrich, 1979). Measuring firm size as dollars of assets or annual sales, a ubiquitous finding is that a firm's size is positively correlated with the number of different corporations represented on the firm's board of directors (Warner and Unwalla, 1967; Dooley, 1969; Pfeffer, 1972; Allen, 1974). Also, there is a positive correlation between a firm's capital

* Direct all communications to: Ronald S. Burt; Department of Sociology; University of California; Berkeley, CA 94720.

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requirements and its tendency to represent other firms on its board of directors.¹ Among the many firms represented on a typical board of directors, moreover, there is usually a representative from a major bank in the same geographical region as the firm itself (Warner and Unwalla, 1967; Dooley, 1969; Levine, 1972; Pfeffer, 1972; Allen, 1974; 1978; Bearden et al., 1975; Mariolis, 1975; Sonquist and Koenig, 1975; and for replication in Great Britain and the Netherlands respectively, see Stanworth and Giddens, 1975; Moken and Stokman, 1979). Thirdly, few other firms are represented on a board dominated by a single interest group. Two kinds of groups in particular have been researched, management and kinship. The thesis advanced by Berle and Means (1932), and supported by subsequent research (Larner, 1970; Allen, 1976), is that corporate "management" in the guise of the board of directors and senior corporate officers has come to power as a result of the diffusion of shares among so many owners that individual owners no longer exercise control over the corporate use of their capital. Contradicting this management control thesis is research demonstrating the continued existence of powerful families as kinship groups whose extensive stock holdings in large corporations perpetuate their ultimate corporate control (Burch, 1972; Zeitlin, 1974; 1976). Whatever the assumed basis for directors

reaching decisions and maintaining their positions as directors, empirical research on the question of corporate control has documented a negative correlation between the tendency for other firms to be represented on a corporate directorate and the percentage of directors who are officers in the corporation (Dooley, 1969; Pfeffer, 1972) as well as the extent to which a single family owns a controlling share of the corporation's stock (Allen, 1976).

These findings can be interpreted as support for an argument that directorates are used to coopt market constraints. The larger a firm is, then the more impact its actions have on other organizations and, accordingly, the more the firm needs representatives who can integrate and legitimate the firm in its external environment (cf. Dooley, 1969:316; Pfeffer, 1972:223; Allen, 1974:395). Arguing for a cooptive interpretation of capital intensive firms representing financial firms on their directorates, Allen (1974:395) suggests that capital is a "... very generalized resource with a very dispersed demand from such economic organizations as corporations" (cf. Pfeffer, 1972:224). Thirdly, the negative correlation between concentration of corporate control and interlocking can be interpreted in terms of cooptation. The more that control of a firm is concentrated in the hands of a single group (management or family), then the greater is the loss of control incurred with the addition of a single outside group on the firm's board. Selznick's analysis of the TVA demonstrates that cooptation can backfire. When the TVA brought representatives of local organizations into its own decision-making structure, the TVA was forced into some actions more beneficial to the local organizations than to the TVA (see Selznick, 1949:113-4, 145-53, 205-13, 217, 259-61), although the long-term benefit to the TVA of avoiding local conflicts is not to be belittled. Where control of a corporation is already dispersed such that each interest group has little control over decisions, on the other hand, the addition of yet another voice on the board entails little loss of control for each group currently on the board. In order to maintain a decision-making ca-

¹ This correlation is observed in a comparison of financial versus nonfinancial firms and Pfeffer (1972:224) reports a positive correlation between interlocking and a firm's capital needs as the ratio of dollars of debt over dollars of equity. Among nonfinancial firms, however, the correlation is negative. Allen (1974:400) reports a negative correlation between interlocking and a firm's capital needs measured as the ratio of dollars of assets over number of employees. Using the traditional capital output ratio to measure capital intensiveness (dollars of assets over dollars of sales, e.g., Lustgarten, 1975), Burt (1980b) also reports low negative correlations between interlocking and capital requirements. In addition, however, the analysis of multiplexity reveals a significant tendency for capital intensive (manufacturing) firms to have a complete multiplex directorate tie to finance; such firms own a finance firm as a subsidiary (Burt, 1980b:Table 8). This could explain why capital intensive firms need not interlock more than noncapital intensive firms; the former own their own establishment in the finance sector.

capacity unimpaired by the competitive interests of their corporate environment, therefore, a dominant kinship or management group in a directorate would be expected to oppose extensive interlocking with other firms (cf. Dooley, 1969:322; Pfeffer, 1972:224). In Zald's (1969) terms, concentration of corporate control in a kinship or management group results in the firm's board serving an internal control function rather than an external representation function.

These cooptively interpreted findings have yet to directly address the connection between market structure and cooperative interorganizational structure. Discussing the cooptive uses of directorates makes intuitive sense. Indeed, interlocking directorates would not be considered a threat to competition between establishments unless such linkages were potentially cooptive. By itself, however, interpreting interlocking directorates as cooptive devices does not advance theoretical understanding of interlocking so much as it provides a sociological label for interlocking. Like instinct theories of action in which a person's behaviors are explained by attributing to the person an instinct for those behaviors, cooptation is a rationalization for action without a specification of parameters for action. In other words, there is no theory predicting when an interlocking directorate between two organizations is not cooptive. Accordingly, there is no method of rejecting an argument interpreting such connections as a cooptive device. What is known is that some types of firms use their directorates in what can be interpreted as a cooptive manner. What is not known is whether these ostensibly cooptive uses of directorates are patterned by market constraints so as to reduce competition between firms or whether there are merely some types of firms that engage in representing the corporate environment on their boards of directors.

Our purpose here is to use a network model of constraint to predict where directorate ties should, and should not, occur, if they are intended to coopt market constraints on profits. We demonstrate that three types of such ties are patterned by market constraint. They

occur together in the presence of market constraint and tend not to occur in its absence. We conclude that, whatever substantive meaning is given to interlock ties, they are patterned as if they were being used cooptively.

THEORY

We employ a network model of "structural autonomy" discussed in detail elsewhere (Burt, 1980a; 1981:chap. 6). The model takes the patterns of relations among occupants of each status in a system as input and predicts the relative freedom the status offers within the system as well as the extent to which that freedom is constrained by role relations with each other status. In a sentence, the occupants of a status enjoy high structural autonomy within their system (i.e., have an ability to pursue their interests without constraint within the system) to the extent that their relational patterns ensure low competition with one another while simultaneously ensuring high competition among the nonoccupant actors with whom they interact. Their structural autonomy is severely constrained by their relations with occupants of a particular other status to the extent that they have relations with occupants of that status only and those occupants are perfectly centralized so as to collectively pursue their own interests. When this constraint occurs, occupants of the first status are expected to establish informal relations with occupants of the second status so as to coopt the sources of constraint on their autonomy.

A slight indulgence in algebra greatly clarifies these ideas. The basis for interstatus constraint is given by the following term expressing the constraint relations between occupants of statuses S_i and S_j pose for the occupants of status S_j :²

² The structural autonomy of occupying S_j , a_j , is then given as a function of these coefficients; $a_j = \beta_0 y_j + \beta_0 X_j + \beta_x (y_j - \bar{y}) (\bar{X} - X_j)$, where $X_j = \sum_i x_{ji}$ for $j \neq i$, the positive effect of oligopoly on autonomy is given by β_0 and the constraining effect of relations with other status groups is given by β_x which is negative (cf. Burt, 1980a:Eq. 1; 1981a:Eq. 6.2b). This equation can be disaggregated to estimate the contribution relations between occupants of S_i and S_j make to the structural autonomy of S_j 's occupants;

$$x_{ji} = [(z_{ji}/\sum_q z_{jq})^2 + (z_{ij}/\sum_q z_{qi})^2]y_i, \quad (1)$$

where z_{ji} is the strength of the relation from S_j to S_i and y_i measures the extent to which occupants of S_i constitute an oligopoly in the sense that their decision making is centralized, enabling them to act as a single body to further their collective interests—at the potential expense of actors occupying S_j . If occupants of status S_j have relations only with occupants of S_i , then the bracketed term of the above equation equals 2. If they have no relations with the occupants of S_i , then the term equals 0 (specifically, $x_{ji} = z_{ji} = z_{ij} = 0$). In other words, x_{ji} is high to the extent that two things occur simultaneously: (1) occupants of S_j have relations only with occupants of S_i , and (2) the occupants of S_i are perfectly centralized (whereupon y_i equals its maximum value arbitrarily set at 1.0). Status S_j offers its occupants structural autonomy within their system to the extent that y_j is high and all x_{ji} are close to 0. A high value of x_{ji} indicates that status S_i poses a constraint for the autonomy of S_j 's occupants. If some potentially cooptive type of relationship is being used within the system to eliminate these constraints, then a strong cooptive relation from status S_j to status S_i , call it w_{ji} , should be observed when x_{ji} is high, and should not be observed when x_{ji} is 0.

