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CHAPTER 4

**BUSINESS GROUPS AS
NETWORKS**

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4.1 INTRODUCTION

IN a definition most scholarship on the topic has come to accept, Granovetter (2005: 95) defined business groups as a set of legally independent firms linked to one another in “formal and/or informal” ways. This is a broad definition of a business group as an interfirm network. A casual perusal of the scholarly literature on business groups reveals much attention to network properties and processes. In our view, however, most business-group scholars have yet to engage in a rigorous way with the concept of network and to exploit in their research the considerable power of network models and methods. This chapter explores how business groups can be viewed as networks; whether and how some groups are more “network-like” than others; and how formal network concepts and analytic methods may facilitate the study of a number of salient problems in business-group research.¹

There is general consensus among business-group researchers that the literature suffers from a lack of close attention to problems of group internal structure. This was

¹ This chapter deals with network-type business groups as described in Chapter 1, and further suggests the network characteristics of a hierarchical variety of business groups including diversified business groups. We acknowledge that our use of the term “network” in multiple senses may at points confuse readers. First, we contend that all (or nearly all) business groups are “networks” (in the broadest structuralist sense of interlinked nodes). Then we suggest that some groups are “pyramidal” and others “horizontal” (network-like) in the narrower morphological sense of whether chains of ties flow vertically or laterally. Finally, we refer to an even smaller subset of business groups that display to some degree the idealized “network form” defined not just in morphological terms but also in functional and performance terms. We regret the potential for confusion here, but the application of the term “network” to a variety of overlapping yet distinct organizational phenomena did not originate with us (on this point, see also Podolny and Page, 1998).

the shared view of the participants at a panel session on business groups organized by the editors and senior author at the 2009 Strategic Management Society in Washington, DC. The typical quantitative empirical study in this literature treats a firm's affiliation with a group as an "all or nothing" dichotomy. The unstated and perhaps unintended assumption is that affiliates are all alike in the degree to which they participate in, identify with, and are controlled by the group. Some research on business groups, the pyramidal sort in particular, does give close attention to the relative positioning of firms within chains of ownership and control relations (see Bertrand et al., 2002; Belenzon and Berkovitz, 2010). Yet often the end result of such nuanced measurement is a simple binary coding of whether the firm is in a pyramid or not (Chittoor, Kale, and Puranam, 2015).

Much of the value of the network lens when applied to the study of business groups is that it forces the analyst to unpack the coarse dichotomy of "group" and "stand-alone" into its constituent relations, equivalences, and complementarities. Network analysis enables the identification and measurement of structural properties of networks shown by research in a variety of settings to shape those networks' operation and performance. Several of these are germane to the study of business groups and appear in various guises in the research literature but rarely with the analytic rigor and theoretic clarity provided by the network lens.

The broad multidisciplinary literature on business groups commonly alludes to and analyzes the network characteristics of groups of a wide variety of kinds. Yet it also often draws a distinction between "hierarchical" groups—centrally coordinated, pyramidally shaped, and sharply bounded—and "network" groups—decentralized, horizontally linked, and porously bounded. This is a meaningful and useful dichotomy both in how it factually divides the world of business groups and in its implications for theory and research regarding them. We devote a major section of this chapter early on to exploring it. But we will also attempt to demonstrate that network groups differ from pyramidal groups more in degree than in kind. *All* business groups and many stand-alone firms as well are in fact structured as networks and can fruitfully be analyzed as such (Podolny and Page, 1998). Some—the Korean chaebol, say—are indeed more centralized and vertically coordinated than others, such as the Japanese keiretsu or Taiwanese *qiye jituan* (Hamilton and Biggart, 1988; Chang, 2003). But these differences are best understood as variations along a set of continuous structural dimensions, not apples-and-oranges differences that thwart thoughtful comparison. We will also suggest that the outward appearance of hierarchy and centralization frequently conceals a more flexible underlying reality.

The chapter is laid out as follows. We first review a variety of corporate phenomena from integrated, divisionalized corporations to clusters of strategic alliances that might or might not be viewed as groups. We then consider how attention to such formal network analytic properties as density, connectivity, centrality, and clustering may facilitate business-group research. We finally examine the concept of a "network form," an ideal type that considerable popular and scholarly writing views as a leading-edge mode of business organizing in the global economy.

4.2 IMAGES OF BUSINESS GROUPS: VERTICAL AND HORIZONTAL NETWORKS

Definitions of business groups often explicitly refer to them as “clusters” of interconnected firms (Granovetter, 2005; Khanna and Yafeh, 2005; Morck, 2010; Jones, this volume). The implication is that interfirm ties within the group do not differ in kind from the ties that surround it. Both inside and outside groups of resource exchange, ownership, governance, kinship, information flow, etc., exist. “Groups” are simply patterns in which firms are linked to one another through ties that are denser, closer, stronger, more multiplex, more direct, and more similar than is true of the network as a whole. Thus, the boundaries of groups are not hard and clear but are rather vague, permeable, and transitory. Khanna and Rivkin (2006) describe groups metaphorically as “icebergs” in a sea of economic relations. Lincoln and Gerlach (2004: ch. 3) similarly characterize the generally amorphous Japanese keiretsu as “gravitational fields” in which some firms are situated at the core of the field (e.g., Mitsubishi Corporation) while others hover around the periphery (Honda in relation to the Mitsubishi Group).

Thus, there are zones within a business group’s gravitational field such that it is difficult to say with certainty whether any given firm is “in” the group or “out.” Colli and Vasta in this volume creatively measure the boundaries of Italian business groups in such a zonal fashion. Unlike most studies that use ownership as the lead criterion of group affiliation, they “take interlocking directorates as proxy of the existence of a formal link between two companies” (18). They apply a kind of confidence interval to gauging the assignment of firms to groups. The upper bound of the interval—unambiguous assignment—is the placement of a high-level executive of firm A on the board of firm B. The lower bound—weak assignment—is satisfied by the less stringent criterion of any kind of interlock between the two firms’ boards (e.g., a direct but lower-level interlock; an indirect interlock wherein a third party sits on both boards).

4.2.1 Vertical (Pyramidal) and Horizontal (“Network-Type”) Groups

The principal distinction in taxonomies of business groups turns on the structure of their underlying networks. On the one hand, there are centralized, vertically structured groups, often referred to as “pyramids.” On the other, there are decentralized, horizontally linked groups, often referred to as “network-type” or sometimes “alliance” groups. We discuss each in turn.

4.2.1.1 *Pyramidal Groups*

Pyramidal groups are defined by the asymmetric chains of equity ties that convey control indirectly but expansively from an apex holding company or founding family to firms at the base or periphery of the pyramid. The constituent companies are independent legal entities in that they have their own charters, issue their own stock, and maintain their own boards, but are nonetheless largely if not wholly controlled by one or more entities higher in the pyramid. Such centralized control is assumed more than demonstrated. Alternatively, such control may be manifested in the decisions on which shareholders are entitled to vote, but it may not pass through to the day-to-day business decisions made by operating managers of the affiliate firms.

