# DIRECTORSHIP INTERLOCKS IN SINGAPORE: A SOCIAL NETWORK ANALYSIS

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**Abstract**

This paper uses social network analysis to examine the extent of interlocking directorships across companies listed on the Singapore Stock Exchange Limited (SGX) Mainboard in 2004. Detailed analyses on different industry sectors within SGX as well as an overall analysis of all the companies on the SGX Mainboard were performed. The findings show that there were varying degrees of interlocking directorships within the different sectors, and on average, each director from a SGX Mainboard-listed company sits on more than 2 directorship positions.

**Keywords:** directorship interlocks, social network, Singapore, corporate governance.

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## Introduction

Directorship interlock has been the focus of much research in USA, Australia, New Zealand and Japan. A directorship interlock, in its simplest form, occurs when the director of one company sits on the board of directors of other companies. A mutual interlock occurs when a group of directors sits on each others' boards. This relationship enables the director to be "in a position to feed back information from a wider corporate scan" (Murray, 2001). Directors in such a position naturally wield considerable power, thus much research has been focused on the corporate power structure of networks of interlocking directorates (Fich & White, 2003).

The study of interlocking directorships forms part of the larger context of research in managerial elites and corporate governance (Pettigrew 1992). The Code of Corporate Governance in Singapore identified by the Committee on Corporate Governance (CGC) and adopted by the Ministry of Finance in Singapore defines corporate governance as "the processes and structure by which the business and affairs of the company are directed and managed, in order to enhance long term shareholder value through enhancing corporate performance and accountability, whilst taking into account the interests of other shareholders. Good corporate governance embodies both enterprise (performance) and accountability (conformance)." In performing their tasks, boards of directors fulfil three widely recognized roles - control, service, and resource dependence (Johnson et al, 1996). The role of control stems from agency theory that focuses on the separation of ownership (shareholders) and control (professional managers). This perspective views the need for the board to act as a regulatory body for controlling the opportunistic behaviour of the managers and to align the interests of the managers to that of the firm (Jensen 1993). The board fulfils the service role by dispensing expert views and strategic advice to the CEOs (Dalton & Daily, 1999; Lorsch, 1995; Westphal 1999). From the resource dependence perspective (Dalton & Daily, 1999; Pfeffer & Salancik, 1978), the board is viewed as an instrument for securing critical external resources such as financing, intelligence on industry and competitions in order to create a competitive advantage for the company (Conner & Prahalad, 1996), Pennings (1980). In Asia, research found evidence that seemed to suggest that directors exhibit behaviours that fulfil the role of resource dependence more than the roles of control and service (Pei, 2004).

In recent times, the increasing magnitude of directors' interlocks has given rise to a number of concerns. Carroll and Thanos (1994) identified four areas of concern. First, the interlocks are said to be responsible for the reduction in the number of opportunities for people to gain access to the board. As a result, the quality of business decisions of the board can be called into question as the directors' attention is spread too widely. Second, there is fear of over concentration of economic power in the hands of a few. Third, interlocks can give rise to conflict of interest and finally, interlocks can also provide collusive or anti-competitive behaviour

which could be detrimental to the shareholders and the industry.

## Directorships Interlocks

Many empirical studies have been conducted to test the many theories and to identify critical factors affecting interlocking directorships. One of the earlier studies by Dooley (1969) looked at the frequency of interlocking relationships in relation to economic considerations. He identified five factors accounting for the occurrence of interlocking directorates: (1) the size of a corporation; (2) the extent of managerial control; (3) the financial connections of the corporation; (4) the relationship with competitors; and (5) the existence of local economic interests. His study which spanned more than 200 of the top companies in the USA between the period 1935 to 1965, found conclusive evidence that the managerial autonomy of a corporation could be curbed by the extent to which external interests are represented on the boards of directors.

Mace (1971) focused on the aspect of boards of directors acting as information conduits for the company in relation to its external environment. His study described how boards of directors often had the privilege to access exclusive information through contacts with either "guest" directors sitting on their companies' board or when they themselves are "guest" directors sitting on other companies' boards. Such an intimate flow of information often gave rise to conflicts of interests, violations of regulations and opportunism.

Pfeffer (1972) on the other hand examined how companies use director interlocks as an instrument to control the organization's external environment. On a random sample of 80 non-financial companies, the study found that there was a significant relation between the size of companies' boards and its performance. The more a company board size deviates from an empirically determined optimal size, the more poorly it performed when compared to industry standards.

Levine (1972) however studied the "spheres of influence" that created the patterns of interlocking directorships. His work revealed that industrial organizations seemed to be more interlocked with financial institutions than with each other. An interesting aspect of our current study is to reveal how interlocked the financial institutions are interlocked to some of the sectors and to see the extent of this sphere of influence between the financial institutions and these interlocked sectors.

In brief, existing literature on interlocking directorships falls into three categories, roughly in accordance to the three roles that boards of directors fulfil. One category sees the existence of interlocking directorates as a form of managerial control while another category sees it as a form of class integration. The third category sees interlocking directorates as a tool for reducing uncertainty. The control, service and resource dependence roles of boards fall into each of the respective categories. Indeed, literature on interlocking directorates (Scott, 1985; Glasberg, 1987; Mizruchi, 1996) identified four perspectives that classified the different perspectives on the study of interlocking directorships. The first perspective emphasizes on control; the second on collusion; the third on discretion and the fourth on social embeddedness. These four perspectives fall into the following three schools of thoughts.

