Is Social Capital an Effective Director Attribute?

An Empirical Analysis of Board of Directors' Social Connectivity and its Contribution to New Zealand Stock Exchange Firms

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He Mihi

Ko Taupiri te maunga tapu
Ko Waikato te awa
Ko Waikato te iwi
Ko Tainui te waka
Ko Potatau Te Wherowhero te tangata
Ko Ngāti Āmaru, ko Ngāti Pōu, ko Ngāti Tarāo hoki ngā hapū
Nō Akarana ahau
Ko Te Awamārahi te marae

I te taha o taku pāpā…
Ko Tiahuia Nehu Tonga taku kuia. Ko Martin Matekino Puhirawaho Ngataki taku koroua
I te taha o taku māmā…
Ko Jonna Andersen taku karanimā. Ko Erik Andersen taku karanipā

Ko Malene Helle Andersen rāua ko Gordon Huriwhenua Ngataki aku mātua
Ko Angela taku ingoa

No reira, tēnā koutou, tēnā koutou, tēnā koutou katoa

Abstract

Corporate directors are required to have an adequate set of capabilities to meet an increasingly diverse range of board responsibilities. Social capital, the value that resides in relationships with others, is an attribute that can support firms by assisting directors in directing and advising management. An important source of social capital that directors bring to the boardroom is their connections to other directors. This connectivity allows directors to access other board members' skills, knowledge and experiences. In particular, networks of directors facilitate the sharing of greater amounts of timely and business-relevant information. However, the prevailing literature has not been able to provide a consistent answer as to the value of social connectivity. This thesis investigates whether social capital is an important director attribute by employing Social Network Analysis. Using a hand-collected dataset of directors, we contribute to the finance literature by providing new empirical evidence on the value of social capital for New Zealand listed firms.

This thesis consists of three empirical studies that collectively provide evidence on the value of social capital for directors and firms. First, we examine the determinants of social capital. We find a positive and significant relationship between human capital and social capital which suggests that human capital needs to be controlled for when examining the importance of connectivity. To date, this issue has not been well considered in previous studies. Second, we study whether connectivity is conducive to board appointments by investigating the value that firms and shareholders place on social capital. The results suggest that social capital positively influences the director selection process, above and beyond human capital. We find that directors who are more connected, receive more board appointments because of their higher social capital. However, we also document that there is no significant abnormal market reaction to firms that appoint well-connected directors. This finding suggests that greater connectivity allows directors to access new board positions despite not necessarily contributing to shareholder value. Third, we find that social capital improves firm performance, although this relationship is non-linear whereby the benefit of

connectivity decreases if boards become far too connected. We also find that poorly performing firms achieve greater benefits from connectivity than firms already performing well. We further document that social capital has a greater impact on firm performance when there is a greater need for the board's input.

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Attestation of Authorship

I hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Angela Andersen

6th May 2019

Acknowledgements

Whakatauki: Te Pā Harakeke
(The Flax Bush, which represents the family)

Hutia te rito o te harakeke
Kei hea te komako e kō?
Kī mai koe ki a ahau
He aha te mea nui o te ao?
Māku e kī atu
He tangata, he tangata, he tangata

Pluck the centre shoot from the flax bush
Where will the Bellbird sing?
You ask me
What is the most important thing in the world?
I will say
It is people, it is people, it is people

Te Pā Harakeke expresses the importance of human relationships which aligns with the topic of my thesis. It also commiserates with a key learning experience of my PhD. I experienced the importance of connection and communication and allowing myself to grow from the influence of intellect, encouragement and advice. I achieved a dream because I did not walk alone on this journey.