Much of the research on pyramidal groups in the finance literature views them negatively, as devices for entrenching family owners and consolidating their control over the numerous enterprises in which their equity stakes—“cash-flow rights”—are small. The evidence from econometric studies appears substantial that pyramidal groups expropriate minority shareholders, clandestinely channeling wealth away from firms low in the pyramid to the apex firm or family. Some recent research, however, challenges the finding that tunneling is what pyramidal groups are all about. Siegel and Choudhury (2013) replicate the much-cited Bertrand et al. (2002) study of tunneling in Indian business groups with improved data and a more rigorous statistical methodology and fail to find evidence of tunneling. Siegel and Choudhury in fact find that Indian-ownership pyramidal groups outperform stand-alone firms, succeeding because, they believe, of the groups’ “recombinant capabilities”: the capacity to mix, match, and synergize a set of industrially diverse firms linked to one another through the groups’ internal networks.

Other studies suggest that the literature on pyramids and tunneling has the causality backward. Almeida et al. (2010) and Bunkanwanicha et al. (2014) find in studies of the Korean chaebol and Thai banks that financial stress and low market valuation may be the cause, not the consequence, of such firms’ positioning within the network of equity ties. Groups place such firms in peripheral positions in the pyramid in order to minimize spillover risks to other affiliates.

4.2.1.2 *Horizontal Groups*

The other principal kind of group, horizontal or network-type, has no one firm or holding company or founding family in a clear apex or controlling position in a network of ownership and control relations. As opposed to the vertical, inverted “tree” structure of downward branching equity ties distinctive of pyramidal groups, dispersed, horizontal, and reciprocal cross-shareholdings and interlocking directorates distinguish the horizontal groups.

As the editors of this volume suggest, the Japanese keiretsu is perhaps the best known and most studied example of a horizontal network group. The keiretsu are also the kind of group on which we have done the most research and about which we are

most knowledgeable (Lincoln and Gerlach, 2004). Many of our examples in the following pages thus draw on our familiarity with the keiretsu.

Horizontal groups are sometimes termed “alliance” groups (Gerlach, 1992). The implication is that the affiliated firms enjoy more managerial autonomy than in a vertical group, and the coordination and strategic orientation of the group are collectively determined through a network process of aggregating members’ strategic choices and operational decisions. Yet horizontal groups are not, strictly speaking, strategic alliances, which are voluntary partnerships of two or more firms aimed at the pursuit of mutual strategic aims. First, most business groups—as highly diversified conglomerate-type entities—do not have the focused and publicly stated goals that distinguish a strategic alliance.

Secondly, unlike a strategic alliance, which we later discuss in greater depth, firms in horizontal groups mostly do not freely elect to affiliate with or participate in the group. Their entry often results from historically and situationally based events of an unanticipated and adventitious sort. Toyota Group members Denso and Toyota Motor Sales, for example, began life as divisions of Toyota Motor Corporation. They were spun off at the behest of TMC’s banks in the late 1940s following the automaker’s brush with bankruptcy. Fellow affiliate Daihatsu, by contrast, transitioned from stand-alone firm to Toyota keiretsu member when the smaller automaker fell upon financial distress in the 1960s and was bailed out by TMC with an equity stake and other resource transfers. Daihatsu’s integration in and subsequent domination by the Toyota Group was not on the whole welcomed by the smaller firm (Ahmadjian and Lincoln, 2001).

Members of a horizontal group need not enjoy complete or even substantial autonomy. The cross-shareholdings typical of such groups are sufficiently small that no one firm is likely to have a controlling stake in any other. But the group as a whole may readily accumulate such control through its aggregate ownership of every individual member firm. Reported instances of the horizontal keiretsu forcing changes on troubled or errant affiliates are not uncommon (see the discussion of the “Mitsukoshi” incident in Gerlach, 1992).

4.2.1.3 *Non-family Groups: Bank- and Trading-Company-Centered*

What determines whether some business groups are configured as decentralized, horizontally linked networks while others take the pyramidal form? Idiosyncratic factors such as culture, institutional setting, and historical circumstance play enormous roles. The rebuilding of the Japanese political economy under US occupation oversight had much to do with the elimination of pyramidal groups from that country and their replacement by the flexible webs of intercorporate relations known as keiretsu (Lincoln and Shimotani, 2010). Another likely factor in the network structuring of the keiretsu was the relative unimportance in comparison to other Asian countries of kinship ties in Japanese business networks (Mehrotra et al., 2013).

Indeed, perhaps the single most important explanatory factor in whether a group takes on the pyramidal or network morphology is the level of founding family ownership and control. In network terms, the question is whether two specific corporate

ties—kinship and ownership—suffice to configure the network, or whether the network is more “multiplex” such that relations of diverse content get equal weight. Multiplex networks exhibit intersecting and overlapping channels of communication and control and thus reduced verticality and centralized control. Multiplexity also implies that the ties that configure the network shift with the industry, location, period, and other contextual circumstances. Thus, which actors occupy the center and how long they remain there are apt to be more variable and contingent than in a group built around fewer ties.

Groups at whose peak or core resides, not a family of owners, entrepreneurial firms, or holding company, but a professionally managed legal entity are more likely to cohere as webs of varied and distinct interfirm relations and thus be flexibly coordinated as networks. As several chapters in this volume testify, business groups centered on trading companies and banks often display such network characteristics. Geoffrey Jones’s historical treatment of the British case in this volume observes that groups formed around trading companies such as Swire had two rings of affiliated firms. The inner ring comprised the wholly owned divisions and subsidiaries of the trading company. The outer ring subsumed “a cluster of partly owned firms linked not only by equity, but also debt, management, cross directorships, and trading relationships.” Such a two-tier network form is evidenced as well in the post-millennium vertical keiretsu clusters that persist in Japan today. With one exception—Denso—the Toyota Group’s inner circle (Aisin Seiki, Kanto, Toyota Motor Sales, Daihatsu, Hino, etc.) is composed of majority-owned subsidiaries of Toyota Motor Corporation. But the affiliates below this elite tier connect to one another loosely through the types of ties identified by Jones (Ahmadjian and Lincoln, 2001). Similar centripetal-centrifugal tendencies have in recent years transformed other Japanese vertical groups as well, notably Panasonic (Guillot and Lincoln, 2005).

Powerful banks have combined lending, shareholding, and director interlocks to position themselves at the nexus of constellations of industrial firms. Like other bank-centered groups, such clusters exhibit network-like attributes. Regarding the German economy, Schröter in this volume writes: “Not even Marxist historians claimed that banks formed an (unitary) *entity* with their client firms. [They] spoke of ‘families’ but not of enterprise.” He acknowledges, however, that some banks did exert top-down control over their client enterprises. He further observes that in the last twenty years the rationale behind German bank shareholdings shifted away from network control and coordination to pure financial investment. Thus, as presently constituted, the German bank-centered networks bear little resemblance to the usual understanding of a business group.