## Interlocking directorates as a form of managerial control

The control perspective, propounded by Weberian-based theorists, sees interlocks as a form of managerial control and power rather than ownership or class collusion. Power is dispersed as the companies which the managers control are usually democratically run in ways that are answerable to the larger community. Unlike the other three perspectives, this perspective sees directors' involvement in interlocking directorates in relatively good light. The underlying assumption in the Weberian model is that if ownership is dispersed, the directors "are free to be civically responsible and need not be motivated just by economic self-interest" (Murray, 2001). In *The Modern Corporation and Private Property,* Berle and Means (1932), see shareholders' power as dispersed due to the ownership of stocks by a large number of shareholders. As a result, the increasing dependence of large firms on external capital and the decision-making power in such companies have come to be consolidated in the hands of a few.

## Interlocking directorates as a form of class integration

The embeddedness perspective looks at how interlocking directorships affects class integration. "Interlocks are seen as a mechanism for capitalist class reproduction ('jobs for the boys') and class cohesion ('don't rock the boat; employ your own') (Murray, 2001). Granovetter (1985) in his article 'Economic Action and Social Structure: the Problems of Embeddedness' said that the involvement of business actors with each other was driven more by social rather than economic gains. He suggested that interlocks would influence the organization's strategies, structures and performances.

However, according to Useem (1982) corporate elites enter into politics to ensure that conditions would always be favourable for the growth of the organization. He identified three principles that would affect the ways in which business enters into politics in order to ensure profits:

1. The Upper Class Principle that defines membership into the elite by a person's wealth and membership into the network of social elite (Koenig and Gogel, 1981).
2. The Corporate Principle that defines membership into the elite by a person's position in a firm and the firm's position in the economy.
3. The Class-wide Principle that defines membership into the elite through positions in a set of related networks transacting virtually all large corporations.

## Interlocking directorates as a tool for reducing uncertainty

Many empirical studies have focused on how directorship interlocks act as a mechanism for decision makers to resolve uncertainty. In this regard, it would be advantageous for the directors to build more trust and social capital with the directors of important firms in order to mitigate the amount of uncertainty pertaining to the motives of these strategic firms. The economic condition of environment will be a determinant for firms to decide which firms to interlock with (Mizruchi and Stearns, 1994).

Both the collusive and discretionary perspectives fall under this category of theories which has its roots in the resource dependence theory. Resource dependence theory is about how companies exchange information, capital and market access so as to buffer the effects of environmental uncertainty (Pfeffer and Salancik, 1978).

The collusive model "looks at interlocks as structural mechanisms that cement collusion and subsequently help the development of business cartels" (Murray, 2001). The discretionary model is a bank-centred approach to studying interlocking directorships and is concerned with the study of how interlocking directorates with banks affect the flow of capital to organizations and companies. The bank hegemony theory developed by Mintz and Schwartz (1981, 1983) falls under this model.

Zahra and Pearce (1989) see board members as boundary spanners acting as the communication conduits with the external environment buffer (Pfeffer & Salancik, 1978). Other authors such as Scott and Griff (1983) and Mizruchi (1996) focused on how firms leveraged on the communication, that is, the social aspect of interlocks to help them in furthering their economic interests. In his later work, The Inner Circle (1984), Useem adopted this stance as well and sees a firm's interlocking directorate as a means of providing the firm a wider scan of its business environment. According to Scott (1985), interlocks are able to do this as they are a conduit for information flows. Davis (1991) extended these studies further by adding that interlocking directorships build social capital which can be used for the furthering of business objectives.

Most boards need to fulfil the three aforesaid roles simultaneously. Thus, most directors would be mixing the three classes of theories in their course of dealings with directors of interlocked firms. It would be difficult to measure the degree to which directors are making use of a particular cluster of theories. However, such complexities had not deterred researchers to conduct studies on interlocking directorships to understand the forces that propel directors into entering into such alliances.

## The Singapore Stock Exchange (SGX)

Little research has been conducted to study the extent of directorship interlock in Singapore. The purpose of this study is to throw some light on the extent of interlocking directorships across the companies listed on the SGX Mainboard, ST Index and the different industry sectors. It also examines the characteristics of the interlocks within each sub-group. This study will also provide a source of comparative studies of Singapore with other countries.

SGX was formed with the merger of two financial institutions, the Stock Exchange of Singapore (SES) and the Singapore International Monetary Exchange (SIMEX) on 1st December 1999. In November 2000, SGX became the first stock exchange in Asia-Pacific to be listed via a public offer and a private placement. It is also "Asia Pacific's first demutualised and integrated securities and derivatives exchange. Listed on its own bourse, the SGX stock is a component of benchmark indices such as the MSCI Singapore Free Index and the Straits Times Index." SGX Mainboard consisted of 459 companies as of 31st December 2004. As shown on the official webpage of the Singapore Stock Exchange on 3rd March 2005, these companies represented a total capitalization value of S$446.3 billion as of December 2004. Compared to more established stock exchanges like Nasdaq, the SGX is considered to be relatively small. Studies in countries such as Australia have shown that smaller economies have a higher tendency for interlocking directorships as the talent pool to head companies is usually scarce and has to be shared among firms.

