DEFINING THE SOCIAL CAPITAL OF THE BOARD OF DIRECTORS: AN EXPLORATORY STUDY

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ABSTRACT

This paper advances the resource dependence and social networks literature by investigating a board’s structural social capital created as a consequence of interlocking directorates. Using approaches and measures developed by social network analysis we compare the interpersonal directorship networks of the top 250 companies in the United States and Australia. We find that the smaller, sparser Australian network is only marginally less compact and connected than the larger US network at the firm level of analysis. However, at the director level of analysis the US network is much larger and more connected than its Australian counterpart. As a result, we argue that scholars studying the resource dependence role of boards should consider using measures of interpersonal links as well as traditional measures of inter-firm links.

Understanding how boards impact on corporate performance is a question central to the corporate governance research agenda. Agency theory, for example, argues that the key way a board adds value is by ensuring the interests of the managers of the firm are aligned with the interests of the owners (Eisenhardt 1989; Jensen & Meckling 1976). A quite distinct area of inquiry, however, relates to the role that the board plays in providing access to important resources such as customers (Penning 1980), capital (Mizruchi & Sterns 1988), the business elite (Useem 1984) and power in general (Pfeffer & Salancik 1978).

We aim to broaden understanding of the resource dependence theory of corporate governance by examining the links provided to a board by interlocking directorships. We commence by reviewing existing research on the resource dependence role of the board before outlining how the emerging construct of social capital can be adapted and applied to investigate this role. In particular, we highlight how it is the personal director network that is critical to the development of social capital rather than the corporate network (i.e. network of corporations).

While this study is primarily exploratory and descriptive, we contribute to the literature by employing a new methodology to measure the ‘opportunity network’ that interlocking directorates provide a board within a national corporate governance system (Adams 2002a; 2002b; 2002c). We show how the formal models, procedures and techniques developed in social network analysis can be applied to individual-level networks among directors. We stress that we are not considering the formation of social capital at the individual level; rather we are examining the systemic connections of individual directors in order to illustrate the opportunity network available to a board within the national corporate governance system.
comparision of the Australian and US systems highlights the divergence in network attributes between corporate networks and the networks of interlocking directors. We conclude with implications and areas for further research.

Boards and Resource Dependence Theory

Resource dependence theory posits a firm’s success will be contingent on its ability to gain access and control over external resources (Aldrich 1979; Aldrich & Pfeffer 1976). Proponents argue that control of the external environment is a key determinant of firm performance (Katz & Kahn 1978; Hillman, Cannella & Paetzold 2000) and so firms seek to control market conditions (such as competition, social forces and regulation) or access critical resources (Boyd 1990; Pfeffer & Salancik 1978). This idea has been extensively investigated in a variety of contexts including differing organisation types, (Zald 1967; Provan 1980; Pfeffer & Nowak 1976; Boyd 1990) and difficult methods of cooption, (Pfeffer 1972a; Burt 1980a; Pfeffer & Nowak 1976; Pfeffer & Leblebici 1973; Galaskiewicz 1979).

Director Interlocks: Definitions and Correlates

Interlocking directors have been long-acknowledged as one method of controlling the external environment and accessing resources (Means 1939). Director interlocks occur between two organisations where a director on a focus firm sits on the board of a different firm (Boyd 1990). Thus, identification of interlocks is straightforward and the method used is common to nearly all studies in the area (Zajac 1988). As Burt (1980b, p. 564-565) sets out, ‘... a connection between two separate firms can still provide more of an “inside” connection between their establishments than would be the case on the open market’. In summary, interlocking boards are generally considered to be ‘vehicles for coopting important external organizations’ (Pfeffer & Salancik 1978, p. 167).

Since interlocks are hypothesised to control the external environment they would most likely depend on certain external contingencies. Interlocks appear particularly relevant to firms facing three conditions: (1) uncertainty and interdependence, (2) organisational complexity, and (3) dispersed ownership. Uncertainty due to competition has been correlated with frequency of interlock (Pfeffer & Salancik 1978), the proportion of outside directors is positively related to level of environmental demand (Pfeffer 1972b) and there is further evidence that, as uncertainty increases, the composition of the board will change as measured by number of directors or proportion of external directors (Gales & Kesner 1994; Hillman, Cannella & Paetzold 2000; Pennings 1980).

Most studies of the complexity-interlock relationship generally use a proxy of firm size as the measure of complexity. This is a reflection of the ubiquitous relationship between firm size and the number of interlocks (e.g. Allen 1974; Burt 1980b; Dooley 1969, p. 316; Pfeffer 1972b; Warner & Unwalla 1967) that is thought to be brought about by the need for more directors to legitimate and coordinate the firm in its external activities (Allen 1974; Pfeffer 1972b). Burt (1980b, p. 578) concluded in his study of manufacturing firms, that as the company grows, it seeks to establish links with other manufacturing firms (i.e. similar organisations) in order to ‘eliminate competition with a firm’s own establishments’.