These simple ideas have been used to describe market constraints on corporate profits. An economy can be discussed as a network of interorganizational market transactions, sales to consumers and purchases from suppliers. The division of labor ensures considerable redundancy in such a network. Establishments producing similar types of commodities have similar relations from other establishments (i.e., will require similar proportions of commodities as inputs from suppliers) and to other establishments

(i.e., will offer similar types of commodities as outputs to consumers). As commonly discussed in economics, these establishments producing similar goods fall into a single "sector" of the economy. The sales and purchase transactions can be aggregated into intersector relations since establishments within a sector have similar tendencies to purchase inputs from each sector as a supplier and have similar tendencies to sell outputs to each sector as a consumer. The resulting aggregate representation of interorganizational relations as intersector relations is discussed as an input-output table containing dollar flow coefficients, z_{ji} being the millions of dollars of sales by establishments in sector J to those in sector I (e.g., Leontief, 1966). In terms of the developments in network analysis upon which Burt (1980a) builds a theory of constraint, the fact that establishments producing similar goods have similar patterns of market relations with economic sectors means that the establishments are structurally equivalent within the economic market. The "sector" of an input-output table corresponds to the "status" as a jointly occupied network position in a density table (e.g., Burt, 1976; 1977; 1980c). Given data on the dollar flow coefficients among sectors of an economy and the extent to which establishments within a sector can act collectively as an oligopoly, therefore, the structural theory of constraint can predict the relative freedom enjoyed in each sector and the extent to which establishments in any one sector are constrained by those in each other sector.

Assuming that establishments would charge high prices (and accordingly make high profits) to the extent that they are free to do so, then the highest average profits should be observed in those sectors with the highest predicted freedom from other sectors. For American manufacturing industries, this is precisely what is observed and reported elsewhere (Burt, 1979a; 1980a). Values of Equation 1 were computed for each of 20 two-digit and each of 335 four-digit Standard Industrial Classification (SIC) manufacturing industries from z_{ji} as the millions of dollars of sales from establishments in industry J to those in sector I according to

$a_{ji} = [\beta_x x_{ji} + \beta_y (y_j - \bar{y}) (\bar{x}_{ji} - x_{ji})] |a_{ji}|$, where \bar{x}_{ji} is the mean constraint imposed on status S_j (cf. Burt, 1980a:Eq. 2). It is these a_{ji} that capture market constraints on profits in manufacturing industries so as to distinguish significant and negligible market constraints (Burt, 1980a:Eq. 5). However, we have focused on x_{ji} in the text since it clearly shows the connection between constraint and market structure without requiring an extensive aside on the autonomy concept or industry profits.

the 1967 Input-Output Study of the American economy where y_i was measured as the concentration of 1967 sales in the largest four establishments in each sector corresponding to SIC industries. Following the lead of economic research on industry profits, adjusted price-cost margins were computed as the relative average profits establishments obtained in 1967 within each manufacturing industry (Collins and Preston, 1969). As one indicator of the portion of a dollar of sales that was profit in an industry, this margin was close to 1 to the extent that total sales by the industry minus direct material and labor costs equalled total sales itself. As expected, those industries with high price-cost margins tended to be concentrated (high values of y_i) and be subject to low constraint from other economic sectors (low values of x_{ji} summed across all manufacturing and nonmanufacturing sectors I).

Assuming that establishments would establish cooptive relations with sectors constraining their pricing discretion within the market, then the structural autonomy model provides a structural theory of corporate cooptation: Interestablishment cooptive relations should be observed where they can eliminate constraint and should not be observed where there is no constraint to eliminate. This theory was supported in an analysis of merger rates among establishments in the two-digit SIC manufacturing industries. Based on the analysis of market constraints confronting the 20 two-digit SIC industries from establishments in 51 manufacturing and nonmanufacturing sectors in 1967, three types of market constraints among establishments can be distinguished: intra-industry, industry constraint, and industry nonconstraint.³ These types of market

relations offer three hypotheses on corporate cooptation.

(H₁) Of the 20 industries, establishments in 16 could increase their freedom from other sectors if they could establish cooptive ties with one another so as to raise y_j for the industry. In these 16 industries, establishments should be connected by cooptive relations ($w_{jj} \neq 0$).⁴ Antitrust legislation poses a bias against support for this hypothesis depending on the type of cooptive relation being considered. Cooptive ties between competitive firms within an industry are less likely than would be predicted by market constraint since such ties are rather flagrant violations of antitrust. This issue is raised again in our conclusions section.

(H₂) There were 86 intersector relations in the 1967 economy where establishments in industry J had extensive transactions with those in sector I and sector I was highly concentrated so that x_{ji} in Equation 1 was high. These 86 industry constraint relations should be associated with cooptive relations intended to eliminate constraints, establishments in industry J creating cooptive relations with those in sector I ($w_{ji} \gg 0$ given $x_{ji} \gg 0$).

(H₃) The remaining market relations referred to a lack of constraint on establishments in each industry. Either the establishments in sector I were not highly concentrated (meaning that there were many independent competitors within the sector) or industry J had no market transactions with the sector. For either reason, x_{ji} in Equation 1 was close to zero so that 794 industry nonconstraint relations should be associated with a lack of cooptive relations intended to eliminate constraints, establishments in industry J not creating cooptive relations with those in sector I ($w_{ji} \approx 0$ given $x_{ji} \approx 0$).⁵

³ In order to distinguish industry constraints from nonconstraints, a 95% confidence interval is placed around 0 constraint using the standard error of the mean constraint on profits in an industry (the mean a_{ji} for industry J from all 51 economic sectors I, see fn. 2). The sector I exercised high market constraint on industry J if x_{ji} was sufficiently different from 0 to make them one of the highest constraints the industry faced in the sense that their constraint was beyond the .95 confidence interval around 0 (see Burt, 1980a:Eq. 5).

⁴ Deleted are the textile, apparel, rubber and fabricated metals industries. Establishments in these industries confront such a high level of market constraint that a small decrease in competition within each industry need not decrease the overall market constraint they face. Nevertheless, there are intra-industry connections here. There are mergers in all four industries and at least two establishments in all but the apparel industry are connected by interlocking, direct as well as indirect through financial institutions.

⁵ There are 794 rather than 914 ($20 \times 51 - 20 - 86$)

These hypotheses do not describe the manner in which corporate cooptation operates. They merely locate those places in the economy where cooptive relations should and should not occur if they are intended to eliminate market constraint. In order to know what types of connections among establishments are cooptive, connections falling under hypothesis H_3 can be compared with those falling under hypotheses H_1 and H_2 . A discretionary connection, tending not to occur in the absence of market constraint (H_3) but tending to occur in the presence of market constraint (H_1 , H_2), is probably being used as a cooptive relation eliminating market constraint. The data on mergers as of 1967 suggest mergers to be cooptive relations in this sense. Establishments within industries had a statistically significant tendency to merge with one another and establishments in industry J tended not to merge with those in sector I if that sector exercised no market constraint on the industry. Given the commonly held assumption that interlocking directorates are cooptive relations, we expect interestablishment connections through corporate boards of directors to show the same patterning.

MEASURING INTERESTABLISHMENT CONNECTIONS THROUGH BOARDS OF DIRECTORS

Measuring the w_{ji} as interestablishment connections through boards of directors requires decisions on three issues. The issues deserve brief discussion as explanation for the decisions made here in order to operationalize the w_{ji} .

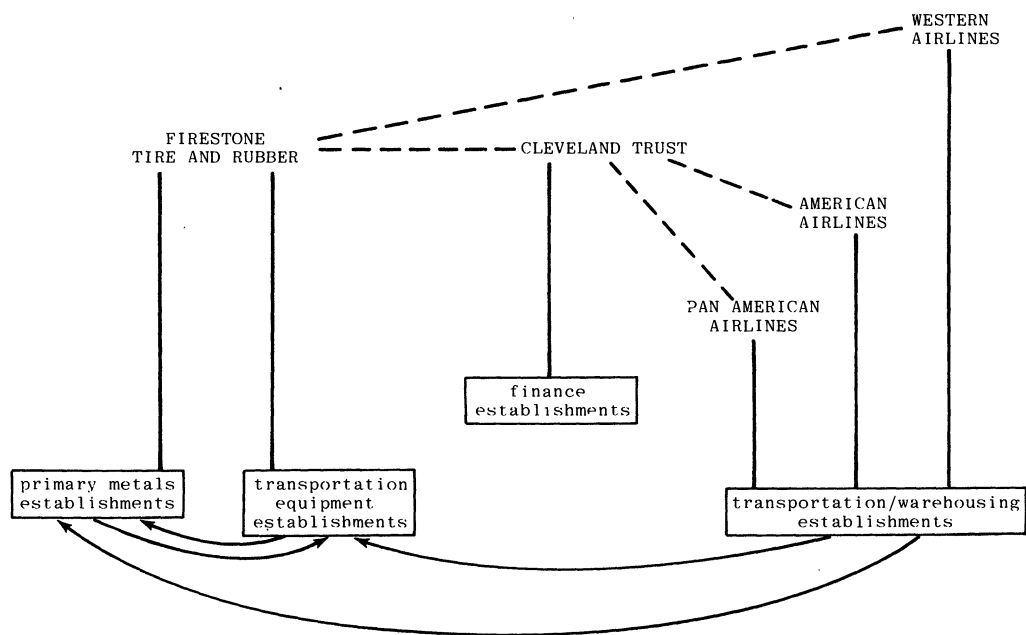
(1) Different organizational units are connected by market constraints and in-

nonconstraint relations because six nonmanufacturing sectors have been deleted as artificially supporting this hypothesis. The six sectors are: federal government, state/local government, gross imports, expense accounts, office supplies, and scrap. There are no SIC categories given in the 1967 Input-Output Study for these sectors, so there would have been no directorate ties to establishments in these sectors as such ties are operationalized here. Since the six sectors exercise no market constraint on any two-digit industry, considering them would have artificially raised the number of nonconstraint relations associated with a lack of interlock connections.