SGX's list of companies consists of nine sectors such as Commerce, Construction, Finance, Hotels & Restaurants, Manufacturing, Multi-Industry, Properties, Transport - Storage - Communications (TSC) and others. It also consists of a group of companies listed under the Straits Times index or ST-index. The ST-index is a group of companies that has been selected by Singapore's leading newspaper, The Straits Times, as the index of choice for reflecting the daily trading activity of stocks on the Singapore Exchange (SGX). At the time of its launch in 1998, the constituent stocks accounted for 78 per cent of the average daily traded value over a 12-month period and 61.2 per cent of the total market

capitalization. The ST index group of companies is therefore significant as it comprised a group of companies that raised the most amount of market capitalization within the stated period.

## Social Network Analysis

Using social network analysis (SNA), the study examines the extent of director interlocks among the publicly listed companies on the SGX Mainboard, the industry sectors, and the ST Index. The study also examines the extent of the interlocks to the resource dependency theory, as well as to identify the various cliques and cohesive subgroups within the network. However, Singapore being such a small economy, and with its limited talent pool of directors, it can be expected that most companies would be highly interlocked hence their dependence on each other.

In analyzing the relationships governing interlocking directorships, researchers have made use of different tools. For example, some studies use regression to analyze the relationship between board size and degree of interlocks, others use Mintz and Schwartz's (1981) method of centrality, breadth and depth analysis to study interlocks. However, in recent years, more and more researchers have turned to SNA, a tool which was initially developed by anthropologist Radcliffe-Brown for studying the social structures of populations.

Using the definition from orgnet.com, "SNA is the mapping and measuring of relationships and flows between people, groups, organizations, animals, computers or other information/knowledge processing entities. SNA provides both a visual and a mathematical analysis of human relationships." It is a set of methods for the analysis of social structures; methods that specifically allow an investigation of the relational aspects of these structures. It is therefore useful for the investigation of kinship patterns, community structure, and interlocking directorships and so forth. The use of these methods depends on the availability of relational rather than attribute data (Scott, 2000). Relational data refers to the contacts, ties and connections, the group attachments and meetings, which relate one agent to another. The methods appropriate to relational data are those of network analysis, whereby the relations are treated as expressing the linkages between the agents. While it is possible to undertake quantitative and statistical counts of relations, network analysis consists of qualitative measures of network structure.

Most SNA studies look to parameters such as density, centrality, centralization, cliques and components for the characteristics of a network so as to determine how closely knitted it is. Density looks at the level of connectedness among the nodes in a network and this statistic will have an effect on the amount of communication and information that is exchanged within the network. Centralization gives an indication of the extent that this connectedness is organized around a highly centralized point. Density and centralization are therefore related concepts (Scott, 2000). Centrality, the extent to which a given individual is connected to others in a network, is the structural property most often associated with instrumental outcomes, including power (Brass, 1984). However, for the study, the extent of the interlock will be based on the number and percentage of directors sitting on more than one company within each network. We will also study the number of components and cliques within each network to further identify the key players or boundary spanners within each network. Networks of both directors and companies will be studied as well in order to understand the key companies which are interlocked and to identify the key directors which are contributing to the interlock.

UCINET, one of the most widely used tools in SNA studies, was used to analyse the data as it is a comprehensive program and is relatively user-friendly that allows the data to be inputted using a spreadsheet.

## Data collection and analysis

The data was collected in March 2005 by downloading the names of companies and their boards of directors from the websites of SGX Mainboard and ST-Index as at 31 December 2004. The list of company names listed on the SGX Mainboard was downloaded from the "By Market" section of its Corporate Information webpage (Listed Companies >> Corporate Information), while that of the ST-Index and the industry sectors were taken from the "Market Indices" section of its Stock/Indices List webpage (Listed Companies >> Stock/Indices). The names of directors on the boards of the companies were obtained from the "Company Directors" section of the Corporate Information webpage. A total of 534 companies were downloaded from the SGX website.

There were a number of inconsistencies and "impurities" in the raw data that would affect the analysis, thus they had to be corrected. The data cleaning process took place on both sets of data for companies and directors. In the companies' dataset, a first level scan of the rows and company names surfaced 64 empty rows, 11 companies listed after 31st December 2004 and 1 duplicate entry of a company. All these had to be removed as UCINET does not accept any empty spaces in the inputted dataset. The number of companies after the first round of cleaning was reduced to 458.

As the data was downloaded in March 2005, some companies which were listed on the SGX Mainboard on 31st December 2004 may have since left the listing, thus their data could have been omitted. The data was then verified against publications that were dated December 2004 in order

to include these omissions. This verification was done against the January 2005 issue of "Pulses" which is monthly publication by SGX. Each issue contains information on the stock pricing of the companies listed on the SGX Mainboard in the previous month and as such provided accurate data as at 31st December 2004. The total number of companies that we found listed on the SGX Mainboard after the verification was 459. Verification for the 45 companies on the ST-Index was done against the Straits Times newspaper dated 1st Jan 2005. The companies on SGX Mainboard were sub-categorized into 9 industry sectors.