Finally, dispersion of ownership is correlated with increased interlocking. This is generally considered to be an attempt by the organisation to engage external constituents through interlocks. Thus, percentage of executive directors (used as proxy for concentration of management control) is negatively correlated with interlocks (Dooley 1969; Pfeffer 1972b) and family-controlled companies are negatively correlated with interlocks (Allen 1976; Burt 1980b). Additionally, management controlled and family owned firms have decreased network range and multiplicity (Burt 1980b).

Board Interlocks and Firm Performance

Resource dependence theory requires the researcher to differentiate between mere correlations of interlocks and the effects of interlocks on firm performance. The first major study of boards as a cooptation device was carried out by Selznick (1949), who noted the Tennessee Valley
Authority (TVA) sought to neutralise strong opposition by bringing representatives of the hostile groups onto the TVA's governing board. Similarly, Price (1963) and Zald (1967) also documented the use of boards as a cooptative device.

Recently, scholars have examined direct links between various measures of firm performance and interlocking behaviour. Boyd (1990) found that, in firms facing greater environmental uncertainty, those with more interlocks (and smaller boards) exhibited superior performance as measured by sales growth and return on equity. Similarly, there is evidence of a negative relationship between firm profitability and the probability of replacing broken ties in five years time (Richardson 1987).

Boards are thought to use their links to add value in three ways: First, they can act as a cooptive mechanism to extract resources (Zahra & Pearce, 1989) and obtain support from external stakeholders critical to the organization's performance. Second, board members serve as boundary spanners (Zahra & Pearce 1989) providing channels for communication information with the external environment (Pfeffer & Salancik 1978). Third, boards are thought to play an important role in enhancing organisational legitimacy (Pfeffer & Salancik 1978; Zahra & Pearce 1989).

While a director's ties will be important to all these activities, it is likely that personal bonds will be more important in some cases than others. For instance, effective resolution of many resource dependency issues require formal company linkages (such as providing access to capital, reducing transaction costs between companies, addressing firm level interdependencies). In other cases, however, individual directors may provide advantage to the firm on a personal level (e.g. environment scanning, provision of information or access to communication channels).

In terms of formal company linkages, many studies have concentrated on providing access to capital (e.g. Mizruchi & Stearns 1994; Stearns & Mizruchi 1993; Thompson & McEwen 1958). Overall, there appears to be a positive relationship between interlocks and firm solvency and performance (see Dooley 1969; Pfeffer 1971b; Penning 1980: Stockman, Ziegian & Scott 1985; Mizruchi & Stearns 1988).

As boundary spanners, directors can increase coordination across firms and reduce transaction costs (Williamson 1984). For instance, interlocking directors can form a formal firm link aimed at reducing the costs of coordination and resource planning (Bazerman & Schoorman 1983). Boundary spanning can also play a role on a more personal director level, with individual directors providing the focus firm with access to information (Allen 1974; Bazerman & Schoorman 1983; Burt 1979; Zahra & Pearce 1989). For instance, Hillman, Zarrukho and Bierman (1999) found that firms with links to the US government had reduced uncertainty due to information flows resulting in greater shareholder value. Similarly, directors with ties to strategically related firms have been found to provide better advice and counsel, which is positively related to firm performance (Westphal 1999).

Interlocking directors can also aid in the dissemination of organisational innovation through a corporate network (Haunschild & Beckman 1998). Firms are more likely to adopt a multidimensional structure if they have a cooptive network (Palmer, Jennings & Zhou 1989) and firms adopt poison pill defences quicker if they are tied to previous adopters (Davis 1991).

Finally, there is a long established tradition that sees interlocking directors use personal reputation to increase legitimacy (Daly & Schwenk 1996; Gales & Kesner 1994; Hambrick & D'Aveni 1992; Selznick 1949). An organisation's reputation depends on the board of directors (Bazerman & Schoorman 1983), so that 'prestigious or legitimate persons or organizations represented on the board of directors (Bazerman & Schoorman 1983), so that 'prestigious or legitimate persons or organizations represented on the focal organization's board provide confirmation to the rest of the world of the value and worth of the organization' (Pfeffer & Salancik 1978, p. 145). For instance, firms with more prestigious boards have been linked with less underpricing at an IPO (Certo 2003; Certo, Daily & Dalton 2001).

**Interlocks: Some Criticisms and a Path Forward**

Despite the evidence of relationships between interlocks and corporate performance, the role of the board as a cooptive mechanism is not without criticism (e.g. Donaldson 1995). In particular, it is argued that boards undertaking an
interorganisational cooptation role would most likely breach legal duties in most Western countries and transgress society’s views on fair play (Burt 1983). Further, since directorships are a matter of public record, directors would be carrying out co-optation in a highly public way and threatening the underlying legitimacy of their organisations (Donaldson 1995).

But the most telling criticism lies in understanding how the interlock works. Studies of interlocking boards presume that ‘when an organization appoints an individual to a board, it expects the individual will come to support the organization, will concern himself with its problems, will favorably present it to others, and will try to aid it’ (Pfeffer & Salancik 1978, p. 163). However, resource dependence theory is based on a reciprocity model (Boyd 1990) whereby the actions of one company place an obligation on another, rather than as an asymmetric relationship envisaged by some authors (e.g. see Donaldson’s (1995) criticism of Pfeffer and Salancik (1978)). These criticisms highlight that we need to understand interlocks as they relate to the individual director if we are to imply reasons for the linkage.