terlocking directorates. Market constraints are defined at the establishment level of analysis but boards of directors are defined at the corporation level of analysis. A firm is a socially defined entity created by corporate law in order to determine legal liabilities. An establishment is an economically defined entity created by the Bureau of the Census in order to describe market structure. For the purposes here, a single firm's holdings in an economic sector is one establishment. Following the Department of Commerce an industry in the economy consists of all establishments engaged in the manufacture of a single type of good. The tobacco industry consists of all establishments engaged in the manufacture of tobacco products, the food industry consists of all engaged in manufacturing food products, and so on. If a corporation owns two factories, one manufacturing bread and the other cigars, then it owns two establishments, one in the food industry and another in the tobacco industry. If a corporation owns three factories at separate locations, two engaged in the production of bread and one manufacturing cigars, then it owns two establishments, one in the food industry and another in the tobacco industry.⁶ Some firms own an establishment in only one economic sector. In this circumstance market constraints among establishments and interlocking directorates among firms can be compared directly. The typical firm owns establishments in many sectors, however, so constraints and interlocking cannot be compared directly. Further, there is no obvious method of comparing constraint and interlocking by assigning firms to their most important sector or aggregating market constraints to the corporation level of analysis.⁷ For this analysis, a cor-

⁶ This treatment differs slightly from that employed by the Department of Commerce. The census separates each factory within a sector as a separate establishment whether or not the factories are owned by a single corporation. Since establishment level data are not available for a national sample of firms and since the concern here is with coordination of establishments in separate sectors, two or more census establishments owned by a single firm in a single sector are treated here as a single establishment.

⁷ Unfortunately, there are no reliable data available to the general public on the proportion of sales



Note: Arrows represent market constraint, solid lines represent ownership and dashed lines represent interlocking.

Figure 1. Illustrating Three Types of Directorate Ties Involving Two Firestone Tire and Rubber Establishments in 1967

porate board of directors is assumed to represent each establishment it owns no matter how small the establishment. The corporation is viewed less as the unit of cooptation than the means to cooptation. To be sure, when a representative from another firm sits on a corporate board, he

represents the other firm. More important to an analysis of coopting market constraints, however, he represents the establishments owned by the other firm. It is access to those represented establishments that might allow the corporation's own establishments to coopt the market constraints they confront.

and profits a firm obtains from its operations in each of multiple sectors. Even if such data were available, there is no obvious criterion after which a firm should be assigned to a single sector. Is a firm in industry J when one-third, one-half, or three-fourths of its income results from its operations in the industry? The task of assigning firms to specific sectors seems implausible at this time. Similarly, aggregating market constraints to the corporate level seems implausible. The typical firm operates in multiple economic sectors. Each establishment it owns is subject to the market constraints characterizing its industry. The firm itself is subject to some mixture of these market constraints collectively confronting its multiple establishments. Further complicating this mixture is the lack of data on the extent to which the firm's sales and profits result from each of its establishments. For the purposes here, it seemed preferable to oversimplify the situation by treating each of a firm's establishments as equally represented by the firm's board. This is probably not true empirically, but it has the advantage of a clear interpretation pending the development of some sophisticated method for quantitatively disaggregating firms into their component establishments.

(2) Establishments are connected in multiple manners by corporate boards of directors. Three manners in which establishments can be connected through boards are illustrated in Figure 1 with selected connections involving Firestone Tire and Rubber in 1967.⁸ Sectors of establishments are represented by squares and solid lines represent ownership (e.g., Firestone owned an establishment in the primary metals industry and another in the transportation equipment industry as well as several not presented in the diagram). A dashed line between two firms represents an interlocking directorate (e.g., one

⁸ A detailed discussion of these three types of connections as cooptive relations is given elsewhere (Burt, 1980b). Also given there is a more complete picture of the establishments represented on Firestone's board of directors in 1967 by the three types of connections.

or more of Firestone's directors also sit on the board of Cleveland Trust). Finally, arrows represent market constraint relations (e.g., establishments in the primary metals industry are constrained by their market relations with those in the transportation equipment industry and those in the transportation/warehousing sector as well as some not presented in the diagram) and the absence of an arrow represents a lack of constraint (e.g., establishments in the financial sector exercise market constraint on no sector presented).

Put yourself in the position of the head executive for Firestone's establishment in the primary metals industry. Among other market constraints his establishment confronts are constraints from the transportation equipment industry and the transportation/warehousing sector. To the extent that Firestone's board of directors is a cooptive device, it should be used to give this executive access to decision making in those sectors constraining his establishment in the market. One form of access could be provided by direct ownership. The fact that Firestone owns an establishment in the transportation equipment industry means that the executive has access through Firestone's board to at least one establishment in that industry constraining him in the market. Two establishments in separate sectors can be connected by having a single firm's board own them both. A second form of access could be provided by direct interlocking. Two establishments, owned by separate firms, can be connected by a direct interlock between the two firms. In Figure 1, for example, Firestone is interlocked with Western Airlines. Since the latter owns an establishment in the transportation/warehousing sector, the executive in Firestone's primary metals establishment has a connection through Firestone's board and Western's board to at least one establishment in that sector constraining him in the market. Moreover, he has a connection indirectly via Cleveland Trust to two more establishments in that sector, one owned by American Airlines and another owned by Pan American Airlines. This illustrates a third type of interestablishment connection through the corporate board. Two establishments,

owned by separate firms, can be connected by an indirect financial interlock, their respective firms both being interlocked with a bank or insurance company as a third party.⁹

In short, there is not a single type of connection between establishments through corporate boards. Multiple types of connections can occur separately. They can also occur concomitantly as multiplex connections. Ownership, direct interlocking, and indirect financial interlocking are distinguished here as very basic types of connections. However, others are possible such as indirect interlocking through a holding company or indirect ownership through a third firm owning a controlling proportion of stock in two other firms.

(3) A third problem consists of aggregating these interestablishment connections into a potentially cooptive intersector relation, w_{ij} . This problem has two parts: translating interestablishment connections into a level of potential intersector cooptation and estimating interestablishment connections involving American manufacturing industries.

There is no obvious answer to the first problem. When have the establishments in an industry coopted those in some sector as a function of the number of connections between establishments in the industry and sector? How many connections would be required for the industry to have coopted this sector? Does each establishment in the industry need to have a connection to each establishment in the sector (i.e., an industry to sector relational density of one) or is it sufficient for each to have a connection to any one establishment in

⁹ There have been arguments for viewing financial firms as intermediaries coordinating a group of firms (e.g., Patman, 1968; Zeitlin, 1974). This possibility is of special interest here since the finance sector exercises no market constraint on the manufacturing industries (as illustrated in Fig. 1), yet manufacturing establishments (as well as other types of establishments) are extensively interlocked with banks and insurance companies. One explanation for this contradiction to the view that interlocks are cooptive relations is the idea that finance firms are intermediaries coordinating the accounting and capital investment activities of multiple interdependent firms. Like the firms themselves, financial institutions can be seen as the means to cooptation rather than the object of cooptation.

the sector? Lacking guidance from theory or available research on corporate directorates, we have chosen to avoid this measurement issue by turning it around to make it more tractable. We focus on the absence of connections. We can very clearly measure the lack of a connection from each observed establishment in industry J and each observed establishment in sector I. In the absence of any connection, we know that establishments in the industry are ignoring that sector. According to the theory, this should not occur among establishments in an industry; it should not occur when the sector is a market constraint on the industry; but it should occur when the sector is not a market constraint on the industry. If there is a connection between any one establishment in the industry and any one establishment in the sector, then we shall assume the presence of some industry to sector connection without attempting to measure the level of potential cooptation it represents. This operationalization is clearly less than perfect. Potentially cooptive connections between sectors of the economy through corporate boards are reduced to binary code; w_{ji} equals present or absent. However, it corresponds to the measurement of market constraint and has the advantage of a reasonable interpretation, the absence of directorate ties clearly indicating the absence of cooptive intent if such connections are cooptive.¹⁰