Larsson and Petersson’s chapter describes the Swedish Handelsbanken group in similar multiplex network terms as “held together by an intrinsic system of cross-wise ownership in combination with strong personal networks and pensions funds, primarily consisting of professional top managers.” Their account of the family-centered Wallenberg group, by contrast, fits the portrait of a centrally controlled pyramidal group.

4.2.2 Groups as “Social Constructions”

Whether hierarchical or horizontal in structuring, the business groups discussed so far conform to the usual “network” definition of a cluster of firms bound by formal and informal ties. However, groups may be defined and identified by other criteria as well. Khanna and Rivkin (2006) suggest that many groups are “social constructions,” such that their interfirm ties matter less for cohesion and coordination than their shared history, values, legitimacy, and reputation in the eyes of external audiences. Khanna and Rivkin also suggest that the naming of groups and the listing of their members in archival databases reflect those socially constructed identities:

As products of social construction, groups probably cannot be reduced to specific types of ties between firms, such as equity holdings, family bonds, or director interlocks. Nonetheless, interfirm ties play a role in the process of social construction, and...field observers of groups have consistently identified groups with particular types of ties.

Thus, business groups may both be “taken for granted” socially and culturally constructed categories as well as clusters of interfirm ties. Depending on the period and the circumstances, however, the two principles of organizational identity may diverge or converge.

Clearly, business groups are defined and supported by the shared identities and cultures that their affiliates take on. Cultures are apt to be particularly strong and established in large, old, and highly institutionalized groups such as Mitsubishi, Samsung, Tata, and Wallenberg. Much of the cohesion of the Tata Group, for example, derives from the values of social responsibility and philanthropy that are institutionalized in the charter of Tata Trust, the holding company in which affiliate shareholding is concentrated (Chittoor, Narain, Vyas, and Tolia, 2013). As Khanna and Rivkin (2006) suggest, such group cultures may transcend and outlive the concrete ties among member firms. Japan’s horizontal keiretsu have in large measure unraveled as network clusters since the asset bubble burst in 1992 (Lincoln and Gerlach, 2004), but their identities persist as cultural categories maintained by brands, logos, and reputation. This is especially true of the Mitsubishi group and, to a lesser degree, the Sumitomo group, historically the most cohesive of the “big six” horizontal keiretsu (Gerlach, 1992).

Conversely, cross-shareholdings, main bank relations, co-location, employee and resource transfers, etc., may persist even when identifiable “groups” as nominal or cultural categories are not in evidence. As *The Economist* (2015) wrote of Prime Minister Abe’s recent efforts to reform the still deeply ingrained network rigidities of the Japanese economy:

Japan’s corporate-governance revolution has had many false dawns... Only 274 of some 40,000 directorships are held by foreigners. A mesh of shareholdings still binds big firms together. Japan’s business lobby group, Keidanren, fought to dilute the new reforms. The banks still keep weak companies afloat: the fact that not one of Japan’s listed firms went bankrupt last year, for the first time since 1991, reflects not just a zippier economy, but also lenders’ clubby ties to borrowers... Hobbesian, Japan is not.

Thus, cross-cutting keiretsu-type horizontal ties remain institutional fixtures of the Japanese economy, despite reforms in disclosure and governance and the general disintegration of the bounded groups themselves.

Whether groups are viewed as network clusters or social constructions has implications for how they can be studied. In the first view, the usual methodology is an inquiry that gathers data on interfirm ties and infers groups from a network analysis of those ties; how indirect versus direct they are; how symmetric and reciprocated versus asymmetric; how dense, connected, and clustered are the surrounding network environments.

In the second view, the researcher needs a measure of group affiliation that has cultural and institutional meaning distinct from the tie data (trade, debt, etc.) that trace interfirm relations. Archival, often officially designated, designations of groups are widely relied upon in business-group studies. It is not clear, however, that they have independent criterion validity. The designations of group names and affiliate lists provided by an official or other formally prepared directory may be merely impressionistic filterings of information on equity and director ties, name, trade and lending patterns, family connections, and the like. Still, some such nominal classifications may satisfy the criterion of independent cultural validity. Khanna and Rivkin claim this to be true of the official Chilean group affiliate lists they utilize in a 2006 study. They suggest that the records of that country's business groups since its financial crisis in the 1980s have been carefully compiled and accurately represent the groups' standing as Chilean socioeconomic/cultural categories.

4.3 THE STRUCTURAL (NETWORK) ANALYSIS OF GROUPS

We now consider in a somewhat more formalistic fashion the relevance of network analysis for the study of business groups. Specifically, we discuss a number of network properties at varying levels of aggregation—node or actor positioning, dyadic and triadic ties, subnetwork clusters, and whole networks. We then examine various measures and models of these properties that are part of the standard repertoire of network analysis along with examples of business-group research that have productively utilized them.

Merely because a network property appears and is measurable at a given level of aggregation does not mean that its causes and effects can be assumed fixed at that network level. Macrostructures such as “groups” may emerge from processes operating at lower levels, such as nodes and dyads. Those structures, that is, are derivative of the network positioning and bilateral relations of the individual firms (Asanuma, 1985; Khanna and Rivkin, 2006). The multilevel configuring of networks demands that their study be guided by a rule of parsimony. If micro-level relational processes suffice to

explain the aggregate patterns, there may in fact be little need, as Khanna and Rivkin (2006) suggest, for the concept of “group.”

4.3.1 Node-Level Properties

We reduce to the concept of “centrality” several nodal properties pertaining to the positioning of individual actors within networks. Much network research examines the causes and consequences of a single actor’s positioning in the network. A variety of concepts and measures describe that positioning, but all deal with the extent to which the actor can access through chains of relations other nodes and network segments.

An application in the business-group literature is an important recent paper by Almeida et al. (2010), who used a centrality measure to index the total direct and indirect control (voting rights) through equity ties accruing to an affiliate firm. Their measure was designed for the Korean chaebol and other groups wherein horizontal cross-shareholding supplements vertical chains (La Porta et al., 1999). They find central firms to be less profitable and valuable than firms higher in the pyramid but less central in the network overall. Chang (cited in Granovetter, 2005) finds a similar tendency for affiliates on the periphery of the chaebol to enjoy higher profitability. Such a pattern accords with network research outside the business group context that reveals central actors generally having less autonomy and power than actors with fewer but more diverse and expansive ties (Cook, Emerson, and Gillmore, 1983; Burt, 1992).

In keeping with this reasoning, some conceptualizations and measures of centrality focus less on the number of ties into and out of an actor—too many such ties being seen as constraining—and rather on the extent to which actors are positioned so as to mediate or broker relations among others (Bonacich, 1987; Burt, 1992). This was the approach of Vedres and Stark’s (2010) study of business groups in Hungary, which focused on “structural folds” in the network: the overlaps of clusters. “Actors at the structural fold,” they write, “are multiple insiders, facilitating familiar access to diverse resources.” Vedres and Stark found stronger financial performance among Hungarian firms occupying such overlap positions.