**Social Capital**

Most studies of the board’s resource dependence role have concentrated on linkages between firms. We are seeking instead to follow Burt (1980, p. 557) and study the ‘network relations involving a specific firm’, particularly the networks of individuals, since it is individuals who provide access to resources, span boundaries and legitimise the firm. This approach recognises that mobilising resources depends on relationships between individual directors rather than linkages between corporations. Our aim in this paper is to better understand ‘exactly who is linked with whom?’ (Zajac 1988, p. 429) so as examine social capital as it applies to boards of directors.

Social capital relates to the elements of social structure that form a resource for action (Burt 1992; Coleman 1990). It is a construct attracting a broad range of scholars seeking to explain how actors mobilise resources through relationships (Adler & Kwon 2002). Unlike other forms of capital, it is jointly owned by the parties in the relationship and cannot be appropriated by an individual (Burt 1992) – thus, the relationship reflects the reciprocity assumption underlying the resource dependence element of interlocking directorships (Boyd 1990).

Since we are concerned with social capital in corporations, we adapt Gabbay and Lencers (1999, p. 3) to provide the following definition:

Social capital is the implicit and tangible set of resources available, by virtue of individual relationships, to assist a corporate player in goal attainment.

This definition matches the role of directors in providing access to resources. First, as in resource dependence theory, it requires resources that the corporate actor (or firm) requires. Second, these resources are made available through individual relationships (i.e. the interlocks between directors). Third, it requires the resources to be necessary for the attainment of corporate goals.

Since social capital is a multidimensional construct, it allows the researcher to recognise the necessity of both the actual linkages and the nature of those linkages. A widely applied dimensionality is that of Nahapiet and Ghoshal (1998) who argue that there are three dimensions of social capital: structural, relational and cognitive social capital. Structural social capital describes the actual bonds or links between actors (i.e. whether they know one another). Relational social capital is the nature of these links (e.g. trust, mistrust, etc.). Finally, cognitive social capital is the level of shared mental schema of the two linked actors. This conceptualisation recognises that both the tie and the nature of that tie are important (e.g. Burt 1992; Scott 2000).

Our study is conceptually important for two reasons. First, it differs substantially from the majority of resource dependence/interlock studies because it uses a new methodology that investigates the links between individuals as the basis for analysis rather than the links between companies. The multidimensional nature of social capital, however, means there will be difficulty in representing it with any single variable. In our case, we concentrate on measuring structural social capital (i.e. interlocks). We acknowledge the presence of structural social capital (i.e. a bond) does not necessarily result in relational or
cognitive social capital (i.e. a positive bond) but nevertheless believe the technique is a methodological advance over current firm-level measures. These basic contacts are a necessary, though not sufficient, condition to develop a board’s social capital (Emerson 1972; Miles & Snow 1993).

Second, we use these ties to explore the network of opportunities (i.e. the potential resources) available to corporations rather than just the resources linked directly between the interlocking boards. Most studies of network opportunity concentrate solely on the resources available through a direct interlock. While this is a conservative approach, we argue that ties open up opportunities beyond those provide by directly interlocking directors. For instance, if I request information on a topic from a friend, most director interlock studies concentrate on the opportunity afforded by the link to my friend. This is because there is clear structural social capital (i.e. the link), and a presumed relational social capital (i.e. positive bond). However, in reality my friend will often introduce to me to a third party (i.e. my friend’s friend), who may be able to assist. In this case, my opportunity network includes my friend’s friends, even though I do not have an interlock (structural social capital) when I first seek the resource. Thus, our approach employs the concept of ‘weak ties’ (Granovetter 1973). In essence, we argue that there is a transfer of relational social capital (positive bond) at the second level of contact because we both have a positive bond with my friend (i.e. there is potential social capital that will crystallise on the formation of the structural tie). We do not believe, however, that this relational social capital will extend indefinitely. While it is arguable that cognitive social capital (shared language, frames of reference, etc.) extends beyond the second tie (e.g. Granovetter), our conceptualisation of the opportunity network is based on the need for relational social capital (e.g. a positive bond) and so will not transfer beyond a third degree of separation (a friend of my friend’s friend).

In summary, we aim to broaden the application of resource dependence theory to corporate governance by examining the personal links provided to a board by interlocking directorships. Our approach parallels that of traditional board interlock studies, but goes one step further in analysing directly the interpersonal connections between boards. It is a quantitative application of the approach suggested by Zajac (1988), who emphasised the importance of the individual to interlocking board analysis. The structures of personal connectedness created by interlocks are the measure of personal social capital and can be understood as a potential communication or opportunity network. Thus, it is likely that all members of those boards that are tied into the large national component of interlocked firms constitute a (potential) ‘opportunity network’ (Adams 2002a; 2002b; 2002c).

Social Network Analysis

Social network analysis (SNA) is the mapping and measuring of structural features or patterns of relationships and information flows between people, groups and organisations. In SNA the unit of analysis is not the individual, but an entity consisting of a collection of individuals and the linkages among them.