This still leaves the problem of estimating interestablishment connections involving American manufacturing. Beginning with the *Fortune* listing of 500 American manufacturing firms with the highest sales in 1967, the four largest firms in each of the 20 two-digit SIC manufacturing industries have been located using the SIC listings in *Poor's Directory of Corporations, Directors and Executives*. The resulting 42 firms represent large

firms engaged in American manufacturing. Since a single firm can be the largest firm in multiple industries, there are 42 firms rather than 80 (four different firms in each two-digit industry). These 42 firms were not the largest manufacturing firms in the nation, although they are quite large. Liggett and Myers Tobacco is the smallest firm in the sample with its sales rank of 220 in the nation, yet it sold an impressive \$384,801,000 worth of product in 1967. The sample represents American manufacturing rather than large firms, per se.¹¹ Members of corporate boards in all

¹¹ Typically, firms are sampled in terms of firm size when interlocking directorates are analyzed. The pace-setting study by the National Resources Committee (Means, 1939) analyzes the 200 largest nonfinancial firms and the 50 largest financial corporations. Dooley (1969) and Allen (1974) analyze identical samples observed later (1964 and 1970 respectively). In a similar vein, Representative Patman's Subcommittee on Domestic Finance, Committee on Banking and Currency (Patman, 1968) analyzes the 500 largest industrial corporations and 200 largest nonindustrial firms in the 1966 *Fortune* listing together with 49 banks in urban centers, Mariolis (1975) analyzes the 500 largest manufacturing firms and the 247 largest nonmanufacturing firms in the 1969 *Fortune* listing, and Bearden et al. (1975) analyze the 1,131 largest firms drawn principally from the *Fortune* listings between 1963 and 1974. This sampling on a size criterion is justified using Berle and Means's (1932) finding that the top 200 nonbanking firms in 1929 controlled between 45% and 53% of the assets of all nonbanking firms. There is little need, therefore, to analyze firms beyond the largest firms if the analysis is concerned with the control of assets. Nevertheless, an innovative twist on this size criterion is given by Warner and Unwalla (1967). Defining a population of 20,989 firms listed in the 1961 *Fortune* compilation of the 750 largest American firms and the 1961 *Million Dollar Directory* from Dun and Bradstreet, a stratified random sample of 500 firms was drawn with the aid of *Moody's Industrial Manual*. The sample was stratified into eleven SIC categories and the number of sampled firms in each category approximated the proportion of total net worth of firms in the category (Warner and Unwalla, 1967:24, 124). Our concern here is less with describing interlocking among American firms than it is with testing predictions of interindustry interlocking. The sampling plan used here is similar to Warner and Unwalla's stratified random plan except that 20 two-digit SIC categories have been distinguished rather than 11 and the four largest firms in each category have been sampled rather than randomly selecting firms in each category. Since large firms are not equally distributed across manufacturing industries (large firms tending to occur in durable industries such as primary metals or fabricated metals, and in energy related industries

¹⁰ A more technical discussion predicts the number of connections from industry J to sector I using the level of market constraint the sector poses for the industry (Burt, 1980d). For all three types of connections through corporate boards, intraindustry connections increase exponentially with increasing levels of industry concentration and increase linearly with increases in the sector to industry constraint.

250 nonmanufacturing firms in the *Fortune* listing for 1967 were coded from *Poor's* and compared to the boards of the 42 manufacturing firms. Of the top 250, 110 interlocked with one or more of the 42 and have been included in the analysis. The sample of 42 firms representing manufacturing industries has been snowballed into a sample of 152 firms representative of large firms involved in American manufacturing in 1967.¹² Although small, this sample is representative of its population. An analysis of the directorates of these firms replicates past research findings discussed in our introductory remarks (see Burt, 1980b). There is extensive interlocking among the firms. Those firms most likely to be involved in interlocking are large firms controlled by diffuse interest groups. This same conclusion holds when firms or establishments are taken as the object of potentially coercive interlocking.

Bringing the above discussion together, three binary estimates have been generated for w_{ji} as a tie from establishments in industry J to those in sector I through boards of directors:¹³

- (O) There is a direct ownership tie from industry J to sector I if one or more of the 42 manufacturing firms owns an establishment in J and I (e.g., there is a tie between the primary metals and transportation equipment industries in Figure 1).¹⁴
- (D) There is a direct interlock tie from industry J to sector I if one or more of the 42 manufacturing firms owns an establishment in industry J and interlocks with any one of the other 151 firms which in turn owns an establishment in sector I (e.g., there is a tie between the primary metals industry and finance sector in Figure 1).¹⁵

pled to similarly represent nonmanufacturing sectors of the economy. Rather, they have been sampled so as to represent the extent to which the 42 manufacturing firms interlock with large corporations in nonmanufacturing sectors. Succinctly stated, the sample of 152 firms is not designed to allow a description of corporate directorates in the American economy. It is designed to make inferences about vertical integration in American manufacturing.

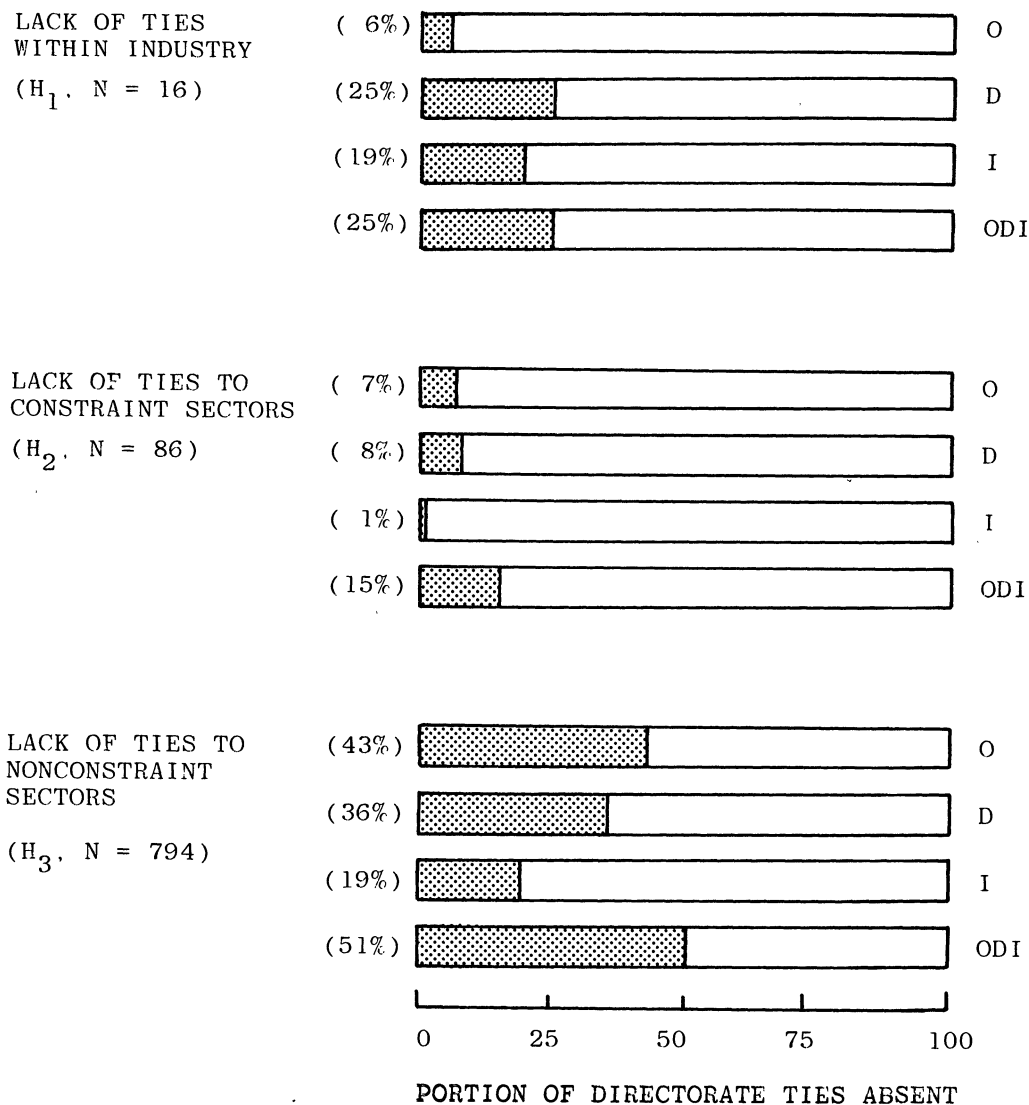
¹⁴ Using the 1967 Input-Output Study's list of SIC categories corresponding to input-output sectors (*Survey of Current Business*, 54, February, pp. 34-7), a (152,45) binary matrix, D, was constructed where element (i,j) is 0 unless firm J is listed in *Poor's* as selling goods in sector I, whereupon the element was set equal to 1. There were only 45 of the 51 possible sectors considered since no SIC categories corresponded to 6 input-output sectors, so none of the firms could be listed as owning establishments in the sectors (federal government, state/local government, gross imports, expense accounts, office supplies, and scrap). D_m is then a (42,45) binary matrix consisting of the rows of D corresponding to the 42 manufacturing firms sampled. The number of manufacturing firms that own establishments in sectors I and J is then element (i,j) of the matrix: $D_m'D_m$. By definition this means that all establishments within an industry are connected since they are each owned by a corporation. In order to avoid this circularity, the intraindustry ownership relations are based on the Federal Trade Commission's *Report on Large Mergers in Manufacturing Industries and Mining, 1948-1969*. There is a direct ownership tie within industry J if there have been large mergers of establishments in the industry. These data are analyzed as corporate mergers by Burt (1980a).

