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Locating women board members in gendered director networks

Abstract

Purpose

It is well-known that boards of directors are primarily male; globally, only 5-20% of directors are women. However, the extent to which women directors are central to the network, or pushed to the margins, is unknown. Using the tools of social network analysis we examine the underlying structure of the director network and determine whether there are differences – apart from size – between the male and female networks.

Design Methodology/Approach

We use a longitudinal approach, comparing director networks on a global network scale (the 2004 and 2007 Fortune Global 200) and a national one (the 2004 and 2007 New Zealand Stock Exchange) with the 1999 Fortune US 1000. The male and female director networks are separated and analysed, together with the full network. By comparing the 2004 and 2007 data it is also possible to calculate director turnover, which gives some idea of stability of the networks over time.

Findings

Female directors are more likely to be found in the largest connected component of the mixed gender network, indicating that they are not marginalised. Despite high turnover rates, director networks are stable over time, with the ratio of connector directors (with multiple seats) to total directors remaining static.

Originality/value

The structure of gendered director networks is an unexplored area despite extensive research into natural and social networks. The location of women directors holding single or multiple directorships in network components has not been considered in board diversity research. The results point to an underlying gender equity in director networks. A new theoretical approach, Glass Network theory, has implications for boardroom diversity interventions.

Keywords

Women directors network diversity

Paper type

Research Paper

Locating women board members in gendered director networks

1. Introduction

Globally, only 5-20% of directors of substantial organizations are women (Vinnicombe, Singh, Burke, Bilimoria, & Huse, 2008). While this gender imbalance is increasingly under challenge in Western countries, as notions of gender equity and equal employment opportunities become the norm, the ratio has remained remarkably constant despite thirty years of affirmative action (Joy, 2008; McGregor & Fountaine, 2006; Ross-Smith & Bridge, 2008). Only where quotas have been introduced, in countries such as Norway and Spain, has board equity been achieved (de Anca, 2008; Huse, 2007).

Women directors have been the subject of considerable research for over thirty years (Vinnicombe et al, 2008), but in their recent comprehensive review, Terjesen, Sealy & Singh (2009) find much of the Women on Boards (WOB) research descriptive in nature and lacking in theory. However, there is data: the numbers of women directors on listed stock exchanges are known in considerable detail, being globally tracked since the early 1990s through regular national censuses and by organisations such as Catalyst (Burke, & Mattis, 2000; Vinnicombe et al, 2008). The numbers of women with multiple directorships have also been tracked in some research such as the Cranfield Female FTSE 100 reports spanning the years from 1999 to 2009 (Sealy, Singh, & Vinnicombe, 2007; Sealy, Vinnicombe, & Singh 2008). In this paper we present one facet of an attempt to verify this, known as Glass Network Theory (Hawarden, 2010).

We wish to lay the foundations for a theoretical approach to the analysis of gendered networks based on advances in complex network theory. We term this the 'glass network,' in analogy to the ubiquitous metaphor of the glass ceiling, which Baxter and Wright (2000) suggested was “one of the most compelling metaphors for analyzing inequalities between men and women in the workplace” (p.71). Although invisible to the participants, it is suggested that director networks have a specific structure that can be revealed through social network analysis. Unlike the glass ceiling, which is viewed as a solid barrier, in gendered glass networks the barriers are conceptualized as transparent and semi-permeable, allowing a small, but constant proportion, of women into boardrooms. In addition, it is suggested that director networks have connector directors of both genders, that is, there will always be some women who have multiple seats or board appointments.

In particular, we are interested in investigating the hypothesis that women are not sidelined in the network of directors, but are present throughout the network in about the same ratio, both for women with single board appointments and those with multiple appointments.

We begin by discussing why there is interest in looking at directors who share board appointments, before introducing the graph as a suitable model for this. Following this, we describe our methodology for identifying and extracting the separate female and male networks within the graphs before presenting the results of our analysis.