To develop our understanding of the opportunity networks in the Australian and the US corporate system, we look at distances, or path lengths, between participants in a network. Path length has been the focus of a recent wave of scientific writing about ‘small world’ (Barabási 2002; Buchanan 2002; Watts 1999). Social network theorists originally conceptualised the closeness of network participants to one another as the critical feature of communication networks because closeness of participants (or short paths) would optimise the efficiency of communication within the network (e.g. see Freeman 1978/79).

Path lengths, distance or degrees of separation are used interchangeably in social network theory. These terms simply mean a count of the number of intermediaries that need to be contacted to pass a message between any two persons in a network. Figure 1 illustrates how this concept can be applied to our data on interlocking directorates and highlights the differences between traditional approaches to intercorporate network studies and our personal network approach. The figure is based on a simple situation where there are four boards of four persons each.

Part A of the diagram represents traditional intercorporate linkages, with each board represented...
FIGURE 1: The Intercorporate Network

PART A

TYPICAL INTERCORPORATE GRAPH
(4 Companies)

PART B

POSITIONS/DIRECTORSHIPS IN THE CORPORATE NETWORK
(16 Positions)

PART C

PERSONAL NETWORK
(12 People)

Legend: ○ Interlocker
        ○ Non-interlocker

Notes: 1. Companies are represented by letters
        2. People are represented by numbers
as a single participant in a network. This is the typical intercorporate graph and represents the four companies, showing the interlocking of directors by way of a single solid line between each company.

Part B of the diagram illustrates the same situation, except the role of individuals in the interlock is explicitly recognised by showing the number of positions (i.e. board memberships) involved in the network. Thus, Part B has sixteen nodes representing all the positions in the network (four directors on four boards). The solid lines in this diagram represent the links between people (i.e. the face-to-face contacts between each director and each of their three colleagues). The dotted lines represent joins between positions held by the same person. For example there are two nodes numbered 1, symbolising the same individual holds two directorships (one on Company A and one on Company B). The duplication of positions is necessary because the analysis is centred on the directorships of each company rather than the individuals who hold those positions. Thus, despite the recognition of the role of individuals in the interlocks, it is still the corporate network that is in focus.

Our analysis focuses on the individual’s role in the intercorporate network and is presented in Part C of the diagram. It shows the personal connections in the network and illustrates the path length in the interpersonal, directorship network that cannot be represented in a traditional intercorporate graph. The forced symmetry of four boards of four persons each means there are only two sets of persons in the network, the interlockers and the others. Interlockers are represented as transparent nodes whereas all other participants are shaded. We can see that each interlocker has a circle of six immediate contacts, three each from the two boards on which they sit. They can reach the other five persons in the network in two steps, i.e. through one of their immediate contacts. While it is possible to represent the different companies on this diagram (i.e. the large circles in Part C), this approach clearly follows Zajac (1988) in concentrating on personal linkages in the network.

The average path length of all interpersonal connections can be interpreted as an indicator of connectivity in a network. The geodesic path length is defined as the shortest path length between two points. In our example, the average geodesic path length is found by calculating the average minimum number of connections it takes for any one director to reach any other director. As discussed earlier, there are only two possible situations in our example for directors: they are either interlocking directors with a seat on two boards, or they are not. An interlocking director has an average path length of 1.45. In contrast, directors who do not interlock have an average geodesic path length of 1.91. These statistics are averaged to give us a path length for the network of 1.76. Detailed calculation of this example is provided in the appendix.

An average path length of less than two (as in our example) implies a high level of connectivity in a network. Since path length is a logarithmic variable (Albert & Barabási 2002), the connectivity of the network falls away very quickly as the average path length rises. Thus, small changes in average or mean path length indicate significant differences in the connectivity and connectedness of networks.

While average path length is a global indicator of network connectivity, it cannot be interpreted directly, just as it is meaningless to speak of an average family having 2.54 children. The distance between individuals involves distinct thresholds; two degrees of separation is different from three, is different from four, and so on. We contend that the frequency count of paths at each discrete distance is a better representation of the ‘average’ opportunity structure for networking, because it represents the number of network nodes available at each degree.

Since we have argued that board social capital occurs with contacts at distance 1 and 2, we contend that the number of contacts at either degree 1 or 2 is a better indicator of a director’s social capital than average path length. In our example, we are arguing that director 11 would have an opportunity to access 82% of the network (i.e. 3 face-to-face contacts representing 27% of the network of individuals and 6 contacts available as contacts of these 3, representing 55% of the network).

The number of first-degree contacts and second-degree contacts (contacts of contacts) that an individual has creates a specific indicator of
closeness in the network as a whole. We regard this as an indicator of connectedness of persons in the network as opposed to the connectivity of the network measured by mean path length. We can also take the average of this number for all individuals in the network. This percentage will then signal differences in the level of connectedness in different networks.

At the individual level however, the more first- and second-degree contacts a director has, the greater their centrality in the network. This will mean they will have a greater access to resources such as information and, potentially, greater social capital (Burt 1992). Since firms need resources to achieve their goals, the social capital of a director represents an opportunity network within the national corporate governance system for firms to utilise.