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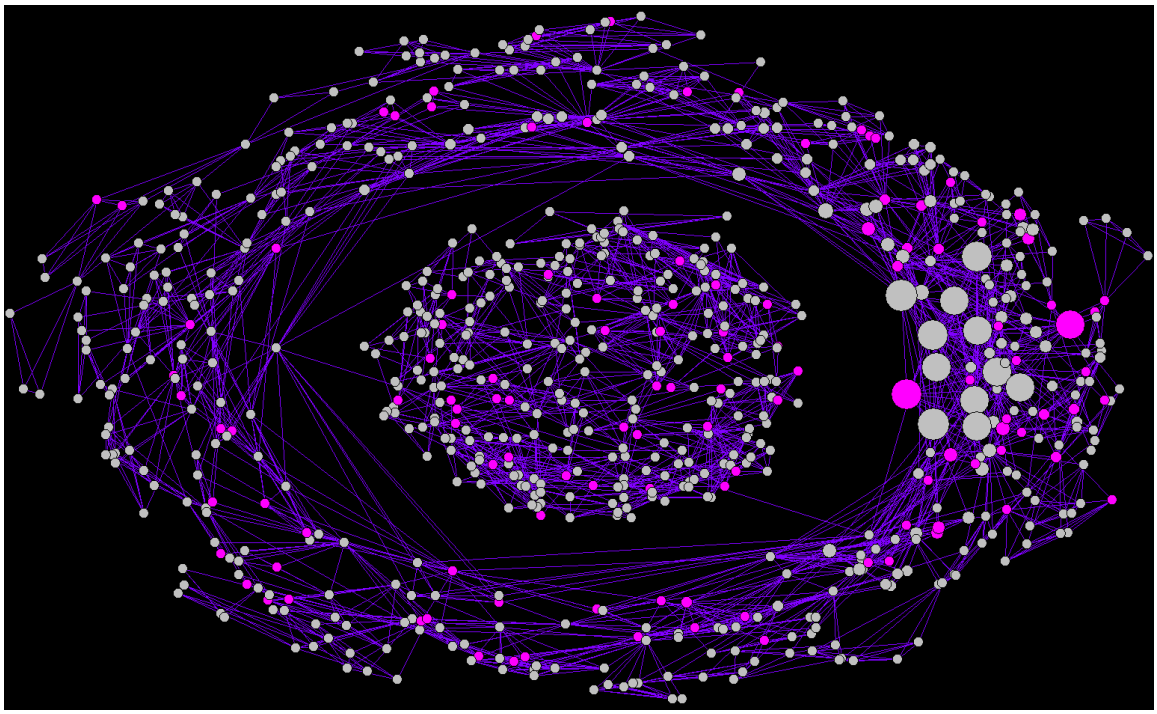
[1] Chapter 6 of the thesis received the NZX Best Paper Award for Outstanding Research with Practical Application at the 2019 New Zealand Finance Colloquium.

Prologue

Is social capital an important director attribute? *This is the subject of my thesis.*

This image is the New Zealand director network in 2015. Each line represents a connection from one director to another director through a common board appointment, connecting firms. The outer sphere is the largest connected network which has the greatest level of connectivity and the inner sphere consists of many smaller satellite networks.

This thesis employs Social Network Analysis to investigate the importance of a directors' social capital based on their connections and position within the New Zealand director's network. We measure a director's network position across four different network dimensions, highlighting one of these dimensions here in this graph where the larger circles represent those with the most direct connections to other highly connected directors. We also describe the attributes of directors, one of which is gender, where in this image, pink represents female.



Graph created by UCINET NetDraw network visualization tool (Borgatti, Everett, & Freeman, 2002).

Key Definitions

Human Capital	Human capital refers to the value of people's personal attributes such as the skills and knowledge acquired through experiences, training and education (Becker, 1964, 1993).
Social Capital	Social capital is broadly defined as the value that resides in social relationships, including factors such as such as the ability to access other's human capital, trust, and norms of reciprocity, in which social networks facilitate (Burt, 1992).
Social Connectivity (referred to in the thesis as connectivity)	Social connectivity is a source of social capital and is the main variable of interest in this thesis. Social connectivity allows access to others' human capital by being connected to them.
Social Network Analysis (SNA)	The empirical measurement of the connectivity in social networks to investigate the value of directors' social capital (Wasserman & Faust, 1994). Social network analysis primarily uses four measures of connectivity that capture different aspects of an individual's connections in a network: Degree (Nieminen, 1974), Closeness (Sabidussi, 1966), Betweenness (Freeman, 1977), and Eigenvector (Bonacich, 1972, 1987).

Chapter 1

Introduction

1.1 Context

1.1.1. The role of the board of directors

The board of directors play a crucial role in the corporate governance and strategic planning frameworks in firms. The board approves management's strategic proposals and long-term decisions by evaluating their implications for firm value (Fama & Jensen, 1983b; Adams, Hermalin, & Weisbach, 2010). The board provides oversight and control over managers and their decisions to help ensure that the firm is operating in such a way that maximises shareholder value. In addition to this role, resource dependence theory argues that boards act as management's strategic counsellors, disseminating information, resources and ideas when advising management on key and complex strategic matters (Hillman & Dalziel, 2003; Hillman, Withers, & Collins, 2009). As a result, it is crucial that the board of directors is able to cope with an increasingly wide range of responsibilities (Kirkpatrick, 2009).