2. Director interlock research

Researchers have long considered that the holding of multiple directorships establishes channels of power and, by driving corporate performance, determines the shape of the business landscape (Davis, 1996; Davis, Yoo & Baker, 2003; Mizruchi, 1996). Sitting together around a boardroom table creates a link or interlock between two directors, with more links being created when directors invite co-directors to take up vacancies on other boards. Interlocking seats are seen to facilitate political cohesion among corporate elites or 'inner circles' (Useem, 1984), and encourage the flow of valuable information on business practices across multiple companies on multiple topics (Tan & Keong, 2006). With business interests spanning communities and countries, linked director networks can exist at local, regional, national and global levels (Kono, Palmer, Friedland & Zafonte 1998).

There have been concerns of undue influence through board interlocks, with director and company interlocks being the subject of a number of studies, reflecting an interest by economists and management scholars in company control, potential conflicts of interest, hegemony of financial institutions and competitiveness (Alexander, Murray & Houghton, 1994; Murray, 2001; Firth, 1987; Roy, Fox & Hamilton, 1994; Walker & Borrowdale, 1994). However, high levels of director interlocks can also be seen as desirable collusion to increase sector size to promote international competitiveness (Firth, 1987). In New Zealand, decreases in the numbers of directors, seats and companies and reduced interlocks observed by Roy et al. (1994), were regarded as undesirable, concentrating control of the economy in a small group of companies, with insurance companies dominating the interlock pattern. However, these papers are largely descriptive and focused on political or economic control.

More recently, director interlocks provide a means by which director networks can be visualised and dissected using the recently-developed tools of social network analysis, as is described next. To date, director gender has been completely ignored in this research.

3. Director Networks

3.1 Network Terminology

Mathematically, a graph consists of a set of vertices or nodes, with links or edges between them signifying some connection between the nodes. The power of this abstraction is that a great many things can be represented and studied in this way, using the same underlying algorithms and analytical tools (Barabási & Bonabeau, 2003; Buchanan, 2002; Scott, 2000). In this paper, in common with many others (e.g, Kogut & Walker, 2001; Newman, 2002; Battiston, Bonabeau, & Weisbuch, 2003; Conyon & Muldoon, 2006) we identify individual directors as nodes, and then place edges between any pair of directors who sit on a board together. While there are variations on the general graph theme to include directed edges (equivalent to one-way streets) and weights on the edges, we ignore that here. (In fact using weights on the edges can be useful to signify that two directors share more than one board appointment, but this is not required for our analysis.)

When a graph is visualised it can often be seen that it is not completely connected, in that if you start at a random director and follow edges, there will be some subset of the directors who cannot be reached. This causes problems for computing the distances between nodes in a graph, since there are a number of pairs of nodes where there is no path between them. For this reason, network analysis tends to consider only the largest component of the graph, which is the piece where there is a path between every pair of nodes, and which is

larger than any other such piece. As is well described elsewhere, it is a property of complex networks that there will be such a largest component, and it will represent a significant proportion of the entire graph (Callaway, Hopcroft, Kleinberg, Newman & Strogatz, 2001).

3.2 The location of female directors in director networks

It is also possible to create sub-networks of the director network by using specific director attributes, such as gender or presence in the network at two points in time. We investigate both the male and female director networks separately, and also what we term 'continuing directors,' being those who are on boards in both the 2004 and 2007 datasets.

By investigating how women directors are connected into the director graph we should be able to see how easily they can access channels of influence. If women are marginalised in director networks then board appointment opportunities for women directors will be less easily obtained, a factor that may be contributing to the static gender balance. Further, if business women are seen as marginalised in an economy and peripheral on boards of directors, who appoint them with reluctance, then it can be hypothesized that the few women directors in the network would be found on the periphery of the director network in the smaller components.

However, Glass Network theory makes the opposite prediction: that women directors are more likely to be found in the largest component. This is because larger companies are likely to be clustered in the large component as they have larger boards (Burke, 2000) and more directors with multiple seats (Newman, 2002, 2003a). Women directors tend to be found in larger companies with larger boards, often as the token woman (Nguyen & Faff, 2007; Farrell & Hirsch, 2005; Carter et al., 2003).