**METHODODOLOGY**

**Data Sources and Technical Analysis**

We used two datasets on the membership of company boards in Australia and the US in 1996. The selection method followed the ten nations, *Networks of Corporate Power* project (Stokman, Ziegler & Scott 1985). The databases contain the top 250 firms for Australia and 250 for the US selected as the 200 largest non-financial companies, ranked by revenue, and the largest 50 financial firms, ranked by assets. The names of directors were compiled from public sources, mainly stock exchange handbooks, and checked against annual reports and biographical sources such as *Who's Who in Business in Australia* 1996 (Dun & Bradstreet Marketing 1996).

Social network analysis was carried out using the social network software, UCINET (Borgatti, Everett & Freeman 1999). All board members (including company secretaries and alternate directors) were read into UCINET as a two-mode dataset. The procedure ‘affiliations’ was used to derive the adjacency matrix of ties between persons. This adjacency matrix was converted to a matrix of geodesic distances between persons to highlight whether directors (and their companies) were connected to the main network. Since we were only interested in exploring the social network of the system we eliminated persons not connected to the main network. Statistical routines calculated the number of persons at distance 1, 2, etc. and the average distance from each of each person in the network to each other person in the network.

**RESULTS**

Table 1 presents the basic information about the corporate networks of Australia and the United States. It contains information on the populations of corporations, persons and positions in each dataset as well as global measures of connectedness in both national networks. Rows 1 and 2 of the table reveal 229 firms, or 91.6% of the original selection were networked into the main component of the US corporate network. In contrast only 198 companies, or 79.2% of the Australian selection, were networked into the main component. The US proportion is very close to the 89.6% for the US network of 1976 reported in the ten nation study (Stokman et al. 1985, p. 27), while the Australian proportion is close to the average result of countries in that study as at 1976, 77.5%. This is an interesting finding in itself, in that top 250 companies in the US are 15.6% more likely to be part of the corporate network than their Australian counterparts.

Row 3 reveals the number of persons involved in the directorship network in the US is almost twice as large as that in Australia (2,282 persons compared to 1,163). This is most likely due to the greater number of positions in the US (see row 4), resulting from a larger board size of US corporations: 13.2 as opposed to 8.0 in Australia (see row 5). Despite these differences in board and network size, the average number of positions held per person is strikingly similar. As row 6 highlights, the average number of directorships held in the Australian network was 1.36 positions as compared with 1.33 in the US.

Table 1 also shows the incidence of interlocking directorship links in the intercorporate network. These are the interlocks between the networked firms only and do not count multiple interlocks between the same pair of firms. Row 7 highlights the smaller number of interlocks for Australia (5.89) compared with the US (8.83). Despite their being more chance of an interlock on an Australian board (i.e. 73.6% of positions)
than in the US (i.e. 66.9% of positions) this would indicate that the lower absolute numbers of interlocks on Australian boards is due to the smaller size of Australian boards.

In order to interpret the implications of these levels of interlocking, it is useful to compare them to thresholds predicted by random graph theory. The natural log of the number of networked companies (row 8) predicts the average number of interlocks we would expect if interlocking between companies were random (Bollobás 2001; Scott 2000). The US network passes this test easily (i.e. 8.83 interlocks compared to a threshold prediction of 5.43) and the Australian network also passes the threshold, although by a much smaller margin (i.e. 5.89 interlocks compared with a threshold prediction of 5.29).

Moving to the network of individual directors,

<table>
<thead>
<tr>
<th>Row</th>
<th>Statistic</th>
<th>Australia</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Number of companies in population</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>2</td>
<td>Number of companies in network component</td>
<td>198</td>
<td>229</td>
</tr>
<tr>
<td>3</td>
<td>Number of persons on boards of networked corporation</td>
<td>1,163</td>
<td>2,282</td>
</tr>
<tr>
<td>4</td>
<td>Number of positions on boards of networked corporation</td>
<td>1,583</td>
<td>3,042</td>
</tr>
<tr>
<td>5</td>
<td>Average positions per board</td>
<td>8.0</td>
<td>13.2</td>
</tr>
<tr>
<td>6</td>
<td>Average positions per person</td>
<td>1.36</td>
<td>1.33</td>
</tr>
<tr>
<td>7</td>
<td>Interlocks per networked corporation (multiplicities excluded)</td>
<td>5.89</td>
<td>8.83</td>
</tr>
<tr>
<td>8</td>
<td>Natural log of the number of networked corporations</td>
<td>5.29</td>
<td>5.43</td>
</tr>
<tr>
<td>9</td>
<td>Average path length (networked companies only)</td>
<td>4.34</td>
<td>3.85</td>
</tr>
<tr>
<td>10</td>
<td>Average maximum path length</td>
<td>6.70</td>
<td>6.37</td>
</tr>
<tr>
<td>11</td>
<td>Average number of persons at degree 1</td>
<td>10.3</td>
<td>17.8</td>
</tr>
<tr>
<td>12</td>
<td>Natural log of number of persons in the network</td>
<td>7.06</td>
<td>7.73</td>
</tr>
<tr>
<td>13</td>
<td>Average number of persons at degree 1 and degree 2</td>
<td>63.3</td>
<td>148.4</td>
</tr>
<tr>
<td>14</td>
<td>Persons at degree 1 and 2 as a % of all persons in the network</td>
<td>5.5%</td>
<td>6.5%</td>
</tr>
</tbody>
</table>
the average path length in the US is about one half a step shorter than in Australia; the US path is 3.85 while the Australian path length is 4.34 (row 9). The average maximum path length highlighted in row 10 (the reach of the average participant (Valente & Foreman 1998)), differs by less than one half of a step (6.7 in Australia and 6.37 in the US). It is interesting that despite the US director network being almost twice the size of Australia, average distance between participants is significantly shorter.