Table 1shows a summary of the number of companies on the SGX Mainboard, ST index and the industry sectors.

**Table 1.** Companies on SGX Mainboard and ST-Index

| Listings | Number of Companies |
|---|---|
| SGX Mainboard | 459 |
| ST-Index | 45 |
| Industry sectors within SGX Mainboard | |
| Commerce | 71 |
| Construction | 24 |
| Finance | 27 |
| Hotel & Restaurant | 16 |
| Manufacturing | 185 |
| Multi-Industry | 19 |
| Others | 63 |
| Properties | 22 |
| TSC (Transport-Storage-Communications) | 32 |

In cleaning the data on the directors' name list, we encountered a number of problems. For example, we observed that a director could be registered with alternative titles and salutations such as Col, Datin, Dato, Datuk, Dr, Lt-Gen, Prof, Sir, etc with different companies. This posed a problem as UCINET would consider these two entries as two different persons, thus having a significant impact on the findings as the same director would have different network parameters associated with him if the programme regarded him as two different directors. Therefore, titles and salutations in the dataset of directors' names were removed.

Further, we also observed that some Chinese directors registered their Christian names with one company but not with another. UCINET also treats such entries as two different persons. These entries could lead to the erroneous deduction that two companies have no relationship although there are some directors sitting on both their boards. We decided that names which differed only by an additional Christian name, would be taken to be the same person and the longer name was kept. It was assumed that in a small country like Singapore with a population of only 4 million, the likelihood of two Chinese with the same name and achieving the same corporate status would be almost negligible. In total, 35 director names were replaced from SGX Mainboard data and 2 names were replaced in the list of companies in the ST Index data. Finally, all the spaces between characters in company names and director names were removed as UCINET would treat each of the characters separated by spaces as unique items. The text file was inputted into UCINET and a case-by-affiliation matrix (also known as incidence matrix) was generated. Companies usually form the central unit of analysis in most studies on interlocking directorships studies and they are regarded as the "cases". Directors, being the agents linking the companies, are regarded as the "affiliations". We have adopted a similar approach in our study and companies (which are the cases) are represented in the rows of the incidence matrix while the directors (the affiliations), which the companies have or do not have in common with one another, are represented in the columns.

From this incidence matrix, we derived two adjacency matrices, namely, the company-by-company matrix and the director-by-director matrix. We inputted these matrices into UCINET and using the functions available in the software, we were able to derive the network parameters consisting of the network density, betweenness, degree, bridges, cliques and components.

To determine the number of interlocking directorships, the diagonals of the directors' affiliation matrices for SGX Mainboard, ST Index companies and the 9 industry sectors were extracted using the UCINET command Data>Diagonal. The diagonal of the directors' affiliation matrix reflects the number of interlocking directorships. The data is converted into the spreadsheet format and the number of directors not in interlocking directorships (that is, the number of directors who sit in one company) was obtained using the "filter" command in Microsoft Excel. To calculate the number of directors in interlocking directorships, we subtract the number of directors not in interlocking directorships from the total number of directors. The steps above were repeated for SGX Mainboard, ST Index and the 9 industry sectors.

Using the Microsoft Excel files that contained the diagonals of the directors' affiliation matrices, the director who sits in most number of companies was identified. The file that contained the companies

and respective directors was used to find the companies that these directors sit on.

## Results and findings

The graphical representations of the networks are derived through the PAJEK programme and Netdraw in UCINET. For example, Figure 1 shows the SGX Mainboard companies network and Figure 2 shows the SGX Mainboard Directors network. Figures 3 and 4 show the ST Index companies' network and Directors, network respectively. It is from these network diagrams that we were able to provide hints of the possible interlock incidences within each dataset. The following section explores in more depth the relationships and attempts to draw possible patterns derived from the analysis *[see appendices, figures 1-4]*.

Table 2 contains the information on the total number of companies and directors in each dataset, as well as the results generated from UCINET, using SNA parameters such as network density, average distance, betweeness, centrality and Freeman degree centrality *[see appendices, table 2]*. The Lambda set approach was used to identify the companies and directors which were the key bridges in each dataset.

It can be observed that the overall network density for both company to company (C-C) (0.0127<density<0.01434) and director to director (D-D) (0.0036<density<0.0751) affiliation matrices for all datasets is low. Despite not having a mode of direct comparison, a close approximation can be used from a study conducted in the rural county of Ringkobing in Denmark. The datasets for that study were significantly bigger (company size >1000 for each dataset) and the density was much lower. The network density for companies in Ringkobing was between 0.0039 and 0.0005 and the density for directors was between 0.0010 and 0.0019. A logical comparison can be made between the two since a larger dataset yields a lower density and a smaller dataset yields a higher density (Scott, 2000).