4.3.2 Dyad-Level Properties

The irreducible, elementary particle of any network is the “tie,” a relation represented graphically by a line connecting a *dyad*— a pair of actors (or nodes). The larger network is then analyzable as aggregations and clusterings of dyadic ties.

4.3.2.1 *Direct/Indirect*

A direct tie means that an observable formal or informal link exists between a pair of actors. One firm is a major shareholder in the other, for example, or has placed a

director on the other's board. A direct kinship tie exists if the CEO's or other executives of the two firms are from the same family (Luo and Chung, 2005). Direct transactional ties exist if one firm sells to or lends to another.

A distinctive feature of networks, however, is the many *indirect* paths or channels through which actors connect to one another. Resources, information, and control flow from firm A to firm B, say, through chains of dyadically linked intermediaries. The length of the shortest such chain measures the network "distance" or, conversely, the proximity between the pair (Knoke and Kuklinski, 1982).

A common and useful network analytic strategy is to represent proximities spatially so that directly linked actors are adjacent in network space, and actors indirectly linked through longer chains are proportionally more distant.

The question of direct versus indirect linkage of the affiliate firms has received close attention in the business-group literature. Clusters of firms may derive their cohesion and coherence from indirect linkage. Lincoln, Gerlach, and Takahashi (1992) analyzed indirect and direct equity and board interlock ties among large Japanese groups in the 1990s. The empirical evidence for groups in their data varied with whether the connection analyzed was purely direct (A owns 10 percent of B) or indirect as well (A owns B, which in turn owns C). The boundaries of groups were not discernible in the analysis of direct trade relations but they emerged clearly when indirect links were allowed.

Colli and Vasta perform a network analysis of a similar sort for their chapter in this volume. They provide two pictorial mappings of the "network neighborhood" of the Italian automaker Fiat. One utilizes direct board interlock links; a second considers interlock paths of length two (one intermediary). As expected, the Fiat network is revealed as much more crowded in the latter case.

4.3.2.2 *Multiplexity*

A second dyad-level property with implications for business group research is *multiplexity*, the number of distinct contents bundled into a relationship. As discussed above, the formal and informal ties that join firms in groups are highly varied. How ties of diverse content combine or unravel across economic and institutional environments has been a core theme of business-group research. Luo and Chung (2005), for example, find for Taiwan that, during the turbulent transition from a highly regulated and centrally controlled economy to a market-based and open one, the linkage of executives by kinship and other similar "particularistic" ties played a heightened role in the performance of the firms.

Multiplexity is an aspect of tie "strength" (Granovetter, 1973), and groups built on networks of multiplex ties can be presumed more cohesive and durable than groups grounded in single-content ties. Thus, multiplexity may offset deficits in network cohesion of other sorts. A sparsely linked network is more cohesive, for example, to the extent that its constituent ties are multiplex. An illustration from the keiretsu case is appropos: as compared to the chaebol and other closely linked hierarchical groups, the network densities of the Japanese groups were low. (This was in part due to legal rules.

Banks were forbidden until 1997 to hold shares larger than 5 percent in industrial clients.) But the ties among the affiliate firms were multiplex: overlaying cross-shareholdings were director and other personnel transfers, presidents' council and supplier association affiliations, co-location (e.g., Mitsubishi firms headquartered in the Marunouchi district of Tokyo), and shared corporate culture and identity. Lincoln and Gerlach's (2004: ch. 3) blockmodeling of the Japanese large-firm network from 1980 to 1998 exploits this multiplexity in extracting clusters based on eight distinct ties: the $i \rightarrow j$ and $j \rightarrow i$ sides of trade, lending, equity, and board connections. Groups inferred from data on multiplex ties, they reasoned, have a firmer basis in reality than clusters derived from single-stranded ties.

4.3.2.3 *Symmetry and Reciprocity*

Related to whether ties are direct or indirect is whether they are symmetric or reciprocated. This, too, is an important relational property that features importantly in network-analytic business-group research. "Pyramids" are defined by the unidirectional chains of equity ties that convey control indirectly but exhaustively from an apex holding company or founding family to firms positioned at the base or periphery of the network. By contrast, network-type groups such as the horizontal keiretsu are distinguished by high rates of direct reciprocal cross-shareholding.

Japan's vertical manufacturing keiretsu have pyramidal structures of this sort. An apex firm (e.g., Toyota, Hitachi) takes equity stakes in and dispatches directors and technicians to second-tier firms, which link similarly to third-tier firms, and so on down the vertically ordered chain. In the horizontal keiretsu, by contrast, lateral cross-shareholding was the prevailing pattern. The South Korean chaebol exemplify a third pattern. Direct reciprocity of equity ties is illegal, but indirect reciprocity, built into circular ownership chains, is conspicuously present (Chang and Hong, 2000; Almeida et al., 2010).

Among the reasons for the asymmetric sequencing of ties observed in many business groups is that the affiliate firms are arrayed along a supply chain sequenced by value-added stage in a production process. In such a chain, the entire network of asymmetric ownership and control ties functions as a governance structure superimposed upon an economic division of labor. Asanuma (1985: 2) offered such a transaction cost explanation for the keiretsu as a counterpoint to the then-common view that the Japanese groups were legacy institutions devoid of contemporary economic functionality:

Whereas the conventional view has tended to regard keiretsu... as remnants of feudalist relations or derivatives of the cultural peculiarities of the Japanese, the most important explanatory variable should be the kind and nature of the transaction of goods or services conducted beneath each of these relations.

Khanna and Rivkin (2006: 8) argue similarly that groups arise endogenously from attempts by firms to monitor and regulate exchange relations through governance structures. They write: "The bonds put in place to forestall opportunistic behavior may lead to confederations of firms that outsiders then perceive as groups." Their reasoning

supports our point that network structures at the macro-level (“groups”) are often rooted in micro-level (e.g., dyadic) network processes.

That the ownership and control ties key to the structuring of business groups might be efficient solutions to the failures of markets clearly represents a very different portrait of the business group phenomenon from the negative one of groups as devices for “tunneling,” entrenchment, and expropriation (Siegel and Choudhury, 2013).

4.3.3 Properties of Whole Networks and Subnetworks

4.3.3.1 *Density*

Network density is the ratio of direct ties in the network to potential ties (the number of dyads). It is the most commonly used measure of network cohesion. A maximally dense network is one in which direct ties interconnect all nodes. Business groups vary widely in the densities of their interfirm networks: the horizontal keiretsu have been low on this structural dimension, for example, while the chaebol and Indian family-based groups are high.

Mahmood and his colleagues have made some important attempts to measure with precision the network properties of Asian business groups. In one paper on Taiwanese business groups they model the association of affiliate firm innovativeness with the densities of several interfirm ties: shareholdings, director interlocks, and buyer-supplier trade (Mahmood, Chung, and Mitchell, 2013). They find no significant effects of the equity and director densities, but that of within-group buyer-supplier links proved a significant predictor at a decelerating rate of the patenting productivity of affiliate firms. They interpret the density of buyer-supplier links as a proxy for “combinatorial opportunity.” Their results in general align with other work that finds positive but ultimately diminishing returns to network embeddedness: at some threshold level the returns to cohesion are exhausted as constraint and rigidity set in (Uzzi, 1996; Luo and Chung, 2005).