¹⁵ Using the list of directors in *Poor's*, a (152,152) binary, symmetric interlock matrix, B, was constructed in which elements b_{ij} and b_{ji} equal 0 unless a director in firm J is also a director in firm I. The number of establishments in sector I that are accessible to manufacturing firms in industry J via direct interlocking with other firms is then given as element

such as petroleum) an analysis of interlocking by large firms is weighted toward firms in specific industries. Given research demonstrating the different market constraints to which different industries are subject, and given interlocking as a potentially coercive response to market constraints, firms have been sampled so as to represent all industries rather than just those with the largest firms. This sampling allows inferences to be made concerning large firms in manufacturing from an analysis of a relatively modest number of strategically selected firms.

¹² Of the 110 nonmanufacturing firms, 32 are banks, 22 are insurance firms, 21 are transportation firms, 20 are utilities (including 2 communication firms and 4 holding companies), and 15 are merchandising firms.

¹³ More specifically, these directorate ties have been derived from two types of information coded for each firm from the 1968 *Poor's Directory of Corporations, Directors and Executives*: names of persons sitting on the boards of directors for each firm and the SIC categories in which each firm (including the firm's divisions and subsidiaries) owns an establishment. Numerical illustration of the manner in which these relations have been obtained is given in Burt (1979b). It may seem curious to code extensive data on all 152 firms and then only analyze the directorates of the 42 manufacturing firms. This has been done for reasons of inference. The 42 manufacturing firms represent manufacturing industries. The 110 nonmanufacturing firms have not been sam-



Note: O refers to ownership, D refers to direct interlocking, I refers to indirect interlocking via financial firms, ODI refers to the absence of O and/or D and/or I; e.g., the 25% for ODI under hypothesis one means that establishments in four industries are not connected by ownership and/or direct interlock and/or indirect financial interlock.

Figure 2. Directorates Ties Tend Not to Occur in the Absence of Market Constraint

(I) There is an indirect financial interlock tie from industry J to sector I if one or more of the 42 manufacturing firms owns an establishment in industry J and interlocks with a bank or insurance company which in turn

interlocks with any one of the other 151 firms which, in turn, owns an establishment in sector I (i.e., there is a tie between the primary metals industry and transportation/warehousing sector in Figure 1).¹⁶

(j,i) of the matrix: $D_m'(B_m - I_m)D$, where B_m is the (42,152) matrix consisting of the 42 rows of B corresponding to the 42 manufacturing firms sampled. I_m is a (42,152) matrix of 0's except that element (i,i) equals 1.

¹⁶ The number of manufacturing firms in industry J that interlock via financial firms with any separate firms owning an establishment in sector I is element

RESULTS

Figure 2 presents bar graphs of the distribution of these three types of purportedly cooptive directorate ties (w_{ji}) across the known market constraints (the three hypotheses). Taking market constraint relations as an example (H_2 , $x_{ji} \gg 0$), there are four graphs of the proportion of the 86 constraint relations that are not countered by any interestablishment connections through corporate boards. In six cases (7%) there is an absence of ownership ties. In seven cases (8%) there is an absence of direct interlock ties. In one case (1%) there is an absence of indirect interlock ties through financial institutions. In thirteen cases (15%) one or more of the three types of directorate ties are absent simultaneously.

Overall, the data conform to the hypotheses. The absence of directorate ties is highest between establishments in an industry and those in a sector when the sector poses no market constraint on the industry (H_3). In comparison, there is a lower tendency for any one of the three types of directorate ties to be absent among establishments within an industry (H_1) and a very low tendency for any one of them to be absent between establishments in an industry and those in a sector constraining the industry (H_2).

There are some perturbations in the data, however, that make it premature to assume that the purportedly cooptive directorate ties are in fact cooptive as predicted by the theory. For one thing, there is a higher tendency for directorate ties to be absent among establishments within an

industry than between establishments in the industry and those in a sector constraining the industry (H_1 versus H_2). This observation is complicated by differences in the extent to which directorate ties are absent between industries and non-constraint sectors (H_3). Of the 794 non-constraint relations on industry J from sector I, there are 453 instances (57%) in which establishments in J and I are connected by ownership ties versus 511 instances (64%) in which they are connected by direct interlock ties versus 647 instances (81%) in which they are connected by indirect interlock ties via financial institutions. In fact, there is an equal tendency for indirect interlock ties to be absent within an industry as well as between the industry and nonconstraint sectors (19%).

Fortunately, there is a mathematical model available for expressing the data so as to partition support for the hypotheses from differences in the extent to which each type of directorate tie is absent. For a given type of directorate tie (O, D, I or ODI), the frequency with which it is absent under hypothesis K (call this frequency f_k) can be expressed in terms of four parameters (cf. Goodman, 1970:228; 1972:1042):

$$f_k = \gamma \gamma^c \gamma_k^h \gamma_k^{ch}, \quad (2)$$

where γ is a constant similar to the overall mean in an analysis of variance, γ^c and γ_k^h , respectively, describe the marginal tendencies for that type of tie to be absent and to fall under hypothesis K, while γ_k^{ch} describes the tendency for it to be absent under hypothesis K. A parameter is greater than 1 when it describes a condition that occurs more often than an average. If the directorate tie tends to be absent more often than it is present, for example, then γ^c will be greater than 1. If fewer relations fall under hypothesis one (H_1) than fall under all three hypotheses on the average, then γ_1^h will be less than 1. More importantly, if the directorate tie tends to be absent more often under hypothesis three (H_3) than it is across all three hypotheses, then γ_3^{ch} will be greater than 1.

The three hypotheses predict interaction terms in this model. Hypothesis one says that establishments within industries

(j,i) of the matrix: $D_m'(B_m^{**})D$, where B_m^{**} is a (42,152) matrix of indirect interlocking through financial institutions. Beginning with B from the previous note, all b_{ij} are set equal to 0 if neither firm I nor firm J is a financial institution (a bank or an insurance firm). This new matrix with deleted b_{ij} , call it B^* , is then squared (B^{*2}) so as to locate two-step chains between firms through banks and insurance firms. A (152,152) matrix, B^{**} , is obtained from the squared matrix such that b_{ij}^{**} equals 0 unless element (i,j) of B^{*2} is greater than 0 and $J \neq I$, whereupon b_{ij}^{**} is set equal to 1 since it represents an indirect connection between firms I and J via one or more financial firms. The submatrix B_m^{**} is then the (42,152) matrix consisting of the 42 rows of B^{**} corresponding to the 42 firms in the manufacturing sample.

Table 1. Predicting the Absence of Directorate Ties

Parameters	Cooptive Relations			
	0	D	I	ODI
γ	32.19	39.57	26.09	43.92
γ^c	.39	.50	.29	.63
γ_1^h	.12	.18	.24	.16
γ_2^h	.68	.59	.35	.70
γ_3^h	12.21	9.61	11.82	9.04
Interaction Terms (unit normal tests of significance in parentheses)				
γ_1^{ch}	.65 (1.2)	1.15 (.7)	1.65 (1.8)*	.92 (.4)
γ_2^{ch}	.69 (1.6)*	.59 (3.2)***	.37 (2.8)**	.67 (2.9)**
γ_3^{ch}	2.20 (4.2)***	1.48 (3.3)***	1.63 (2.4)**	1.63 (4.4)***
$\chi^2(\gamma_1^{ch} = \gamma_2^{ch} = \gamma_3^{ch} = 1)$	61.23***	33.21***	25.60***	47.97***

* p < .05.
 ** p < .01.
 *** p < .001.

will be connected by cooptive relations. If directorate ties are the cooptive relations they are purported to be, than γ_1^{ch} should be less than 1; there should be few industries in which directorate ties are absent. Hypothesis two (H_2) says that establishments in an industry will create cooptive relations with establishments in sectors constraining the industry. If directorate ties are cooptive, therefore, γ_2^{ch} also should be less than 1; there should be few industries from which directorate ties to constraint sectors are absent. In contrast, hypothesis three says that establishments in an industry will ignore nonconstraint sectors so γ_3^{ch} should be greater than 1 if directorate ties are cooptive; there should be many industries from which directorate ties to nonconstraint sectors are absent.