Strong differences appear when we consider the raw numbers of contacts in each system provided in rows 11, 13 and 14. Board members in the US have, on average, 17.8 immediate contacts (see row 11). This is 72.8% more than the 10.3 contacts of Australian board members. This average number of immediate contacts provides the basis to compare the density of connections in each country's director network to the threshold given by random graph theory. Row 12 provides the natural log of the number of individuals in the personal network, and represents the number of direct contacts that we would expect should board interlocks be random. A comparison reveals the Australian network passes this threshold more comfortably at the personal as opposed to intercorporate level of analysis. The US network is more than two and a half times the threshold. Thus, we can conclude that the structure of interlocking in the US and Australian systems is not random.

The differences between the two systems compound when we consider the total number of persons at distance 1 and 2, provided in rows 13 and 14. The US figure (148.4) is over twice that of Australia's (63.3). The average network participant in the US is connected to more directors than the average Australian participant. Even when we consider the numbers of directors that are available to be known, a US director is more likely to know his or her counterpart than in the smaller Australian network. The proportion of people that the average participant in each system knows is 5.5% in Australia as compared with 6.5% in the US.

Another way to illustrate the significant differences in opportunity networks provided by the two systems is to look at the connectedness of the top participants in each system. Table 2 presents data on the top 10 network participants in Australia and the US, i.e. the best-connected people in each net-

<table>
<thead>
<tr>
<th>Individual Connectedness Ranking</th>
<th>Number of positions held</th>
<th>Number of persons at distance 1 and 2</th>
<th>Proportion of persons at distance 1 and 2</th>
<th>Mean geodesic distance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Australia</td>
<td>US</td>
<td>Australia</td>
<td>US</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>7</td>
<td>311</td>
<td>874</td>
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<tr>
<td>2</td>
<td>5</td>
<td>6</td>
<td>307</td>
<td>835</td>
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work. The number of positions (or directorships) held by these top ten participants is relatively similar. On average, the top 10 Australian linkers held 4.5 positions whereas their US counterparts held, on average, 5 positions.

Despite this similarity in numbers of directorships held, there are substantial differences in individual connectedness. First, the top 10 Australian linkers could access on average just over 285 people at either degree 1 or 2. In the US system, the top 10 linkers had, on average, access to nearly three times that number of people at degree 1 or 2 (733). Even accounting for the difference in network size, the differences are substantial. On average, the top 10 Australian linkers had access to 24.56% of the network at degree 1 or 2. Their US counterparts had access to 32.14% of their substantially larger network.

Finally, we can examine the average path length of the top 10 individuals to illustrate the relative closeness of individual directors. In terms of the whole network, Australia’s top 10 linkers are, on average, 3.10 degrees of separation away from everyone in the network. In contrast, the top 10 US linkers are only 2.82 degrees away. As noted earlier, this 0.3 step represents significant differences in connectedness, a fact highlighted by the absolute number of contacts referred to earlier.

A feature common to both networks is the difference in meaning between centrality in the network (based on our measures of closeness and connectedness) and the number of positions held. The significant divergence between positions held and opportunities available (represented by persons at degree 1 or 2) highlights that although number of positions held will generally correlate with measures of network connectedness, number of directorships held is not necessarily a good indicator of an individual’s network position nor an individual’s opportunities. Further, the relatively small differences evident in a purely company focused network study (i.e. access to 16% more companies see row 2 table 1) is not indicative of the differences in the personal opportunity network (i.e. access to 156% more individuals see row 13 table 1) by factor of almost 10.

**DISCUSSION**

The study of interlocking directors has been criti-

cised as a method in search of a theory (e.g. see Pettigrew 1992). In this paper we have made a modest contribution towards addressing this concern. By employing the construct of social capital (Lin 2001), we focus on the structure of individual director networks as the basis for exploring the resource dependence role of the board of directors. The results are interesting and provide a number of points for conjecture and further research.

We started by recognising that interlocking directors have long been thought to facilitate access to capital and resources (Johnson, Daily & Ellstrand 1996), and affect firm decision-making (Mizruchi 1996). Director networks are thought to have significant influence on industry structure, firm resources and capabilities, and transaction costs (Herculeous & Murray 2001; Gulati, Nohria & Zaheer 2000). Therefore, understanding how interlocking directors can assist their firms to gain competitive advantage is best undertaken by examining the structure of the network of individual directors (Herculeous & Murray 2001).