4.3.3.2 *Connectivity*

Connectivity is the ratio of direct and *indirect* ties to the number of dyads, the number of potential ties. A maximally dense network (= 1.0) is a maximally connected one, but full connectivity is also compatible with low levels of density.

The concept of a pyramidal group rests on an assumption of vertically ordered connectivity. The group is fully connected vertically through chains of ownership and control ties emanating from an apex firm, family, or holding company. Pyramidal groups differ from horizontally networked groups in that lateral and reciprocal ties are minimized (Belzon and Berkovitz, 2010). The usual approach to the measurement of pyramidal structures combines three distinct network properties: (1) the ratio of connectivity to density in the equity network; (2) the asymmetry or verticality of equity ties; and (3) the magnitude of the ties—specifically, the extent to which they exceed the

10-percent threshold commonly assumed to confer voting rights control. A potentially more informative analytical approach, we suggest, is to unpack the pyramid dummy by entering these three component structural variables and their interactions in regressions predicting performance outcomes such as sales growth, profitability, and Tobin's Q. The analyst could then ascertain what precisely it is about the pyramid—its verticality, connectivity, asymmetry, or magnitude of pairwise linkage—that conditions such performance outcomes.

4.3.3.3 *Centralization*

The counterpart to centrality at the node or actor level is centralization at the level of the network as a whole: the extent to which ties issue from one or few central actors and how direct and indirect they are. A long stream of research on groups and organizations finds centralized networks to be more efficient but also more rigid and decentralized ones more flexible and conducive to innovation (Burns and Stalker, 1961). These results, however, are contingent, varying strongly with the environment, goals, capabilities of the actors, and other moderating variables. Centralized networks are in general better performers in stable and homogeneous environments, whereas decentralized networks are better adapted to volatile and heterogeneous environments.

Another recent study by Mahmood and colleagues (2013) uses a measure of centralization in the ownership network to predict profitability (return on assets) in a sample of Taiwanese business groups. The authors also include as regressors the densities of equity and directorate ties, a measure of family ownership, and a dummy variable for whether the group exhibits the pyramidal form. Of these only the centralization variable related significantly to return on assets, its coefficient being positive. Centralization also interacted positively with the group's industrial diversification (suggestive of a greater coordination burden) and negatively with a dummy for the post-2008 global financial shock (indicative of a turbulent economic environment).

4.3.3.4 *Clustering and Boundaries*

A distinctive structural feature of many networks is "lumpiness." Ties and connections are not spread evenly over nodes but are instead *clustered*, concentrated in some regions of the network and absent or sparse in others. At the extreme of clustering, the network is fragmented into separate subnetworks or "islands," each tight-knit in density, connectivity, and multiplexity terms. As noted earlier, networks that are highly clustered but well connected via inter-cluster links display the informationally efficient "small world" structure (Watts, 1999).

Mani and Moody (2014) report a blockmodel clustering of ownership ties in the Indian corporate network in 2001 and 2005. They analyze 44,528 pairings of Indian firms and domestic shareholders, the latter comprising firms as well as individual shareholders. Their unit of analysis, however, is the interfirm dyad, which may thus be connected either directly by a firm-to-firm equity tie or indirectly, as when two firms have a third-party shareholder in common. Their cluster analysis empirically revealed a

distinct three-level tiering of the network, each tier of which was organized around a different network principle. They describe it as comprising:

... a disconnected periphery that conforms to the disconnected networks implied by classical transactional models; a semiperiphery characterized by small, dense clusters with sporadic links, similar to that predicted in “small world” models; and finally a nested core composed of deeply reconnected clusters that echoes the unequal involvement insights of the scale-free literature.

Assigned to the “nested core” of their mapping of the network were the large Indian groups such as Tata. Positioned at the periphery as often isolated dyads and triads were small, regionally based groups.

4.3.3.5 *Clustering Criteria: Cohesion versus Structural Equivalence*

An alternative lens on how groups correspond to network clusters views them as positions or “blocks” whose member firms are “structurally equivalent.” Actors are structurally equivalent to the extent that they are similarly positioned in networks; i.e., their direct and indirect ties to others are the same. A pair of nodes may be structurally equivalent yet not directly tied, although indirect ties are necessarily implied. In the business-group literature, firms’ ties to third-party actors such as the state, founding families, and foreign investors reveal groups as positions in structural equivalence terms (e.g., Siegel, 2007).

Japan’s horizontal keiretsu derived their definition less from internal cohesion than from structural equivalence clustering. The interrelations among industrial firms were mostly sparse and weak compared to the dense and strong equity and director ties flowing to them from such financials as banks, brokerages, and insurance companies. Lincoln and Gerlach’s (2004: ch. 3) clustering of large Japanese firms in the 1980s by the structural equivalence of their trade, lending, director, and equity ties accurately reproduced the horizontal and vertical keiretsu socially constructed categories—the names and affiliate lists supplied by institutional archives.

4.3.4 **Capturing Group Evolution: Dynamic Clustering**

An oft-noted limitation of network analysis is its static portrayal of structure. Networks are rendered as snapshots rather than motion pictures of an unfolding process. Clearly, the speed and trajectory of such dynamic processes matter for a full understanding of the business group form.

An example of business-group evolution is that of Japan’s keiretsu networks over the decades following the bubble’s burst, such that they are of mostly historical interest today. Lincoln and Gerlach (2004: ch. 3) address the “withering away” hypothesis with a series of blockmodel-type cluster analyses from 1978 to 1998 of the trade, lending, board, and equity ties among large Japanese financials and industrials. They observed clear declines across this period in the cohesion and definition of empirically derived clusters corresponding to the “socially constructed” groups.

A cluster analysis of business groups that takes the modeling of the dynamics of cohesion and dissolution farther is Vedres and Stark's (2010) interesting work on Hungarian business groups. Using longitudinal data, they study "lineages of cohesion" to detect how groups "reproduce[e] and exchange members across generations and maintain their coherence through interwoven lineages." They further ask how entrepreneurial effort and success by affiliate firms feed back to diminish or enhance the cohesion of the group. Their inquiry evokes Schumpeter's "creative destruction" theory. Some affiliate firms pursue innovations that deviate from the mainstream strategies of the group and in so doing undermine its long-term cohesion and viability.

Dynamic network analyses of the Vedres and Stark sort enable a researcher to grapple with the "groupness" in a set of interfirm relations with a temporal depth that cross-sectional snapshots cannot provide. The authors' thoughtful framing bears repeating here:

The conventional graph snapshot of network analysis does not distinguish robust and stable collectivities from transitory alignments; it only enables the distinction between denser or sparser network regions. . . . Once we think of groups as histories of cohesion, however, . . . [w]e can recognize groups despite temporary losses in density. In fact, we often find that the strategic separation between groups within larger units is only recognizable through historical analysis.