As director networks are dynamic entities the movement of directors into, through and exiting out of director networks must also be taken into account. Limited research shows that there are high levels of turnover in director networks. Davis et al., (2003) found this to be 95% in 17 years. Male and female director turnover is unknown although some research such as the Cranfield FTSE 100 report series (Sealy, et al, 2007; Sealy et al 2008) does monitor new board appointments and distinguish between female directors who have previously had a FTSE 100 board appointment. For example, in 2008 of the 16 new female appointees (11.0%), 25% had previously held FTSE 100 seats (Sealy et al. 2008).

Recent research has shown that once a stable state is reached, both natural and social networks are robust and change-resistant, despite continually changing inputs and outputs, in this instance, new directors being appointed and older directors retiring (Newman, 2002; Newman, Barabási & Watts, 2006). This is a valuable attribute in power grids or the internet, but a problematical one when affirmative action interventions attempt to increase the numbers of women directors.

4. Methodology

4.1 Determining Director Gender

Using methods similar to Hillman et al. (2007), the datasets were hand-coded by research assistants based on their knowledge of gendered first names. When a gender neutral name, initials or unusual name was encountered this was highlighted for further checking and validation. Websites listing boys and girls names were also consulted, as was the internet profile of the directors in the databases used. In order not to overstate the number of women directors in a network, a conservative approach was followed and the default of male assigned in the very few instances where gender could not be determined.

4.2 Data Preparation

4.2.1 The 1999 United States Fortune 1000 director dataset

The 1999 Fortune US 1000 director dataset is the iconic dataset of director network analysis and has been used by a number of network researchers (Battiston & Catanzaro, 2004; Battiston et al., 2003; Davis, et al., 2003; Newman, 2002; Newman, 2003a; Newman & Park, 2003; Newman, et al., 2001), but has not previously been used in gender research. While this dataset is referred to as the US Fortune 1000 dataset, it does not contain data from a thousand companies: Davis et al. (2003) selected data from the largest 600 public firms that reported the compositions of their boards to the United States Securities and Exchange Commission (SEC) from among the Fortune 1000 for 1999. The data was captured into a Microsoft SQL database and a number of stored procedures written to remove duplicates and then extract files in the DL format required by UCINET.

Validating procedures reduced the number of companies from 967 to 916, the number of director seats to 10,098 seats and the number of directors to 7,644. Validation followed similar steps to those reported by Davis et al. (2003). If directors with similar names could not be shown to be a single director with multiple seats, the default action was to leave them as two individuals, thereby reducing the number of linked directors.

4.2.2 Fortune 200 Global director datasets

The 2004 and 2007 Fortune Global 200 director data sets were derived from the detailed male and female director information of the Top 200 global boards ranked by Fortune magazine and studied by the Corporate Women Directors International organization (CWDI 2004 Report, CWDI 2007 Report). The global companies in the 2004 dataset were ranked by Fortune magazine according to global revenue in 2004 and were current on 30th June, 2004. The companies in the 2007 dataset were ranked by Fortune magazine according to global revenue in 2006 and were current on 31st March, 2007. The 2004 and 2007 Fortune Global 200 datasets were already gender coded, but this were validated where possible. The appendices containing the detailed director information were found to have proofreading errors and director totals did not always agree with totals in the text. Data was verified by an internet company search and corrected figures used.

4.2.3 New Zealand Stock Exchange (NZX) director datasets

Two datasets spanning 2004 and 2007 were constructed, permitting a longitudinal analysis of the gendered New Zealand director network. The raw New Zealand Stock Exchange datasets were obtained from the stock exchange administration on 27th January, 2004 and January 2007 respectively. Only the main board companies

were analysed, but comprised the full number of companies on the stock exchange for each year. This consisted of 184 companies in 2004 and 185 in 2007.