With the exception of the SGX Mainboard and SGX Manufacturing which are the largest datasets, the average distance for the remaining datasets decreases to less than 3. This can be attributed to the relative smallness of these datasets, hence explaining the shorter distance between two companies or directors. Contradicting this observation however is the ST Index that displays an average distance of 3.026. Although popular belief tells us that the government-linked companies which dominate the ST dataset tend to have higher incidence of interlocking directorship, the analysis does not show it.

Table 2 also highlights the companies and directors with the highest betweenness centrality whilst Table 3 shows those with the key bridges for each of the 11 datasets. When using the Lambda set approach to identify the key bridges in each of the datasets using the D-D affiliation matrix, it was observed that 3 particular names (Brian Richard Keelan, Simon Keswick and Henry Keswick) appeared in the ST Index, SGX Commerce and SGX Hotel and Restaurant. It can be deduced that these three individuals are key bridges of the social networks. Using this set of findings, an investigation was conducted to verify if the director who holds the highest number of directorship positions is the same as the one who has the highest Freeman degree centrality.

**Table 3**. Network on Key Bridges

| Dataset | Number of Companies | Number of Directors | Key Bridges | |
|---|---|---|---|---|
| | | | Company | Director |
| SGX | 459 | 2661 | Note: Unable to obtain results | Note: Unable to obtain results |
| ST Index | 45 | 362 | Jardine Strategic Hldgs Ltd<br>Jardine Matheson Hldg Sltd | R C Kwok, Brian Richard Keelan<br>Simon Keswick, C G R Leach<br>Percy Weatherall, Henry Keswick |
| SGX Commerce | 71 | 492 | Jardine Strategic Hldgs Ltd<br>Dairy Farm Int' Lholdings Ltd | Percy Weatherall, Henry Keswick<br>R C Kwok, C G R Leach<br>Brian Richard Keelan, Norman Lyle,<br>Simon Keswick |
| SGX Construction | 24 | 172 | Koh Brothers Group Limited<br>L & M Group Investments Ltd<br>Econ International Ltd<br>Low Keng Huat (Singapore )Ltd<br>King Wan Corporation Limited<br>Chip Eng Seng Corporation Ltd<br>United Fiber System Limited | Sakae Ando, Lee Suet Fern<br>Boey Ta kHap, Liow Keng Teck<br>Osamu Abiko, Katsush iMiyamoto<br>Ng Que kPeng, Kazuo Kanaya<br>Li Ling Xiu, HiroshiIde |
| SGX Finance | 27 | 238 | United Intl Securities Ltd<br>United Overseas Insurance Ltd | Wee Ee Cheong, Wee Cho Yaw |

The findings revealed some patterns that are consistent with our prediction that the extent of the interlock would be high due to the small size of talent pool of directors in a small economy. It can be observed on Table 4 that in the ST Index, Brian Richard Keelan occupies the highest number of directorships positions and is also one of two directors with the highest Freeman degree centrality. Also note that Jardine Matheson Holdings Ltd with the highest Freeman degree centrality is one of the companies that Brian Richard Keelan sits on. Although this relationship is not prevalent across all datasets, it can be said that if a director occupies the highest number of directorships positions, he/she is more likely to be one with the highest degree of centrality in a specific social network.

Table 5 shows a summary of the extent of interlocking companies. SGX and ST have the highest percentage of companies that are interlocked, at 89.3 per cent and 82.2 per cent respectively. Conversely, SGX Construction displays the lowest percentage (29.2 per cent) of companies that are interlocked. The findings also revealed that there are 2661 directors occupying 3485 directorship positions on the SGX MB.

**Table 4.** Relationships between Freeman Degree Centrality and Number of Directorship Positions

| | **SGX MB** | **ST Index** |
|---|---|---|
| Director | Reggie Myint Thein | 1.Brian Richard Keelan<br>2. Peter L.H. Seah |
| Highest # of Director Positions held | 12 positions | 1. 5 positions<br>2. 5 positions |
| Names of Companies this director sits in | Bil International Ltd<br>Central Properties Ltd<br>FJ Benjamin Holdings Ltd<br>Grandbanks Yachts Ltd (GBholdings)<br>Guoco Land Limited<br>Haw Par Corp Ltd<br>Hotel Malaysia Ltd<br>Keppel Tele & Tran<br>Lindeteves-Jacoberg Ltd<br>MFS Technology Ltd<br>Mobile One Ltd<br>Goodwood Park Hotel Ltd | 1.<br>Dairy Farm Int'l Holdings Ltd<br>Hongkong Land hldgs Ltd<br>Jardine Cycle&Carriage Ltd<br>Jardine Matheson Hldgs Ltd<br>Jardine Strategic Hldgs Ltd<br>2.<br>Capital Land Limited<br>Chartered Semiconductor Mfg Ltd<br>Sembcorp Industries Ltd<br>Singapore Tech Engineering Ltd<br>Stats Chip Pac Ltd |
| Companies with Highest Freeman Degree Centrality | Haw Par Corp Ltd<br>Singapore Land Ltd<br>United Industrial Corp Ltd | Jardine Matheson Hldgs Ltd |
| Directors with Highest Freeman Degree Centrality | Wee Cho Yaw | Brian Richard Keelan |