Using the data in Figure 2, Table 1 presents estimates of the gamma parameters for the different directorate ties.¹⁷ Note that the frequency with which any type of

tie is absent under any hypothesis can be perfectly reconstructed from the parameters in Table 1. The one case in which an industry is not connected by indirect interlocking (I) to a sector constraining profits in the industry, for example, consists of a mean effect ($\hat{\gamma} = 26.09$) multiplied by a tendency for indirect interlocking to be absent ($\hat{\gamma}^c = .29$) multiplied by a tendency for relations to fall under hypothesis two ($\hat{\gamma}_2^h = .35$) multiplied by a tendency for indirect interlocking to be absent under hypothesis two ($\hat{\gamma}_2^{ch} = .37$): $1 = 26.09(.29)(.35)(.37)$. In keeping with the obvious features of Figure 2, directorate ties consistently tend to be absent less often than they are present (all $\hat{\gamma}^c$ are less than 1) and relations more often fall under hypothesis three than the other hypotheses (all $\hat{\gamma}_3^h$ are much greater than 1 while all $\hat{\gamma}_1^h$ and $\hat{\gamma}_2^h$ are less than 1).

Also presented in Table 1 are statistical tests of the interaction parameters predicted under the three hypotheses.¹⁸

¹⁷ Frequencies for each type of directorate tie can be computed directly from Figure 2. Let n_k refer to the number of relations falling under each hypothesis ($n_1 = 16$, $n_2 = 86$ and $n_3 = 794$). The f_k can then be computed from the percentages in Figure 2. For example, 6% of n_1 do not have ownership tie(s), so f_k for ownership is $.06(16)$, or 1. The number of intra-industry relations for which ownership tie(s) are present is then $n_k - f_k$, or 15. As described by Goodman (1972:1046), the effects are computed as geometric means:

$$\gamma = (\prod_k^3(n_k - f_k)f_k)^{1/6}, \gamma^c = ((\prod_k^3 f_k)^{1/3})/\gamma, \gamma_k^{ch} = f_k/(\gamma^c \gamma_k^h \gamma), \gamma_k^h = ((f_k(n_k - f_k))^{1/2})/\gamma.$$

¹⁸ Statistical interpretations of the gamma coefficients assume that each of the 896 w_{ij} is independently observed. As with much of network analysis, it is difficult here to determine the correct number of independent observations underlying second-order coefficients. The cooptive relations have been computed from 152 separate firms for which 2,903 different persons serve as directors and the firms together owned 414 of what we are treating here as establishments (a conservative estimate of what the Department of Commerce treats as establishments in con-

Completely eliminating interaction between market constraint and directorate ties (i.e., imposing the restriction that $1 = \gamma_2^{\text{ch}} = \gamma_3^{\text{ch}}$) reduces the ability of the model to recreate the observed data at well beyond the .001 level of confidence for each type of directorate tie. There is a strong interaction between market constraint and directorate ties. Looking at the individual parameters themselves, it is clear that this significant overall interaction is not a result of support for hypothesis one. Ownership ties (O) and multiplex directorate ties (ODI) have the predicted low tendency to be absent among establishments within industries; however, neither tendency is statistically significant.¹⁹ Furthermore, the direct and indirect interlock ties (D and I) tend to be absent within industries, the indirect interlock ties significantly so ($\hat{\gamma}_1^{\text{ch}} = 1.65$, with a unit normal test of 1.8 indicating that the estimate is significantly greater than 1 at beyond the .05 level of confidence). The overall interaction between market constraint and directorate ties is a result of strong support for hypotheses two and three. As predicted by hypothesis two, each type of directorate tie has a low tendency to be absent between establish-

ments in an industry and those in a sector when the sector constrains the industry (for O, D and I, $\hat{\gamma}_2^{\text{ch}}$ is significantly less than 1). As predicted by hypothesis three, each type of directorate tie tends to be absent when the sector does not constrain the industry ($\hat{\gamma}_3^{\text{ch}}$ is significantly greater than 1 for O, D and I). Beyond these tendencies for each type of directorate tie to be patterned by market constraints, Table 1 shows that the three occur together according to market constraints. If a sector constrains an industry, then all three types of directorate ties tend to exist between establishments in the industry and those in the sector ($\hat{\gamma}_3^{\text{ch}}$ for ODI is less than 1 at beyond the .01 level of confidence). In the absence of such constraint, one or more of the types of directorate ties tend to be absent ($\hat{\gamma}_3^{\text{ch}}$ for ODI is greater than 1 at well beyond the .001 level of confidence).

It is not surprising to find directorate ties coordinated as ODI multiplex ties if ties are intended to coopt sources of market constraint, multiplex relations typically being stronger than uniplex relations. But there is value in knowing the specific manner in which the three types of ties are coordinated since they constitute different levels of interorganizational control and so define different cooptive strategies when used in different combinations (see Burt, 1980b:Fig. 2, for detailed discussion). Of the relations that are not ODI multiplex in Figure 1, how many are null ties, how many represent individual ties (O, or D, or I), and how many represent coordinated pairs of directorate ties (OD, or OI, or DI)?

Table 2 presents the distribution of each observed combination of ties across the three hypotheses. Let f_{mk} be the frequency with which the m^{th} combination of directorate ties occurs under hypothesis K. For example: there are 142 cases in which establishments in an industry have no directorate ties to establishments in nonconstraint sectors ($f_{13} = 142$); there are 2 cases in which establishments within an industry are connected only by ownership ties ($f_{21} = 2$); there are 12 cases in which establishments within an industry are connected by all three types of directorate ties ($f_{81} = 12$); and so on. Just as the data in Figure 2 are expressed in terms of pa-

structing the input-output table, see fn. 5). Any one, or some mixture, of these numbers could be the correct number of independent observations. Further complicating the situation, the independence of observations is not equal across the three hypotheses since there is a more likely interdependence between w_{ji} and w_{jk} than between w_{ji} and w_{ik} , separate firms being more likely across two separate industries than within an industry. In the absence of a more appropriate treatment, we have merely assumed the w_{ji} to be independent and reported standard statistical interpretations of the gammas and their significance.

¹⁹ Estimation of the gamma parameters can be improved (in terms of increased efficiency and decreased asymptotic bias) here by adjusting the observed f_k by a constant; Goodman (1970:229) suggests an increase of 1/2. So altering the observed f_k does not affect the conclusions based on Table 1. Slight modifications in the gammas and their error variances occur, but the modifications are minimal. The most serious change is an increase in the unit normal test of $\hat{\gamma}_2^{\text{ch}}$ for indirect interlocking (1) and multiplex directorate ties (ODI) from their current values of 2.8 and 2.9 to a value of 3.0. This would make both coefficients less than 1 at beyond the .001 level of confidence rather than the .01 level presented in Table 1.

Table 2. Multiplex Directorate Ties and Market Constraints

Combinations of Directorate Ties*	Market Constraint			Total
	H ₁	H ₂	h ₃	
null	1	1	142	144
O	2	0	2	4
D	0	0	3	3
I	0	0	70	70
OD	0	0	0	0
OI	1	7	68	76
DI	0	5	121	126
ODI	12	73	388	473
Total	16	86	794	896

* Null refers to the complete absence of any ties between establishments, O refers to one or more ownership ties, D refers to one or more direct interlock ties, and I refers to one or more indirect interlock ties via financial institutions. OD, OI, DI and ODI refer to the simultaneous presence of combinations of the three types of directorate ties.

rameters in Table 1, the data in Table 2 can be expressed in terms of the following parameters:²⁰