The expanded responsibilities of directors require them to possess an equally expanded range of capabilities to fill their blended role of oversight and advisory (Carpenter & Westphal, 2001; Withers, Hillman, & Cannella, 2012). For instance, directors are expected to be efficient in board processes such as ensuring meetings are balanced between substantive discussion on key items and routine matters and be able to deliberate with management and direct their decisions. Directors

need to provide input into strategy development and suggest ways in which it may be achieved, through for example, adequate design of operations (Anderson & Maley, 2007). Directors must have a strong understanding of how to operationalise complex plans, the financial complexities involved, and thus, understand the internal environment of the firm itself (Allio, 2004). They are also required to understand the external environment to identify current industry or competitive challenges (Pfeffer & Salancik, 1978), social responsibilities (Spencer Stuart, 2017a), and essentially key risks (Kor & Sundaramurthy, 2009). For some industries, technological evolution is becoming increasingly important, driving the need for firms to constantly adapt and innovate (Dalziel, Gentry, & Bowerman, 2011). Consequently, boards need to be dynamic to keep pace with the agile technological environment (Spencer Stuart, 2017a) as well as their increasing and time consuming responsibilities (Bowley, 2010). Therefore, it is important for directors to have a mix of skills, experience and current commercial knowledge to effectively support their advisory and monitoring functions (Carpenter & Westphal, 2001; Allio, 2004; Kor & Sundaramurthy, 2009). One issue with the board's increasing responsibilities is whether directors are able to personally provide enough of these capabilities. Co-opting other people's skills and knowledge is one way to increase the skills without having it personally, and so the social capital in connections may be an important contribution to firms.

As a result of its crucial role, the board of directors has been the focus of many studies across a wide range of disciplines. Earlier research predominantly focused on understanding the efficacy of board composition such as the role of board size (Yermack, 1996; Ferris, Jagannathan, & Pritchard, 2003), independence (Hermalin & Weisbach, 1988; Bhagat & Black, 1999), non-executive directors (Byrd & Hickman, 1992) and committees (Klein, 1998; Xie, Davidson III, & DaDalt, 2003). However, recent research has focused on the individual and combined attributes of the board of directors. In particular, studies have begun to consider the effectiveness of directors' attributes by investigating their impact on firm outcomes (see Johnson, Schnatterly, & Hill, 2013

for a literature review). These studies have predominantly shown that the attributes of directors can effectively assist the board in monitoring and advising management.

1.1.2. Social capital in finance

An aspect that has recently been of interest to both academics[2] and practitioners[3] is social capital. Social capital is the value that resides in the social relationships between individuals including the opportunity for individuals to communicate and share their knowledge and skills (Burt, 1992). Therefore, an individual with a wider pool of friends and associates, who we would classify as well-connected, has a greater level of social capital.

The social capital measures commonly employed in the finance-related literature typically capture only direct connections, such as two corporate insiders being connected through attending the same university (Hwang & Kim, 2009) or sitting on the same board (Davis, 1996). Recently, researchers have begun to explore broader dimensions of connectivity via chains of directors that sit on multiple boards by employing Social Network Analysis (SNA). SNA provides a way of measuring a person's connectivity and by extension, their social capital. SNA suggests that network location is important as better social connectivity enables faster communication, better control and greater access to pertinent information (Wasserman & Faust, 1994). This can enable boards to be more effective in meeting the diverse range of responsibilities their roles demand (Pfeffer & Salancik, 1978).

[2] See for example Horton, Millo and Serafeim (2012) who discuss the increasing academic attention being placed on social networks and agency problems. They base their director study on social capital theory from the perspective of Burt (1992), suggesting that the connectivity in social networks contributes to an individual's access to a broader source of information and other skills through both direct and indirect ties.

[3] For example, the Spencer Stuart (2017a) guide for best practice in board rooms outlines the increasing issue for firms with directors who hold multiple positions concurrently on different public company boards. It outlines the heightened responsibilities these directors face due to today's level of commitment required by directors, the burden on firms in risky operational environments, and the additional pressure on these directors from corporate year-ends compressing diaries. Additionally, these directors are more likely to hold positions at private companies and not-for-profit organisations, further exacerbating their commitments. These aspects indicate that the industry views excessive directorships to be detrimental to firms. This raises questions about the consequences of connectivity in that there may be similar issues associated with being more connected. For instance, an overload of information via network channels may reduce the efficacy of the board's advisory and monitoring roles (Khanna, Jones, & Boivie, 2014).

Within the context of corporate finance, connections to other firms allow the sharing of timely and business-relevant information. This information may pertain to contemporary growth opportunities and competitive threats in particular industries, market segments, and countries (Larcker & Tayan, 2010; Klarner, Probst, & Useem, 2015). Or the opportunity to gain alternative strategies and corporate practices, while maintaining up to date knowledge of market trends (Carpenter & Westphal, 2001). This information can support the firm by assisting directors with directing and advising management, suggesting that well-connected directors are better able to perform the board's multiple roles (Stuart & Yim, 2010).