**Table 5.** Summary of Company Interlocks

| ***Dataset*** | **#. of Companies** | **% of Companies not interlocked** | **% of Interlocked Companies** |
|---|---|---|---|
| SGX MB | 459 | 10.7 | 89.3 |
| ST index | 45 | 17.8 | 82.2 |
| Commerce | 71 | 56.3 | 43.7 |
| Construction | 24 | 70.8 | 29.2 |
| Finance | 27 | 59.3 | 40.7 |
| Hotel/Restaurant | 16 | 62.5 | 37.5 |
| Manufacturing | 185 | 25.9 | 74.1 |
| Multi Industry | 32 | 63.2 | 36.8 |
| Others | 63 | 52.4 | 47.6 |
| Properties | 22 | 40.9 | 59.1 |
| Tpt-Stor-Com | 19 | 62.5 | 37.5 |

Table 6 shows the directors interlocks in both SGX Mainboard and ST Index. It can be deduced that 443/2661 = 16.6 per cent of the directors are interlocked and are occupying positions in other companies within the SGX Mainboard. The percentage of interlocked directors in the ST Index also shows a close, but higher figure of 18.5 per cent. In the remaining datasets, the extent of interlocking directorships seems relatively lower compared to those of SGX and ST Index.

It is observed that the percentage of interlocked companies from the SGX MB is 89.3 per cent, whereas the percentage of interlocked directors is a low 16.6 per cent. While these results may appear inconsistent at first glance, comparing the mean number of directorships positions held per director with the mean number of directorship positions offered per company will help us to better understand the occurrence

Table 7 shows the mean number of directorships held per director. Taking x to be the mean number of directorships held per director, this mean was derived using the following formula:
*[(Total no. of directors in the dataset – No. of interlocked directors in the dataset) * 1 directorship position] + [No. of interlocked directors in the dataset * x] = Total no. of directorship positions in a dataset.*

Using the SGX Mainboard dataset as an example, the computation is as follows:

*[2661 – (443)1] + [443*x] = 3484*

*x = 2.86, where x is the mean number of directorships held per director in the SGX Mainboard*

Since the mean number of director positions per company in the SGX Mainboard is 8 and just 1 director occupying a seat in another company would create an interlock, it therefore mean that only 1 out of 8 seats needs to be occupied by another director for a company to be interlocked. However, the mean number of directorship positions held per director is 2.86. This means that there is a lower possibility of an interlock taking place, simply because a director on a SGX Mainboard company occupies an average of 2.86 seats, leading to a relatively lower percentage of interlocked directors. At this point, despite the SGX Mainboard having a low mean of 2.86, there are directors who have abnormally high interlocked relationships such as Reggie Myint Thein who holds 12 directorships.

We also examined the prevalence of cliques and their significance across companies. Table 8 presents a snapshot summary on the prevalence of cliques formed outside the same company. 481 cliques were discovered in the SGX Mainboard. However on closer inspection, it was discovered that there were in fact 8 cliques of directors that sat on the same board in the same company. Discounting this incidence, we still have a relatively high number of 473 cliques that are not attributable to the same company.

In summary, the findings show that there are varying degrees of interlocking directorships within the different datasets. On average, each director from a SGX Mainboard-listed company sits on more than 2 directorship positions. The relatively high number of cliques that are not attributable to the same company also suggests that there is a significant occurrence of interlocking directorship in SGX Mainboard, ST Index and 9 other industry sectors.

**Table 6.** Summary of Director Interlocks

| *Dataset* | # of Directors | # of Directorship positions | # of Directors Not Interlocked | # /% of Interlocked Directors |
|---|---|---|---|---|
| SGX MB | 2661 | 3484 | 2218 | 443 (16.6%) |
| ST Index | 362 | 463 | 295 | 67 (18.5%) |
| Commerce | 492 | 257 | 463 | 29 (5.9%) |
| Construction | 172 | 534 | 168 | 4 (2.3%) |
| Finance | 238 | 176 | 222 | 16 (6.7%) |
| HotelRestaurants | 113 | 123 | 104 | 9 (8.0%) |
| MFG | 1175 | 1326 | 1069 | 106 (9.0%) |
| Multi Industry | 158 | 257 | 145 | 13 (8.2%) |
| Others | 408 | 437 | 381 | 27 (6.6%) |
| Properties | 187 | 202 | 175 | 12 (6.4%) |
| Tpt-Stor-Com | 243 | 172 | 230 | 13 (5.3%) |

**Table 7.** Summary of average number of directorships held per director in all datasets

| *Dataset* | Mean # of Positions Per Company | # of Directors Not Interlocked | # /% of Interlocked Directors | Mean # of directorships held per director |
|---|---|---|---|---|
| SGX MB | 8 | 2218 | 443 (16.6%) | 2.86 |
| ST Index | 10 | 295 | 67 (18.5%) | 2.51 |
| Commerce | 10 | 463 | 29 (5.9%) | 2.19 |
| Construction | 8 | 168 | 4 (2.3%) | 2.45 |
| Finance | 7 | 222 | 16 (6.7%) | 2.00 |
| Hotel/Res | 8 | 104 | 9 (8.0%) | 2.11 |
| MFG | 7 | 1069 | 106 (9.0%) | 2.42 |
| Multi Industry | 8 | 145 | 13 (8.2%) | 2.08 |
| Others | 7 | 381 | 27 (6.6%) | 2.07 |
| Properties | 9 | 175 | 12 (6.4%) | 2.25 |
| Tpt-Stor-Com | 9 | 230 | 13 (5.3%) | 2.08 |