By investigating the network of director (as opposed to corporate) interlocks, we highlighted that significant differences exist between the corporate networks and the individual director networks. For instance, when normalised for board size differences, we find that the level of corporate network activity and reach are roughly similar across the Australian and US networks (e.g. there are only 16% more companies connected in the US system than in the Australian system). However, companies do not gain access to resources from other companies – people gain access to resources through people. When viewed in this light, the US system provides much more opportunity to its participants. There are nearly twice as many contacts in the US network than in Australia. Further, a participant in the US has more than twice the network contacts at degrees 1 and 2, and so has access to a greater proportion of the larger corporate network. This is despite the strikingly similar average number of board seats held in both countries. These differences in personal networks may have significant implications for comparisons between US and Australian governance systems in three key areas.

First, since interlocked firms are likely to have their actions copied (Herculeous & Murray 2001; Davis & Greve 1997), we would anticipate that a heavily interlocked corporate governance network
(as represented in our methodology) would support the dispersion of corporate innovation and activity because the interlocking directorates (i.e. the individual directors) are likely to be conduits for diffusing norms and managerial innovations (Davis 1991; Fligstein 1985; Johnson et al. 1996; Mizruchi 1989). Since there is greater social network embeddedness in the US system, it is likely that directors in that system are provided with superior information and resources. Future research could compare the dispersion rate of corporate activities such as acquisition activity (Haunschild 1993) and anti-takeover devices (Davis 1991; Davis & Greve 1997) between the two national networks.

Second, on a more sinister note, actors embedded in a social system are more susceptible to social systems pressure (Useem 1984). Thus, there may be significant negative effects for a more densely interlocked governance system (e.g. the proliferation of aggressive accounting or adoption of excessive executive remuneration schemes (see Partnoy 2003). Investigating this ‘dark side’ of embeddedness (Gulati & Westphal 1999, p. 501) provides an opportunity to understand recent corporate malfeasance and compare the diffusion of these techniques for strongly embedded companies or even comparing the diffusion of practices between governance systems.

Third, by examining individual director networks, it may be possible to better understand the influence of geographical or spatial factors in the board’s resource dependence role. While previous findings highlight the influence of geography on corporate interlocking (Davis & Greve 1997; Kono, Palmer, Friedland & Zafonte 1998), we anticipate that spatial differences highlighted thus far should be reflected in differences in personal director networks. Therefore, the methodology we have outlined could provide important insights into this area. By examining the role of individual directors, it would be possible to highlight their role in overcoming or entrenching such spatial differences.

Implications for Business Agendas

While network structure may affect individual corporations, it is also probable that network structure will impact the business agenda of the different corporate governance networks in the two countries in different ways. We know that network structure affects information dispersion and agenda framing (Reese, Danielian & Grant 1994). Also, since actors have a psychological need to confirm their work with others (e.g. Crouse 1972; Sigal 1973), it is possible that the more connected network of the US system encourages a convergence of viewpoints and the setting of a strong, aligned business agenda. This idea parallels the previous discussion on the diffusion of innovation and practices, but instead of focusing within the network (i.e. impact on firms) it centres on the impact of firms on the wider environment. For instance, is there likely to be less dissent on important economic and social issues voiced by the business community in a more connected network? What is the role of the tightly connected directors (as opposed to corporations) in any relationship? How are the views of individual directors incorporated into any agenda-setting process?

Implications for Board Dynamics

Network theory suggests that indirect ties (i.e. second order ties in our analysis) will lead directors to attribute characteristics of their contact to the third person (Kilduff & Krackhardt 1994; Westphal & Milton 2000). Thus, indirect social ties can enhance confidence in the abilities of a third person by association (Granovetter 1973; Krackhardt & Porter 1985; Westphal & Milton 2000). For example, minority directors may increase their influence in the boardroom by having network ties to other directors. These ties enable minority directors to create a perception of similarity to the majority by creating a stronger basis for social identification (Westphal & Milton 2000). Thus, the higher degree of personal connectedness in the US system may indicate that there is greater likelihood that minority directors have influence and are viewed more positively than their Australian counterparts. It would be interesting to investigate if these perceptions are borne out and, further, whether it has led to an increased adoption of minority directors in the US system.

Managing Environmental Complexity

Viewing our findings from a different perspective, the increased interlocking of the US system may represent the generally accepted view that more complex organisations require more directors to manage interactions with the external
environment (Hillman, Cannella & Paetzold 2000). Given the size and complexity disparity between the Australian and US networks, we could conclude that directors of the top 250 US companies play a greater role in managing their environment than their Australian counterparts. This opens an interesting area of research as to whether there is an absolute ‘optimal size’ rule for boards and interlocks that transcends national boundaries. Our approach would lend itself well to extending Pfaffler’s (1972b) investigation of just such a question, but from the individual director perspective.

Alternatively, are the network divergences the result of the structures and processes of board appointments and formation in each country? They may result from the myriad of separate decisions that boards make about the number of positions they will create and the type of person appointed to fill them. Another course of investigation lies in investigating these decision-making processes.