4.2.4 Longitudinal datasets

To construct longitudinal datasets, directors who were present in both the 2004 and 2007 datasets for the Fortune 200 and NZX were identified. Director names were matched and sorted, which allows for the continuation rate of directors to be established by comparing the percentage of the continuing directors to the numbers of directors in the full network. These percentages should decrease over time as directors resign their directorships. This study differs from Davis et al. (2003), who analysed a panel of 195 firms that were still present 17 years later and the number and identities of the directors varied at three points in time.

4.3 Statistical Analysis

As the data is categorical data, chi-squared analysis with Yates correction and one degree of freedom was selected to test the female director location hypothesis in the largest connected component for all directors and the continuing directors.

5. Results

Table 1 provides summary statistics for the five networks analysed. It can be seen that female directors are found in low levels (11% or below) in all networks. The mean number of seats per director was just over one for the Fortune 200 and NZX, meaning that most directors have just one seat, and the percentage of female seats closely followed the director percentages. However, 23% of directors in the Fortune 1000 network are connector directors having more than one board appointment, significantly more that the 8.7% in the Fortune 200. The lower value for this latter figure may reflect the logistics of global travel reducing multiple board appointments. Interestingly, similar percentages of the continuing directors who were present in both the 2004 and 2007 networks for the Fortune 200 and NZX were connector directors (6.1% as compared to 8.7% for the Fortune 200 and 15.8% as compared to 15.0% for the NZX). This indicates turnover in the connector director group.

There does seem to be slight evidence for a preference for women with more than one seat, since the percentages of female connectors directors are 2 – 4% higher than in the whole population. This suggests a higher proportion of token women directors in international companies and is reflected in the lower percentages of connector directors. For the continuing directors, the female to male connector director percentages for the Fortune Global 200 and NZX were 17.6% and 4%. The international women directors once appointed tended to be there for the long haul in greater numbers, while reduced numbers in the NZX data probably reflects turnover in a small sample.

Table 2 reports statistics for the two networks where we have two sample points: 2004 and 2007 data for the Fortune 200 and NZX. The table indicates a high level of director turnover in both networks: over the three year time span between the two surveys, around 47% of the directors in both networks had been replaced. In the Fortune Global 200 network, the continuing male director turnover was 10% higher than the female director turnover, with only 54% of male directors continuing compared to 64% of women directors retaining their seats,

although this could be a small sample effect. It was the reverse in the NZX network with an average of 52% of male directors continuing, but only 41% of the women directors continuing.

Table 1
Descriptive statistics for the mixed gender 1999 Fortune US 1000, 2004 and 2007 Fortune Global 200, 2004 and 2007 NZX director networks.

	1999 Fortune US 1000	2004 Fortune Global 200	2007 Fortune Global 200	2004 NZX	2007 NZX
No. of companies	916	200	200	184	185
Average board size	8.3	13.6	13.8	6.4	5.8
No. of directors	7644	2479	2538	965	899
Male directors (%)	6985 (91.4)	2223 (89.7)	2263 (89.2)	908 (95.1)	832 (92.5)
Female directors (%)	659 (8.6)	256 (10.3)	275 (10.8)	57 (5.9)	67 (7.5)
Gender ratio	10.6	8.6	8.2	16	12.4
No. of seats	10090	2725	2754	1176	1059
Mean seats	1.4	1.1	1.1	1.2	1.2
No. of male Seats (%)	9141 (90.6)	2439 (89.5)	2446 (88.8)	1106 (94.0)	985 (93.0)
No. of female seats (%)	949 (9.4)	286 (10.5)	308 (11.2)	70 (6.0)	74 (7.0)
No of connector directors (%)	1608 (23.0)	198 (8.9)	190 (8.4)	144 (15.9)	117 (14.1)
No of male connector directors (%)	1432 (89.1)	170 (85.9)	160 (84.2)	133 (92.4)	110 (94.0)
% No of female connector directors (%)	176 (10.9)	28 (14.1)	30 (15.8)	11 (7.6)	7 (6.0)
***Largest connected component only**					
No of directors*	6705 (87.7)	1573 (63.5)	1562 (62.3)	633 (66.2)	445 (49.6)
Number of connector directors (%)*	1595 (23.8)	185 (11.8)	181 (11.6)	130 (20.5)	96 (21.6)
% Male single seat directors*	76.7	88.4	88.9	79.1	78.2
% Male connector directors*	23.3	11.6	11.1	20.9	21.8
% Female single seat directors*	71.1	87.2	86.6	84.9	81.1
% Female connector directors*	28.9	12.8	13.4	15.1	18.9

Table 2
Descriptive statistics for the continuing directors in the 2004 and 2007 networks for the Fortune Global

200 and NZX.