Network measures and models such as those discussed above have considerable power for the network analysis of business groups. Yet it is not always easy to tell from the network data and analysis alone whether a group is vertical or horizontal or within the groups which firms are in controlling positions and which are not. An example is La Porta, Lopez-de-Silanes, and Shleifer's (1999) demonstration using the Toyota Group of their methodology for mapping firms' vertical positions within a pyramidal group. By their coding rule, Mitsui financial institutions "controlled" Toyota Motor Corporation as they collectively held greater than 10 percent of Toyota's stock. That portrait is quite at odds with the common knowledge and evidence at the time that the Mitsui, Sanwa, and Tokai banks were more dependent on and under the control of TMC than the other way around. Sakura Bank (Mitsui) was in fact forced into a de facto acquisition by Sumitomo Bank in 2001 when TMC under then president Hiroshi Okuda spurned the bank's pleas for a financial rescue (Ahmadjian and Lincoln, 2001; Lincoln and Gerlach, 2004). The example makes clear that "control" in the narrow corporate governance sense of voting rights bestowed by ownership is not the same as general strategic and financial dependence in an interorganizational network (Pfeffer and Salancik, 1978).

4.4 BUSINESS GROUPS AS NETWORK FORMS

We shift now to a more focused discussion of business groups as network forms. By "network form" we mean a mode of organization that is more distinctive in structure

and performance aspects than “network” or “network-type” as we and others use those terms to describe horizontally linked groups. The concept of network form is much discussed in organization theory and in the business press as well (Kanter, 1989; Powell, 1990; Perrow, 1992; Byrne, 1993; Ancona et al., 1996; Podolny and Page, 1998). It is portrayed as an effective mode of governing and orchestrating transactions that stands in contrast to the “market” and “hierarchy” dichotomy famously articulated by Oliver Williamson (1975). In his later work, Williamson (1999) himself embraced the general concept (“relational contracting”) as a governance hybrid able to avert not only market failures but bureaucratic diseconomies as well. Network-form theorists such as Powell (1990), however, resist the suggestion that the network form is subsumed by the “hybrid” governance idea of late-stage transaction-cost economics. Neither markets nor hierarchies display network properties, such theorists argue, so no mere composite of the two can be said to constitute a network form.

Powell (1990) describes the network form as follows:

Horizontal patterns of exchange, interdependent flows of resources, and reciprocal lines of communication. . . . Transactions occur neither through discrete [i.e., market based] exchanges nor by administrative fiat but through networks of [agents] engaged in reciprocal, preferential, mutually supportive actions . . . Complementarity and accommodation are the corner stones of successful production networks. The entangling strings of reputation, friendship, interdependence, and altruism become integral parts of the relationship.

The network form as here defined is held to be an evolutionary advance in economic organization, superseding the sharply bounded, vertically integrated “command and control” hierarchies of the economic past. In network-form theory, such clusters of legally and often managerially independent companies are quite different from the family-controlled, regionally specific, emerging economy institutions to which business-group research has given so much empirical attention. Nor can they be dismissed as cultural/historical anomalies or legacy holdovers from an “adolescent” phase of economic development as Katz (1998) has claimed in regard to Japan. Business groups exhibiting the “network form” are, on the contrary, theorized as positioned at the forefront of economic evolution (Dore, 1983; Piore and Sabel, 1984; Perrow, 1992).

Much business in the modern global economy is organized in network forms. Today’s ideally adapted global corporation is claimed to be a lean, specialized, and nimble player that satisfies its resource needs through flexible partnering with external providers, not by absorbing them into its administrative hierarchy as wholly owned divisions. Apple Computer and its supplier and other allied companies constitute a frequently cited case in point (Varian, 2007). Other global firms, notably Fiat and Corning Glass, operate more as coordinating nodes in strategic alliance clusters than as stand-alone firms (Nanda and Bartlett, 1990; Mitchell and Hohl, 2008). Even such large, diverse, and globally distributed corporations as IBM and Unilever have been portrayed as network forms, the autonomy and flexibility of their divisions

approximating those of stand-alone firms (Ghoshal and Bartlett, 1990; Palmisano, 2006) and their interdivisional and functional coordination resting more on flexible intergroup and interpersonal networking than formal rules and executive fiat.

4.4.1 What Kinds of Business Groups Display the “Network Form”?

Our concern is with business groups, so the foremost question for us is: How prevalent among them is the “network form” defined in Powell’s terms as a horizontally linked and flexibly coordinated cluster of interacting companies? An extreme view is that the “network form” is the dominant mode of business-group structuring. As webs of specialized, often small-to-medium scale, and separate but interdependent enterprises groups represent a functional alternative to the diversified and divisionalized but centrally controlled and coordinated “M-form” corporation (Colpan and Hikino, 2010; Lincoln and Shimotani, 2010). The reality, however, is that while all or most business groups are indeed networks in the structural sense of interlinked firms, many groups are as hierarchically configured and centrally controlled as any stand-alone corporation. Even among groups described as “network- or alliance-like,” as we have done in the preceding pages, many do not meet the organization and performance criteria of the “network form.” Thus, while some groups display the connectivity, symmetry, flexibility, synergy, and creativity that Powell and others ascribe to the ideal-type “network form,” most other groups, whether pyramidal or otherwise in their outward morphology, clearly do not. In the following sections we consider several kinds of business groupings that appear to embody the “network form.”

Many real-world business groups are conspicuous, not for their flexibly lateral coordination, but rather for their (often family-based) control. Yet we would also suggest that a surface appearance of pyramidal structuring and apex control may sometimes mask an underlying reality that is more subtle, flexible, and dynamic. A case in point is the Tata Group, whose interfirm network is explored in a detailed Indian School of Business case (Chittoor et al., 2013). Over the course of a restructuring spearheaded in the 1990s by incoming chief executive Ratan Tata, the Tata Group shifted from a loose horizontal keiretsu-like structure of sprawling cross-shareholdings and board interlocks to a less symmetric, vertical form in which most horizontal equity relations were eliminated. Under the new structure, most equity ties to member companies flowed downward from the group’s two holding companies, Tata Sons and Tata Industries, the latter majority-owned by the former.

The new structure corresponds closely to the pyramidal form, but, as in the treatment of the Toyota case by La Porta et al., the appearance is deceiving. The reorganized Tata Group was, in fact, a fluidly coordinated “network form,” a configuration that substantially improved alignment of strategies and operations across its many affiliated firms. The holding company coordinated the group through a

combination of carrot (e.g., discounted HR, strategic, and legal services) and stick inducements (e.g., denial of use of the Tata name). Strong identity and reputation in India and a shared culture centered on social responsibility helped as well. But affiliate firms retained autonomy and could and did resist pressure from the holding companies to do the bidding of the group. A recent *Financial Times* article underscores the networking style of management exercised by the leadership of the group (Hill, 2011).