Limitations and Future Development

The exploratory nature of our proposed measure means that its validity will require testing. In particular, the assumption that the presence of a bond (i.e. structural social capital) correlates sufficiently with a positive bond (i.e. structural and relational and cognitive social capital) requires investigation. Also, our key proposition that personally focused measures are superior to corporate measures requires empirical verification. This will depend on whether resource dependence is due to personal attributes (e.g. obtaining access to separation from a director’s network) or the formalisation of a firm-level decision (e.g. becoming a director on a joint-venture board). If we are incorrect, our proposed measure may overstate the opportunity network compared to a firm-level measure.

CONCLUSION

The comparison of US and Australian corporate opportunity networks raises three interesting points. First, large networks (such as in the US) provide more connectedness for participants than smaller counterparts (such as in Australia). If these differential opportunities are utilised by participants to the same extent, we would expect a number of potentially important implications. For instance, the larger the network, the greater access to resources for a firm. Similarly, innovation and information should diffuse more rapidly through a larger network and we would expect that any information asymmetry or innovation advantages would not last as long in a larger network.

Second, despite directors in both systems holding, on average, similar numbers of positions, the US director has a much greater potential network in which to build and exploit social capital. This is the case in percentage and absolute terms. Do directors in the US see this as an advantage, or do they envy the simpler lives of their counterparts in countries such as Australia? What drives discussion and decision making about board size in each system?

Third, there is the question about the relationship between networking and opportunity structure. Is it the case that the perception of collective opportunity drives and legitimates higher levels of interlocking in the US or is it an accidental by-product of historically embedded practices of board appointment? Conversely, is the historical practice of smaller boards in Australia a constraint that is overcome by the higher number of positions held per person?

We propose that a significant part of the social capital of a board comes through the person-to-person contacts that board members make with members of other boards. These contacts create an interpersonal network among board members. We also argue that the interpersonal network arises as a consequence of interlocks between firms. Once these links are dense enough to create a large, central national network, directors are brought into a single, connected communication network of significant breadth and scale. This is a resource for building the social capital of individual directors and enhancing the social capital of boards. This, in turn, may have implications for board, firm and system performance.

Future research on board social capital, particularly structural analysis of directorship networks, can profit from our approach and techniques. We suggest that it is important to understand the relationship between density and centralisation that we have not been able to investigate in this paper. This relationship will be tied to the dual nature of
board networks. There is also a need for research on the manner and degree to which members of boards access and utilise the resource offered by networks. Although requiring a different mode of enquiry, research of this kind is also needed to complement the formal analysis used in this paper and to concentrate more on the effect of an individual board or director’s position within the opportunity network itself.

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Appendix One – Calculation of Geodesic Path Length

In the hypothetical example provided (figure 1), directors: they are either interlocking directors with a seat on two boards, or they are not. An interlocking director can reach 6 contacts with a path length of 1, and the other 5 contacts with a path length of 2. Thus the average path length for an interlocker is \((6*1+(5*2))/11 = 1.45\).

In contrast, directors who do not interlock can reach 3 contacts with a path length of 1 (e.g. Director 11 has face-to-face contact with directors 10, 12 and 3). The director then has contact with another 6 directors with a path length of 2 (in our example, directors 7, 8 and 9 become second degree contacts through director 10 and directors 1, 2 and 4 become second degree contacts through director 3). Finally, 2 directors require a path length of three for the non-interlocking director to connect (in our example directors 5 and 6 require a path length of 3 because no director is common to companies B and D). Thus, non-interlocking directors have an average geodesic path length of \((3*1)+(6*2)+(2*3))/11 = 1.91\).

In order to calculate the mean path length for the network (as opposed to individual directors), we need to average these statistics. Since we have four interlockers and eight non-interlocking directors, the mean path length for the network is \((4*1.45+8*1.91)/12 = 1.76\).

1 Interlocks have been used to study research topics beyond resource dependence theory. For example, linkages have been employed to examine issues of class hegemony whereby boards are seen as a ‘means of perpetuating the powers of the ruling capitalist elite’ (Zahra & Pearce 1989: 299) and financial hegemony (Mintz & Schwartz 1981).

2 Study of interlocks has been extended to the study of indirect interlocks (Burt 1980b). An indirect interlock occurs where directors of firms A and B have a chance to communicate decisions made by their firms through creating an interlock with another firm, particularly financial institutions. Although there is little existing systemic evidence of this arrangement, case studies provide individual evidence of the use of financial intermediaries in cooptation. For example, Patman (1968) reports case study material that documents some firms using financial institutions as intermediaries in coopting resources.

3 This negative correlation has been interpreted as a need for cooptation by non-family companies (Burt 1980b) and has been interpreted as the board performing a representation rather than an internal control function (Zald 1969).

4 An important implication of this study is that board size and interlocks cannot be used interchangeably

5 Studies of broken ties essentially argue that if an interlock is important, it will be reconstituted if accidentally broken (Mizruchi & Stearns 1988).

6 Pfeffer and Salancik (1978) identify another key role as providing specific resources from experience (i.e. advice), a view that has been empirically examined by looking at the relationship between interlocks and strategy development (e.g. Eisenhardt & Schoonhoven 1996; Geletkanycz & Hambrick 1997).

7 We are indebted to the editor for alerting us to this key point.

8 A network typically contains a main component and several other networks that are not linked to the main component.