²⁰ It might appear to be more straightforward to estimate the saturated model for the four-way table (hypothesis, O, D, I) directly here; however, such a model does not capture directorate tie multiplexity. The problem is that interactions in the model do not capture multiplexity. This is not obvious, so a quick justification is in order. Consider a three-way table cross-tabulating Ownership (no, yes), Direct interlock (no, yes), and Hypothesis (nonconstraint - H₃, constraint - H₁ and H₂). Ownership and direct interlock ties should occur as multiplex directorate ties in the presence of market constraint. The frequency with which the *i*th level of ownership and *j*th level of direct interlock occur under the *k*th level of hypothesis, f_{ijk}^{HOD} , is given in terms of eight parameters:

$$f_{ijk}^{HOD} = \gamma \gamma_k^H \gamma_j^O \gamma_{ij}^{OD} \gamma_{ij}^{HO} \gamma_{ij}^{HD} \gamma_{ij}^{HOD}$$

where the parameters in brackets capture the interaction of the two types of directorate ties with constraint. Note three points in this specification: (1) There is no parameter capturing the association between null ties (the simultaneous absence of O and D) and market constraint since this condition is absorbed into the other parameters. This means that there is no independent test for the hypothesis that directorate ties tend to be simultaneously absent in the absence of market constraint. (2) The parameter capturing an interaction between ownership and direct interlock, γ^{OD} , is not the tendency for OD multiplexity to occur—it is the tendency for ownership ties and direct interlock ties to occur together and/or to be simultaneously absent:

$$\gamma_1^{OD} = \gamma_2^{OD} = [(\prod_k (f_{k11} f_{k22} / f_{k21} f_{k12}))]^{1/8}$$

which is the fourth power of the mean odds-ratio between O and D (e.g., Goodman, 1972:1042). In other words, if ownership ties and direct interlock

$f_{mk} = \gamma \gamma_m^c \gamma_k^h \gamma_{mk}^{ch}$, (3) where γ and γ_k^h respectively describe the overall mean and the tendency for relations to occur under hypothesis K. The tendency for the *m*th combination of directorate ties to occur is described by γ_m^c and its tendency to occur under hypothesis K is described by the interaction term γ_{mk}^{ch} . Table 3 presents estimates of the γ_m^c and γ_{mk}^{ch} for Table 2.²¹ Recalling the discussion of Table 1, a coefficient greater than 1 indicates a condition that occurs more often than would be expected on the average.

Column one of Table 3 shows that the three types of directorate ties tend to occur together as multiplex directorate

ties tend to be simultaneously absent but only have a random tendency to occur together, this interaction parameter will be high. This is not what is meant by relational multiplexity (see Burt, 1980c:89-90, for review and references). A hermit has no relations with others and so at once has no social relation or economic relation to any particular other, but this does not mean that the hermit has coordinated his relations as multiplex ties to others. Rather, it means that he is an isolate. Multiplexity refers to the simultaneous presence of different types of relations from one actor to another. The simultaneous absence of relations is a wholly different concept. (3) The impropriety of γ^{OD} as a measure of multiplexity carries over to γ^{HOD} as the parameter capturing the interaction between constraint, ownership, and direct interlock. This third order interaction is the tendency for O and D to be simultaneously present or absent in the presence versus the absence of market constraint:

$$\gamma_{122}^{HOD} = \gamma_{111}^{HOD} = [(f_{111} f_{122} / f_{121} f_{112}) / (f_{211} f_{222} / f_{221} f_{212})]^{1/6}$$

which is proportional to the odds-ratio between O and D in the absence of market constraint over the odds-ratio in the presence of constraint. Again, it can be high either because O and D tend to occur together in the absence of constraint or because they tend to be simultaneously absent in the absence of constraint.

²¹ Since there are several empty cells in Table 2, parameters have been estimated from frequencies increased by 1/2. Deleting the nonexistent OD category, effects are computed in a manner only slightly more complicated than that used for Table 1. The overall mean effect is the geometric mean of frequencies in all 21 cells; $\hat{\gamma} = 5.27$. The tendency for relations to occur under hypothesis K is the geometric mean of frequencies under the hypothesis given the overall mean:

$$\gamma_k^h = [(\prod_m f_{mk})^{1/7}] / \gamma$$

so that $\hat{\gamma}_1^h = .26$, $\hat{\gamma}_2^h = .47$, and $\hat{\gamma}_3^h = 8.22$. The tendency for the *m*th combination of directorate ties to occur and its interaction with hypothesis K are then given as the following ratios of geometric means: $\gamma_m^c = [(\prod_k f_{mk})^{1/3}] / \gamma$ and $\gamma_{mk}^{ch} = f_{mk} / (\gamma_m^c \gamma_k^h)$.

Table 3. Predicting the Multiplex Directorate Ties in Table 2

Combinations of Directorate Ties	Parameters			
	γ_m^c	γ_{m1}^{ch}	γ_{m2}^{ch}	γ_{m3}^{ch}
null	1.30 (.7)	.85 (.3)	.47 (1.3)	2.53 (2.4)**
O	.28 (2.5)**	6.60 (3.0)***	.73 (.4)	.21 (2.6)**
D	.18 (2.8)**	2.02 (.7)	1.11 (.1)	.45 (1.2)
I	.49 (1.2)	.74 (.3)	.41 (1.0)	3.30 (2.0)*
OD (no observations)	—	—	—	—
OI	1.74 (1.8)*	.63 (.8)	1.74 (1.3)	.91 (.3)
DI	1.32 (.6)	.28 (1.5)	1.69 (1.0)	2.13 (1.6)*
ODI	13.47 (12.6)***	.68 (1.1)	2.21 (2.6)**	.67 (1.8)*

* $p < .05$.** $p < .01$.*** $p < .001$.

ties. Ownership ties (O), direct interlock ties (D), and indirect interlock ties via financial firms (I) tend not to occur independently ($\hat{\gamma}_2^c$, $\hat{\gamma}_3^c$ and $\hat{\gamma}_4^c$ are all less than 1). For ownership and direct interlock ties, this tendency is significant beyond the .01 level of confidence. Ties have various tendencies to occur together in pairs. While ownership and direct interlock ties (OD) never occur together, direct interlock ties occur with indirect interlock ties (DI) and ownership ties occur with indirect interlock ties (OI) more often than would be expected on average. However, only the OI multiplexity has a statistically significant tendency to occur ($p < .05$). Rather than occurring in pairs, the three types of cooptive ties tend to occur simultaneously. Far and away the strongest effect in Table 3 is the tendency for ODI multiplex directorate ties to occur (the unit normal test statistic of 12.6 is significant at well beyond the .001 level of confidence).

There is a significant overall interaction between market constraint and the different types of directorate ties. Imposing the restriction that all interaction parameters (the γ_{mk}^{ch}) be equal to 1 noticeably reduces our ability to predict the observed frequencies in Table 2. The likelihood-ratio chi-square of 70.73 with 12 degrees of freedom is significant at well beyond the .001 level of confidence.

Assessing each hypothesis individually, the second column of Table 3 offers meager support for hypothesis one. There is a significant tendency for establishments within an industry to be connected by uniplex ownership ties ($\hat{\gamma}_{22}^{ch}$ is 6.60 with a unit normal test indicating a significance at the .001 level of confidence). There are no other significant interaction effects for hypothesis one. Although establishments in 12 of the 16 industries are connected by all three types of directorate ties simultaneously (ODI multiplexity), this is not a statistically significant frequency since ODI multiplexity has such a high tendency to occur on the average across all three hypotheses.

In support of hypothesis two, all three types of directorate ties tend to occur simultaneously between establishments in an industry and those in a sector constraining the industry. Although having a high tendency to occur across all three hypotheses ($\hat{\gamma}_8^c = 13.47$), ODI multiplexity occurs under hypothesis two with an increased frequency significant at beyond the .01 level of confidence ($\hat{\gamma}_{82}^{ch}$ is 2.21 with a unit normal test of 2.6). There are no other significant interaction effects under hypothesis two; however, as a complement to the ODI multiplexity, it is unusual to find establishments in an industry unconnected by any of the three directorate ties to establishments in a sector

constraining the industry ($\hat{\gamma}_{12}^{ch}$ is .47, but this is not significantly less than 1, even at the .05 level of confidence).