**Table 8:** Summary of clique measures in SGX MB and SGX Finance datasets

| Dataset | Clique Size – 4 directors | # of cliques of directors in same SGX MB company | Cliques not attributable to same – company directorship positions |
|---|---|---|---|
| **SGX Mainboard** | **481** | **8** | **473** |
| **SGX Finance** | **27** | **1** | **26** |

## Limitations and directions for further research

The exploratory nature of the study means that further in-depth studies can be performed on the same set of data. For example, due to time constraints, we were unable to explore, to greater depth, the degree of interlocks between the different sectors on the SGX Mainboard. Such a study would be useful in looking at the dependencies of different sectors on each other from the resource dependency theory. However, such a study would require extensive data generation of between two or more sub-sectors at any single generation. As there are 9 different industry sectors within the SGX Mainboard, the total number of datasets generated would be 81.

Factors such as uncertainty in the external environment could also have an effect on the extent of interlocks within the SGX Mainboard companies. It is interesting to compare the extent of interlocks in the SGX Mainboard during the 1997 financial crisis with that in 2004. However, in order for meaningful comparisons to be made across different datasets, the sample size of each dataset must be as identical as possible. Over time, the impact of interlocking directorships on the financial performance could also be made. At this stage, we were unable to make such comparisons as the number of such studies on interlocking directorships in Singapore is still relatively small.

As the information collected was based on the websites, the plotting of undirected network graphs may give relatively little information on the strength of the interlocks. Researchers studying social capital would find the strength of the interlocks a very useful statistic. However, extensive interviews spanning a period of months or even years have to be done on each of the 2661 directors in order to determine the strength of the interlocks. Given the time limitation of the study, we were unable to conduct such interviews. Nonetheless, the study may provide future researchers some information on which interlocks and directors they should focus on in doing further study on social capital.

The findings are based on the assumption that interlocks are indicators of potential power relationships between companies at the highest level. It cannot be inferred that directors exploit networks of board memberships merely because such potential exists (Pettigrew 1992). Future research can leverage on our findings to explore the actual benefits accrued from these interlocks as an active interlocking directorate can only be said to occur where "the link is of actual benefit to the firms involved" (Fogelberg and Laurent 1974).

## Conclusion

Indeed, the phenomenon of interlocking directorship is an interesting area of study in the local context. The potential of studying the effects of interlocking directorships on different facets of companies is tremendous, and is a niche area within the wider study of corporate governance which is still glaringly lacking. Further studies in this area, particularly in monitoring the extent of collusion (if any) among influential companies and directors such as the "key bridges", would be useful in advancing our

understanding on the importance and impact of interlocking directorships in Singapore.