	2004 Fortune Global 200	2007 Fortune Global 200	2004 NZX	2007 NZX
No. of Companies	195	193	159	167
No. of continuing directors	1384		476	
Male continuing directors (%)	1215 (87.8)		451 (94.7)	
Female continuing directors (%)	169 (12.2)		25 (5.3)	
Gender Ratio	7.1		18 .0	
No. of Seats	1582	1557	653	621
Mean Seats	1.14	1.12	1.4	1.3
No. of Male Seats (%)	1388 (87.7)	1363 (87.5)	617 (94.5)	588 (94.7)
No. of Female Seats (%)	194 (12.3)	194 (12.5)	36 (5.5)	33 (5.3)
Number of connector directors (%) with 2 or more seats	85 (6.1)		75 (15.8)	
Male Connector Directors (%)	70 (82.4)		72 (96.0)	
Female Connector Directors (%)	15 (17.6)		3 (4.0)	
% total director continuation rate	55.8	54.5	49.3	52.9
% male director continuation rate	54.7	53.7	49.7	54.2
% female director continuation rate	66.0	61.5	43.9	37.3

The location of women directors in the network components can be ascertained from Tables 3 and 4. The null hypothesis that male and female directors are found in the largest connected component in the same ratio as the total gender ratio for the director network is rejected for the 1999 Fortune US 1000 directors with a x^2 value of 5.9, significant at $p<.05$ and the 2004 and 2007 Fortune Global 200 directors with x^2 values of 20.4 and 33.7, significant at $p<.001$. Examination of Table 3 and 4 indicates that the ratio of men to women directors in the largest connected components of these two networks is significantly less than the total gender ratio, indicating that more women directors are to be found in the largest connected components than in the unconnected components. For the NZX data the null hypothesis was accepted, although this may be a function of the small size of the network and the contraction of the number of directors in the NZX between 2004 and 2007.

In the continuing director networks, the chi-squared results given in Table 5 show that the null hypothesis that male and female directors are found in the largest connected component in the same ratio as the total gender ratio for the director network was similarly rejected for the 2004 and 2007 Fortune Global 200 directors. It was also rejected for the 2004 NZX network with a x^2 values of 6.0 with $p <.05$, but accepted for the 2007 NZX network of continuing directors.

Table 3
Director Component Analysis by Gender for 1999 Fortune US 1000, 2004 and 2007 Fortune Global 200.

	1999 Fortune US 1000			2004 Fortune Global 200			2007 Fortune Global 200		
	Male (%)	Female (%)	Gender Ratio	Male (%)	Female (%)	Gender Ratio	Male (%)	Female (%)	Gender Ratio
Total	6985	659	10.6	2223	256	8.6	2263	275	8.2
Largest connected component	6107 (87.4)	598 (90.7)	10.2	1377 (62)	196 (76.6)	7.0	1366 (60.4)	216 (78.5)	6.3
Remainder unconnected components	878 (12.6)	61 (9.3)	14.4	846 (38)	60 (23.4)	14.0	897 (39.6)	59 (21.5)	15.2
x^2	5.9*			20.4**			33.7**		
** p<.001 and p<.05* with Yates correction for one degree of freedom									

Table 4
Director Component Analysis by Gender for 2004 and 2007 NZX.