Thanks to Ratan Tata's untangling of internal fiefs over the past 20 years, the Tata empire is doing well. The structure is still idiosyncratic. Tata's chairman exercises moral suasion, mainly through minority stakes, over 100 Tata companies, run by professional managers and independent boards. . . . As Ajay Bhalla of Cass Business School puts it, ". . . he has to be a good steward, rather than a hands-on manager, and stewardship is implemented through connection with various stakeholders."

The lesson to be drawn from these examples is that relative power in a business group is not reducible to the magnitude, connectivity, and sequencing of equity ties, useful as these relational dimensions are to an analysis of the structure of the group. The formalism of the network paradigm has its limitations. In reducing a range of distinct and complex social and economic structures to the common denominators of points and lines, the researcher can bring to bear on the analysis of those structures the leverage of a common conceptual framework and a rich set of methodological tools. The dilemma, however, is that formal network structures, however intriguing the patterns they display, may not be interpretable without a road map drawn from deep and nuanced contextual and institutional knowledge.

In the following sections (4.4.2–4.4.4), we discuss what we believe to be some distinctive examples of "network form" business groups.

4.4.2 The Industrial District as a Network-Form Business Group

There is wide agreement that vibrant industrial districts and technology clusters, of which Silicon Valley is the most celebrated example, instantiate the network form. In Piore and Sabel's (1984) influential theory of regional economic development, such systems of "flexible specialization" represent a "second industrial divide," one sharply distinct from the First Industrial Revolution that ushered in "Fordist" mass production and the large integrated, hierarchically coordinated corporation. Beyond Silicon Valley (Saxenian, 1996), Germany (Herrigel, 1994), Italy (Perrow, 1992), and Japan (Dore, 1983) afford famous examples of localized business clusterings whose network properties render them flexible, entrepreneurial, and dynamic but also conducive to economies of scale and scope.

Saxenian's (1996) comparison of the American high-tech districts of California's Silicon Valley and Massachusetts' Route 128 provides a colorful narrative of how the former enclave outperformed and outlasted the latter. Silicon Valley's configuring as a

dynamic cluster of adjacent and connected but managerially autonomous producers, capital, and service providers, as well as universities and think tanks, infused the region with more diverse information flows, faster competitive response, and more innovative product and process development than the self-sufficient and inwardly focused Route 128 corporations (DEC, CDC, Data General) could achieve.

Schröter's chapter on Germany and Colli and Vasta's chapter on Italy in this volume further discuss how the enclaves of small- and medium-sized firms in southern Germany and northern Italy contributed much to the regional and national competitiveness of those countries.

4.4.3 The Keiretsu as a Network-Form Business Group

Japan's postwar horizontal and vertical keiretsu are often identified as loosely knit network groupings subject to little top-down control. Postwar Japan as a whole has in fact been portrayed in scholarly and journalistic writing as network-based. Not only the economy, but Japanese politics and civil society as well appear configured by thick networks of strong ties unguided by any "visible hand" of state or corporate or ruling-class control (Van Wolferen, 1990). In Lockwood's (1968: 503) memorable phrase, Japan is a "web with no spider." Relationships abound and networks layer upon networks, but no one hegemonic actor pulls the strings. An interesting if hard-to-test hypothesis, then, is that the loose interfirm linkage that distinguishes the keiretsu from business groups elsewhere both mirrors and derives from the network makeup of Japan as a whole.

A difficulty with this hypothesis is that the zaibatsu—the large, diversified business groups that dominated the modern Japanese economy until the end of World War II—were as centrally managed and imperatively coordinated as the family-led Korean chaebol of today (Hamilton and Biggart, 1988; Gerlach, 1992; Morck and Nakamura, 1999; Lincoln and Shimotani, 2010). The postwar transformation of the tight-knit zaibatsu into loose-knit keiretsu was an unintended consequence of American occupation efforts, first to democratize and decentralize Japan, and then, as Cold War tensions escalated, to unify and fortify it as a bulwark against communist expansion (Lincoln and Shimotani, 2010). The holding companies coordinating the groups were outlawed, the lead firms were broken up, controlling families lost their stakes, and top executive ranks were purged. Like business groups everywhere, then, the emergence of the keiretsu was grounded in some very specific historical and institutional circumstances (Guillén, 2000).

At the peak of Japanese economic prowess—the mid-1980s to early 1990s—admiring observers imputed many of the ostensible virtues of the network form to the horizontal and vertical keiretsu groupings. The horizontal group firms' stable equity and director interlocks were explained as efficient solutions to the classic corporate governance problem of how to monitor top management when shareholders are small, numerous,

and dispersed (Thurow, 1993). The standout production efficiency, product quality, and development speed exhibited by Japanese automakers and their affiliated suppliers were cited as evidence for the organizational superiority of the vertical keiretsu mode of supply chain structuring over the time-honored American system of arms-length and adversarial supplier relations (Womack, Jones, and Roos, 1990).

Toyota is particularly famous among Japanese automakers for the organization of its suppliers into flexible networks able to take quick and decisive action in a bottom-up coordinated way (Dyer and Hatch, 2004). The Toyota keiretsu's network capabilities have been prominently displayed in times of crisis. In the late 1980s a fire on February 1, 1997, at a factory in Aichi Prefecture operated by Toyota Group affiliate Aisin Seiki, halted production of a critical brake component, the p-valve, which brought most Toyota domestic production to a standstill (Nishiguchi and Beaudet, 1998). Yet within days the Toyota keiretsu firms had revamped supply chains, shifted p-valve production to other plants, and through similar collaborative efforts restored output to normal levels. As Nishiguchi and Beaudet (1998: 49) conclude, much of this activity took place without the direct supervision of Toyota Motor itself:

The Toyota model . . . involves more than a set of long-term relationships between a firm and a few select suppliers. As the Toyota group's collaborative response to the destruction of a key supplier's plant suggests, the relationships among the suppliers are equally important. More generally, a complex mix of institutions permits self-organization during crisis with little need for a leader's direct control.

A similar spurt of seemingly spontaneous yet finely tuned, coordinated action by Japanese supplier networks in response to a disaster transpired in the wake of the Tohoku region earthquake and tsunami in 2012 (Olcutt and Oliver, 2014). Key plants of several manufacturers in the region were shuttered. Horizontally orchestrated action by a diverse array of firms—some keiretsu partners, others direct competitors—restored production in a short period of time.

In our view, the close cooperation shown by keiretsu groupings in time of crisis and uncertainty dramatically illustrates the self-organizing capabilities attributed to the network form.

4.4.4 Strategic Alliance as a Network Form of Business Group

Strategic alliances appear to epitomize the network form. They are distinctive for their voluntarism—the freedom of the partners to enter and exit at will—but also for their putative cultures of sharing, mutual commitment, and support. These attributes are what theorists of the network form find progressive and attractive in the alliance idea. Collaboration and sharing replace the “fiat” and surveillance that mark divisional relations within the administrative hierarchy of a unitary firm. Strategic alliances also

reduce the haggling and opportunism that mar the operation of arms-length markets. This is not to say that strategic alliances are devoid of opportunism. Alliances between competitors, for example, are prone to failure for this reason.