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## Appendices

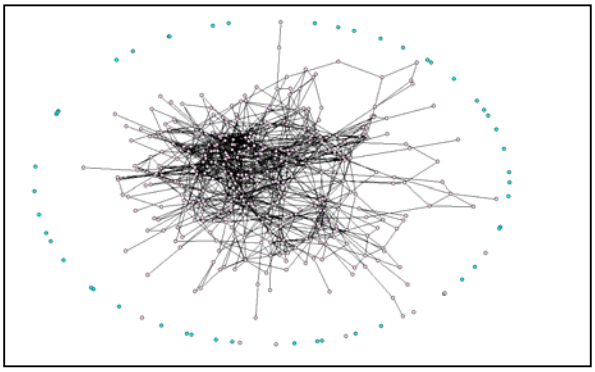

**Figure 1.** SGX Mainboard Companies Network

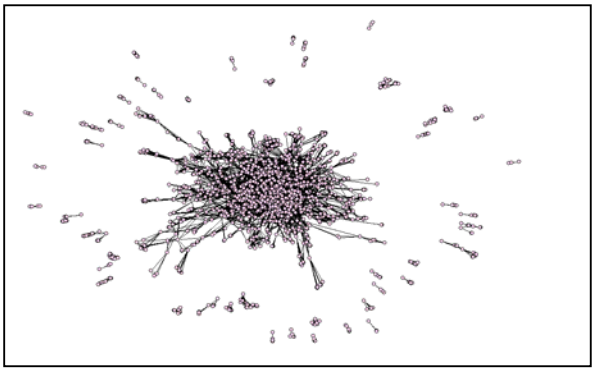

**Figure 2:** SGX Mainboard Directors Network

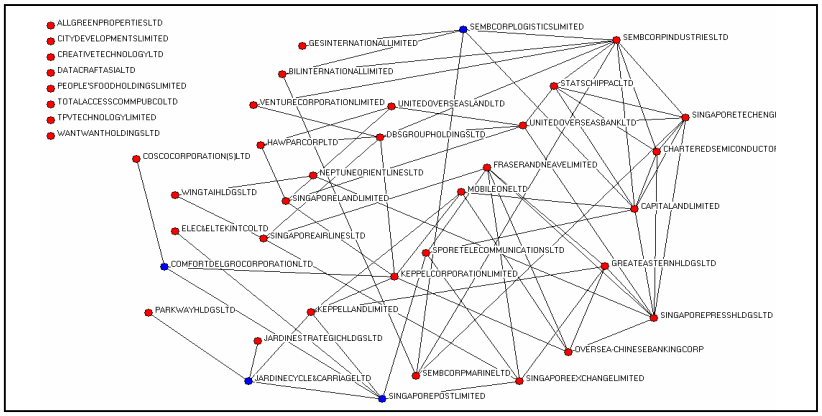


**Figure 3.** ST Index Companies Network

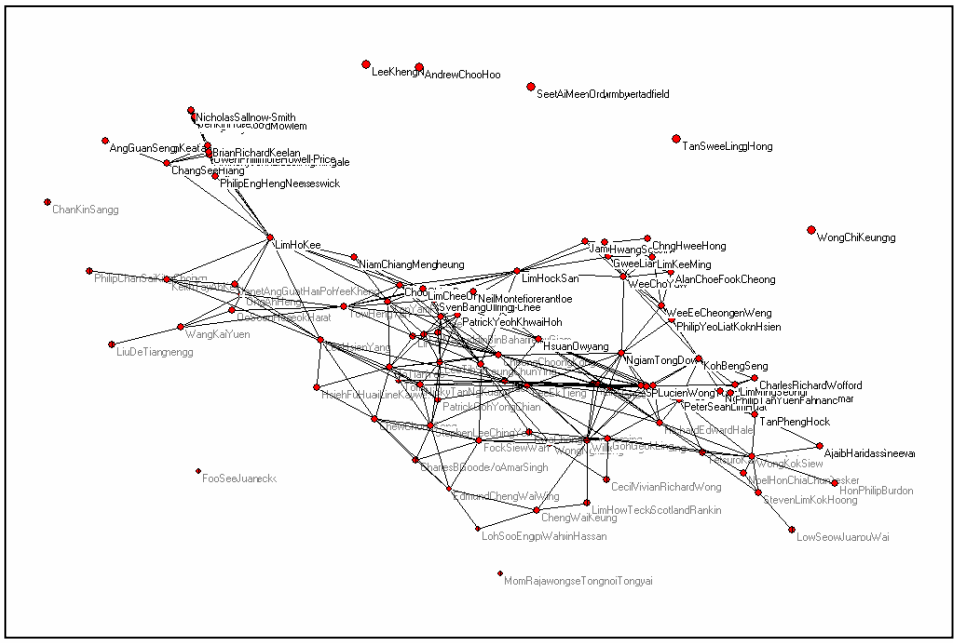


**Figure 4.** ST Index Directors Network

**Table 2.** Network Overview

| Dataset | Number of Companies | Number of Directors | Network Density | | Average Distance | | Companies/Directors with the highest betweeness centrality | |
|---|---|---|---|---|---|---|---|---|
| | | | *Company* | *Director* | *Company* | *Director* | *Company* | *Director* |
| SGX MB | 459 | 2661 | 0.0153 | 0.0036 | 4.068 | 4.932 | Yeo Hiap Seng Ltd | Chew Heng Ching |
| ST-Index | 45 | 362 | 0.1434 | 0.0349 | 3.026 | 3.736 | Jardine Cycle & Carriage Ltd | Lim Ho Kee |
| SGX Commerce | 71 | 492 | 0.0225 | 0.0155 | 1.887 | 2.052 | Pertama Holdings Limited | Hee Theng Fong |
| SGX Constructio | 24 | 172 | 0.0145 | 0.0392 | 1.2 | 1.344 | Chip Eng Seng Corporation Ltd | Goh Chee Wee<br>Ang Mong Seng |
| SGX Finance | 27 | 238 | 0.0627 | 0.0453 | 2.636 | 2.866 | Singaporere Insurance Cor Ltd | Tan Beng Lee |
| SGX Hotel and | 16 | 113 | 0.0917 | 0.0751 | 1.286 | 1.282 | Overseas Union Enterprise Ltd | Wong Hung Khim |
| SGX Manufacturi | 185 | 1175 | 0.0127 | 0.0066 | 5.115 | 5.906 | Singapore Press Hldgs Ltd | Teng Cheong Kwee |
| SGX Multi | 19 | 158 | 0.0877 | 0.0627 | 1.714 | 2.037 | Haw Par Corp Ltd | Hong Hai<br>Lim Hock San |
| SGX Others | 63 | 408 | 0.0159 | 0.0289 | 1.292 | 1.844 | Singapore Airport Trml Svcs Ltd | Hong Hai |
| SGX Properties | 22 | 187 | 0.0736 | 0.0532 | 1.929 | 2.266 | Dragon Land Ltd | Kevin Wong King cheung |
| SGX Tpt-Stor- | 32 | 243 | 0.0302 | 0.0341 | 1.84 | 2.199 | Comfort Delgro Corporation Ltd | Ong Ah Heng |