	2004 NZX Directors			2007 NZX Directors		
	Male (%)	Female (%)	Gender Ratio	Male (%)	Female (%)	Gender Ratio
Total	908	57	16.0	832	67	12.4
Largest connected component (%)	597 (65.8)	42 (73.2)	14.0	409 (49.2)	37 (55.2)	11.0
Remainder unconnected components (%)	311 (34.2)	15 (26.8)	20.7	423 (50.8)	30 (44.8)	14.1
x^2	1.19			0.65		

Table 5
Director Component analysis by gender for the 2004 and 2007 Fortune Global 200 and NZX continuing directors.

	2004 Fortune Global 200		2007 Fortune Global 200		2004 NZX		2007 NZX	
	Male	Female	Male	Female	Male	Female	Male	Female
Total	1215	169	1215	169	452	24	452	24
Largest Connected Component (%)	701 (57.7)	119 (70.4)	738 (60.7)	131 (77.5)	295 (65.3)	22 (91.7)	238 (52.6)	13 (54.2)
Remainder Unconnected Components (%)	514 (42.3)	50 (29.6)	477 (39.3)	38 (22.5)	157 (34.7)	2 (8.3)	213 (47.1)	11 (45.8)
x^2	9.4*		17.2***		6.0**		0.00	
*****p <.001 **p <.05 * p <.01 with Yates correction for one degree of freedom**								

6. Discussion and Conclusions

Low levels of women directors have been observed as a persistent pattern over many years in director data from listed stock exchanges. There has been a tacit assumption that a director networks are amorphous entities, which this study questions by undertaking the first investigation of gendered director networks. We have investigated three gendered networks of directors at a national and global level, two of them over a three year period. By extracting network components and using gender as an analytical tool, the location and role of women directors as connector directors has been determined.

The study has found the same low percentages of women directors reported elsewhere, but we have also found that – despite high levels of director turnover, with approximately 50% of directors replaced between 2004 and 2007 – the percentage of women directors are remarkably consistent. Although consisting of a similar number of companies to the NZX, the Fortune Global 200 network has nearly double the percentage of women directors. This may be due to the larger board size: an average of 13.7 members compared 6.1 for NZX boards. Although the gross WOB data is reflecting slow increases in the numbers of women directors these changes cannot be attributed to diversity interventions unless factors such as board size are held constant. Comparisons across countries are consequently also difficult.

The study has found that continuing women directors, particularly in international networks, show less turnover and may be more motivated to retain prestigious international appointments.

This study also highlights the role of the connector director (who has more than one simultaneous board appointment) in the network, with differing gender percentages within this group when compared to the total network or the largest connected component. The ability of women connector directors to secure the small proportion of multiple seats available to them suggests that overlooked differences may exist between them and single seat directors. Connector directors of both genders may share these characteristics, which may relate to competence and leadership abilities.

These results give support to the Glass Network hypothesis that women directors (including the female continuing directors) are found in the largest connected component. Those women who are appointed to boards, whether as single seat directors (the vast majority), or as a small proportion of connector directors are not marginalised in director networks. They have the same opportunities for interaction with influential connector directors as well as access to network resources.

However, network size and the possibility of effective affirmative action enhancing this tendency for women directors to be located in the largest connected component must also be considered as explanations for the obtained results. Company size, as measured by turnover or ranking such as the criteria used in the Fortune analyses, is also related to board diversity. As the Fortune Global 200 data show, the world's largest companies have bigger boards and have more women directors.

These findings have implications for diversity interventions and future research. The lack of women in director networks cannot be explained by the location of women directors in their networks as this seems to be a level playing field with women over represented in the largest connected component. Women directors must be

differentiated into sub-groups for a clear picture to emerge of which women are getting board appointments. This paper suggests that categorisation into national and international, connected or unconnected components and single or multiple directorships are useful groupings for differentiation.

Diversity interventions can therefore be directed at increasing the numbers of women in different categories using different strategies. For example, connector directors who are already known in a director network may be able to pick and choose less risky board appointments, while single seat directors may be setting themselves up for failure by accepting such appointments. A general strategy to increase women directors as a whole may not be as effective as a more targeted approach.

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