Strategic alliances are generally specialized affairs. They have well-defined and usually explicitly stated goals: joint R & D, consolidated production, coordinated marketing and distribution, and so on. Firms join in them because they believe that they lack the resources, skills, or connections to pursue such aims on their own.

Many strategic alliances are little more than public announcements by two or more firms that they will work together on common goals. The extent to which the firms are bound to one another through the kinds of links that build cohesion in business groups—equity ownership, director interlocks, family connections, resource and personnel transfers, and administrative bodies—is variable. Some highly formalized strategic alliances—joint ventures—lock the partners in through legal rules and common ownership and governance. Others are structured by written contracts and reciprocal equity stakes. Alliance teams and alliance managers are additional devices for coordination. Many alliances, however, get by with none of these.

Thus, the ideal strategic alliance is one rationally and deliberately entered into by two or more firms that have conscientiously scanned the partner prospect pool and made a careful choice based on the assessed capabilities of the other and the potential for synergy. Yet the evidence is abundant that firms tend to choose alliance partners with whom they have preexisting direct or indirect ties (Gulati, 1998). Such ties include prior alliances, interlocking boards, co-location, family and school connections, and so on. These foster trust and reduce uncertainty (Keister, 1998), although they also reduce the size and diversity of the partner pool and thus the choice set for synergistic matching (Beckman, Haunschild, and Philips, 2004).

The majority of strategic alliances are dyadic—a partnership between a single pair of firms. Given this dyadic nature, the strategic alliance is perhaps best regarded as a type of tie, not in itself a cluster or group. Strategic alliances often function as a flexible governance structure that overlays a set of bilateral transactions (Williamson, 1999). They are thus akin to cross-shareholdings, director interlocks, friendship and kinship bonds, and other “relational contracting” ties.

These, of course, are the kinds of ties that engender cohesion and coordination within a business group, and certainly strategic alliances are prevalent among firms within groups. Co-affiliation is the kind of prior tie that strategic alliances need in order to launch and operate from a platform of trust and compatibility. Strategic alliances in the Japanese electronics industry, for example, were mostly done within, not across, the boundaries of the horizontal and vertical keiretsu groups until the turbulent post-bubble 1990s. Thereafter, R & D alliances in the industry were about as common outside as inside the keiretsu. Within-group alliances for other purposes, however—many aimed at consolidation and cost reduction—surged in numbers often at the behest of group lead firms (Lincoln and Choi, 2010; Lincoln, Guillot, and Sargent, 2017).

Strategic alliances are also a vehicle whereby whole business groups conduct transactions or pursue cooperative ventures with one another. A large-scale multilateral

undertaking of this sort was the series of alliances that Japan's Mitsubishi Group pursued with Germany's Daimler companies in the 1980s (Lincoln and Gerlach, 2004).

Strategic alliance activity is prevalent in high-tech industrial districts, among firms whose production processes are intertwined in a supply chain, and among affiliates of an established business group. The prevalence of alliance ties is much of what distinguishes such clusters as "network forms." Apple Computer, a relatively lean corporation that for many years did none of its own manufacturing, is regularly portrayed as a leading-edge practitioner of alliance-style supply-chain management (Kanter, 1994; Varian, 2007).

Similarly, high-tech enclaves such as Silicon Valley and Cambridge, UK, display high rates of alliance activity. The proximity of the firms to one another and to supportive institutions such as venture capitalists, business service providers, and universities render alliances easy to form and to operate. Moreover, the participating firms in many cases are spin-offs of one another or of university research programs.

What kinds of strategic alliance clusters exist, and can they reasonably be characterized as business groups? Most such clusters revolve around a central node and in that respect appear closer in form to vertical or pyramidal than horizontal network groups. Often that node is a firm that is particularly active in alliance formation. Companies such as Cisco, Corning, and Fiat are well-known central nodes in large and active alliance clusters.

Several recent papers use the kinds of analysis reviewed above to detect clusters in strategic alliance network data. As in Rosenkopf and Padula's (2008) longitudinal CONCOR analysis of alliance ties in the mobile communications industry, the resulting clusters are mostly composed of individual firms and their pairwise partnerships. Bridging links do, however, appear across clusters such that the industry network as a whole displays "small world" properties, which are conducive to knowledge-sharing and open innovation (Fleming and Waguespack, 2007). But the kind of dense, decentralized, and lateral networking implied in the concept of "network form" is not evident in these studies.

Japanese supplier associations—or *kyoryoku-kai*—represent another kind of multi-firm yet centralized alliance in which an "apex" firm orchestrates the network. The most effective ones, such as Toyota's *kyoho-kai* or Panasonic's *kyoei-kai*, cultivate horizontal and indirect ties among suppliers. These are useful in mutual learning and problem-solving activities (Dyer and Hatch, 2004; Guillot and Lincoln, 2005).

A similarly centralized cluster distinctive to Japan is the R & D consortia organized by MITI, Japan's then Ministry of International Trade and Industry, which were prevalent in the 1980s and early 90s. Branstetter and Sakakibara (2002) conclude that, without MITI's pressure to participate, few Japanese firms would have done so. On the US side, the semiconductor R & D consortium, SEMATECH, is similarly a multi-member alliance of manufacturers set up and supported by the US government until 1996, when the federal funding was withdrawn.

Our general view is that strategic alliances as such have many of the organizational qualities attributed to the "network form." They are voluntary pacts that firms choose

to enter or withdraw from; they are in general governed by flexible, lateral, and reciprocal ties; and they are cooperative and synergistic. They are capable then, as Powell, Williamson, and others suggest, of overcoming both the failures of arms-length market contracting and those of bureaucratic control. That said, we would not characterize strategic alliance clusters as “network-form” business groups. Such clusters are generally made up of networks that are centralized and vertical, not decentralized and horizontal. Strategic alliance is better thought of as a critically important inter-firm *tie* that facilitates cooperation, learning, and synergistic innovation in such network-form business groupings as the Japanese keiretsu, industrial districts such as Silicon Valley, and well-articulated global supply chains.

4.5 CONCLUSIONS

The pervasive global economic form known as “business groups” continues to draw close attention from researchers, journalists, and policymakers. A weakness of this otherwise rich and interesting literature, in our view, is that it fails to address with clarity and precision the internal organization or structuring of groups. In general, research has focused instead on strategic and financial outcomes such as the diversification, competitiveness, and performance of the affiliate firms and how the group allocates capital and other resources among them. The internal organization of the group—the configurations of ties and flows among its constituent firms—is clearly implicated in these concerns but in and of itself has received less close and systematic scrutiny. We propose that business groups are fruitfully conceived as interorganizational networks, and we have attempted to demonstrate the utility of the concepts, logic, and methods of network analysis for making sense of the internal structuring of groups. We are not the first to apply a network lens to the problem of group organization, but we believe that our effort here is broader in scope and perhaps more foundational in its treatment than is true of prior such efforts. We strongly recommend to other scholars that they leverage in their studies of business groups the richness and rigor of the network paradigm.