In support of hypothesis three, establishments in an industry tend to have none of the three directorate ties with establishments in a sector not constraining the industry. The tendency for null directorate ties (the simultaneous absence of ownership ties and direct interlock ties as well as indirect interlock ties via financial institutions) to occur in this absence of market constraint is significant at the .01 level of confidence ($\hat{\gamma}_{13}^{ch} = 2.54$). Also as would be expected under hypothesis three, there is a significant tendency for all three directorate ties not to be present simultaneously in the absence of market constraint. The interaction effect for ODI multiplexity and the absence of market constraint is less than 1 at beyond the .05 level of confidence ($\hat{\gamma}_{83}^{ch}$ is .67 with a unit normal test of 1.8).²²

CONCLUSIONS

In conclusion, the network model of structural autonomy seems to be accurate

²² Contrary to hypothesis three, however, there is a significant tendency for indirect interlock ties via financial institutions to occur in the absence of market constraint. Both uniplex indirect interlock ties (I) and multiplex direct/indirect interlock ties (DI) occur under hypothesis three with a frequency significant at the .05 level of confidence. Unfortunately, there is no method of estimating the extent to which these deviations from hypothesis three can be attributed to the lack of control firms have over selecting each establishment they reach by this type of directorate tie. Since interestablishment connections are measured here by treating each of a firm's establishments equally, one manufacturing establishment can be connected to a vast number of establishments through a single indirect interlock. For example, the two establishments American Airlines owned in the retail/wholesale and personal services sectors in 1967 are deleted from Figure 1. Neither of these sectors poses a market constraint for any of the industries in which Firestone owned an establishment. However, the indirect interlock that connected Firestone to American's establishment in the transportation/warehousing sector (a source of constraint on Firestone's establishments) brought with it unnecessary connections to the retail/wholesale and personal services sectors. Without better data on the links between establishments and their parent firms, direct and indirect interlock ties are likely to overstate interestablishment coercive relations so that hypothesis three will be rejected spuriously. We have therefore focused on multiplex directorate ties in the text.

in predicting where directorate ties occur in the American economy as coercive relations intended to eliminate market constraints. Each of the directorate ties considered (establishments connected through corporate boards by ownership, direct interlocking, and indirect financial interlocking) tends to occur where there is market constraint and tends to be absent in the absence of constraint. Moreover, the directorate ties occur simultaneously as multiplex directorate ties. If one or more of the establishments in an industry are connected by any one of the three types of directorate ties to establishments in some other economic sector, then it is likely that establishment(s) in the industry and sector are also connected by the other two types of directorate ties. This is particularly likely when the industry is constrained by its market transactions with establishments in the sector. In the absence of such market constraint, all three types of directorate ties tend to be simultaneously absent between establishments in the industry and sector.

These results suggest that the study of intraindustry cooptation through directorate ties should be treated as a special case apart from interindustry cooptation. Despite the strong support for intraindustry cooptation using merger data (Burt, 1980a), support using directorate ties is weak. There is a marked tendency for establishments within an industry not to be connected by interlock ties, direct or indirect. One plausible reason for this is federal regulation of the market. When establishments within an industry merge, or in some other manner create an ownership tie between them by coming under the jurisdiction of a single directorate, then they no longer exist as independent competitors within the industry. The creation of an interlock tie, in contrast, involves a connection between separate competitive firms operating in the industry, a connection easily visible to persons outside both firms and clearly a violation of antitrust legislation intended to prevent collusion between competitors (cf. Dooley, 1969:319). In short, coercive relations that eliminate the corporate sovereignty of competing establishments

within an industry are more likely to conform to hypotheses regarding intraindustry market constraint than are cooptive relations (such as interlock ties) which create institutionalized communication channels between separate corporations.

Returning to cooptation more generally, our results on directorate ties make even more apparent the need for an understanding of how, as opposed to why, cooptation can operate through directorate ties. We have focused on binary code, the absence versus presence, of directorate ties since we have no method of measuring the intensity of cooptation represented by an absolute number of such ties. How does the number and nature of directorate ties between establishments in two sectors translate into cooptation? There is no easy answer here since the importance of a potentially cooptive directorate tie is contingent on the individual constituting the tie. When an owner or senior officer in one firm sits on the board of another firm, the two firms could be considered to be more closely tied than would be the case if a consulting lawyer for both firms sat on their respective boards. The distribution of persons a firm uses to interface with its corporate environment has been studied. Indeed, "boundary" personnel are an important feature of Evan's (1965; 1972) discussion of the organization-set connecting a firm with its corporate environment (e.g., Hirsch, 1972, provides an application to some firms in the communication, broadcasting and amusement sectors). Questions on the roles of directors and officers as connections between establishments remain. For example, how are types of persons used to connect types of sectors?²³ Are directors randomly assigned to

interlock with manufacturing firms versus financial firms versus other types of non-manufacturing firms? If not, how does the systematic assignment of types of persons to types of directorate ties vary by the intensity of market constraint they are intended to coopt? If establishments in an industry are highly constrained by their market transactions with establishments in a specific sector, one might expect them to use their senior officers to represent them on the corporate boards of firms owning establishments in the problematic sector. This raises the issue of asymmetry in directorate ties. We have considered directorate ties only in their traditionally symmetric form. If firm J is interlocked with firm I, then firm I is interlocked with firm J. However, market constraint can be asymmetric. Establishments in industry J can be constrained by those in industry I without also constituting one of the market constraints faced by industry I (x_{ji} need not equal x_{ij} in Equation 1). It is quite possible that our findings are the result of exploitation rather than cooptation. Given the multiplex directorate tie w_{ji} superimposed on a market constraint x_{ji} , have establishments in industry J attempted to coopt the constraint they face from sector I or have establishments in sector I exploited their market constraint on industry J? An answer to this question requires more detailed information on how the people providing the directorate tie function within the respective establishments.

Perhaps more important than an under-

were more likely to be involved than single position directors in the governance of nonprofit private organizations, in advising governmental agencies, and in participating in business policy associations. Still, the process by which directors might influence establishments and the "career" of being a successful director are only vaguely documented.

²⁴ This shortcoming is not invisible to the general public. In a recent compilation of top stockholders in each of 122 large American corporations (Metcalf, 1978), New York's Morgan Guaranty Trust was the number one stockholder in 27 corporations. A staff writer for *Time* (Vol. 111, no. 5, p. 50) seemed to agree with the bank's response: "Morgan Guaranty was quick to respond. Said a spokesman: 'Where are the examples of abuse?' Indeed, the study seemed to shed a lot more light on the extent of stock-power concentration than on its effects, good or ill."

²³ Allen (1977) presents some results relevant to this question by describing some attributes of persons holding four or more positions as director in 250 large firms in 1935 versus 1970. These elite directors tended to be affiliated with financial institutions or manufacturing firms, tended not to come from the upper class (about 20% were upper class), and evidenced careers as managers rather than entrepreneurs or inheritors. Systematically comparing directors sitting on four or more directorates with those sitting on fewer, Useem (1979) shows that those directors holding multiple positions in 1969

standing of how cooptation might operate through directorate ties (although difficult to address without such an understanding) is a knowledge of the consequences of cooptively successful directorate ties. Systematic empirical research on corporate cooptation (that is to say, research generalizing beyond case studies of cooptive efforts by more than a handful of firms) has consisted of describing the extent to which potentially cooptive directorate ties occur among large firms. We reviewed examples in our introductory comments. Such description falls somewhat short of providing a theoretical understanding of the etiology or consequences of corporate cooptation.²⁴ Moving beyond a description of the distribution of directorate ties in the American economy, we have shown that such ties are patterned by market constraints and so appear to be cooptive relations. This is only half the battle. The immediate question raised by our results is whether or not such patterning is capable of eliminating market constraints. Merely having a multiplex directorate tie superimposed on a market constraint is not equivalent to eliminating the constraint. In fact, if every market constraint has superimposed on it a multiplex directorate tie coopting it, a whole new class of unanticipated constraints in a social market arises. In order to give establishments in one or more industries an unfair market advantage, directorate ties must be used with unequal effectiveness in coopting market constraints across industries. In the same manner that the existence of an oligopoly within an industry allows high profits in the industry, effective elimination of the market constraints faced by the industry allows high profits in the industry. But in a preliminary analysis of the effectiveness of merger ties, Burt (1980a) found establishments in each two-digit SIC industry to be connected to almost every sector constraining the industry. Our results extend these findings to the more general case of ODI multiplex directorate ties. In other words, strategic cooptation of market constraints could be a necessary precursor to corporate survival rather than an opportunity for increasing profits. If this is the case, then the original im-

petus for researching cooptive uses of directorates as a menace to the free market is lost. Rather, the widespread use of directorate ties to coopt market constraints could have created a dual market, an economic market consisting of sales and purchase transactions and a social market consisting of formal and informal interorganizational cooptive relations. We know directorate ties are patterned by market constraints. Needed here is research on the profits obtained by such patterning.

We seem to be raising more questions than our results have answered, but anyone who has spent time reading through directorate memberships or spent time talking with directors themselves, knows that there is no single explanation for each director sitting where he does.²⁵ Some persons are directors because of connections to a firm's owners or because they participate in the day-to-day management of the firm. Others are directors because they are influential with other firms or because they have influence in a firm's community. Still others are directors because of the expertise they bring to the firm. The many reasons for holding a position as director make it difficult for social scientists to interpret, with any generality, potentially cooptive uses of the directorate. Each use seems to have its own ideographic explanation. Such difficulty notwithstanding, it seems clear, judging from the evidence that we have seen, that there is a pattern to directorate ties, a pattern predictable from the network of market constraints in which directorates operate.

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²⁵ Domhoff (1967:51-2) distinguishes nine types of directors, excluding those recruited from the upper class, that he observed in a sample of 50 large American corporations in 1963; senior corporate officers, technical experts relevant to the firm's operations, college presidents, former military men, corporate lawyers, foundation executives, local businessmen, members of a "Jewish upper class," and foreign nationals.

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