Connectivity's value has been verified in discussions with the board of directors' themselves. For instance, New Zealand director Julia Raue, says she actively uses her connections with other directors to learn from their experiences. "I have been incredibly fortunate to work with some of the country's top directors, and I have definitely watched and learned from their experience, and the experience of those in my wider networks" (Raue, 2019, Q. 3). Results from recent research interviewing with more than 30 directors and executives from leading firms, reveals the value of connectivity in board discussions where "directors use insights gained through their professional networks and from their other board engagements when discussing important matters such as the firm's strategic direction, leadership development, and CEO succession planning" (Klarner et al., 2015, Para. 3).

Prior academic studies have indicated that social connectivity can influence firms in various ways. On the positive side, the seminal work of Pfeffer and Salancik (1978) argues that connections to other firms can provide boards the ability to meet the diverse range of demands from their roles and operational environment. For instance, studies find that the anti-takeover practice of one firm has been passed onto another connected firm (Davis, 1991), as well as profitable acquisition strategies (Haunschild, 1993), and beneficial corporate policies (O'Reilly, Main, & Crystal, 1988). Later studies find that social connectivity positively influences firm performance (Horton et al., 2012; Larcker, So, & Wang, 2013; Omer, Shelley, & Tice, 2014b),

corporate decisions (Omer, Shelley, & Tice, 2014a), earnings management (Fogel, Ma, & Morck, 2015), corporate finance policies (Fracassi, 2017), corporate governance (Horton et al., 2012; Fogel et al., 2015), and management's planning and forecasting (Schabus, 2018). These positive contributions are uniformly argued in the literature to be manufactured by the sharing of information, support and experiences between boards. However, the prevailing literature has not been able to provide a consistent answer as to the value of this social connectivity.

In contrast, other studies suggest that connectivity weakens the firm's corporate governance by limiting the board's efficacy to make good monitoring decisions (Barnea & Guedj, 2007). Connectivity has also been associated with managerial entrenchment (El-Khatib, Fogel, & Jandik, 2015), the spread of value-destroying corporate practices (Chiu, Teoh, & Tian, 2013). and poor firm performance (Andres, Bongard, & Lehmann, 2013; Andersen & Gilbert, 2014). One reason for the negative impact of connectivity is that boards may get overloaded with too much information (O'Reilly, 1980; Chewning & Harrell, 1990). Another reason is that directors sitting on multiple boards may become too busy to spend the time and effort to meet their board responsibilities (Fich & Shivdasani, 2006; Cashman, Gillan, & Jun, 2012; Khanna et al., 2014). Prior studies therefore suggest that connectivity could influence firms in both positive and negative ways.

1.2. Motivation

1.2.1. Literature

This thesis is motivated by the absence of a clear understanding about the implications of social connectivity. Aside from the inconsistency in the empirical findings, another, and perhaps a contributing issue with the prevailing literature, is the absence of adequate controls for a director's human capital. Social capital differs from human capital in that it represents the potential information flow from relationships between individuals whereas human capital represents an individual's personal attributes (Becker, 1964; Burt, 1992). However, while social capital and

human capital are different, they are likely to be interrelated (Coleman, 1988) such that individuals with high human capital are also likely to be highly connected. Additionally, human capital itself has been extensively shown to impact the board's role (e.g. Anderson, Reeb, Upadhyay, & Zhao, 2011; Johnson et al., 2013; White, Woidtke, Black, & Schweitzer, 2014; Hamori & Koyuncu, 2015). So, the question of whether directors' connectivity is beneficial, needs to be considered along with directors' human capital. Much of the extant literature, however, appears not to consider human capital at all or does so in a superficial manner. Thus, the value of connectivity is an empirical question which remains to be unresolved.

1.2.2. Why New Zealand?

This thesis is also motivated by the absence of connectivity studies in the New Zealand setting where the implications of connectivity could be more material than other economies. The first reason why it is more material is due to the cultural setting within New Zealand. Out of 149 countries, New Zealand ranks first in the social capital pillar of the United Kingdom Legatum Institute's Prosperity Index, ahead of Australia and Norway placing second and third, respectively. This index measure's "the strength of personal and social relationships, social norms and civic participation in a country." (2018, p. 8). New Zealand's first place suggests that interconnected social networks may be a suitable framework for New Zealand and thus play a more important role in the governance of New Zealand firms (McCann, 2003).

Second, New Zealand is a small country (Statistics NZ, 2005) with a small pool of qualified individuals for directorships (Hawarden & Stablein, 2008; Koerniadi & Tourani-Rad, 2012). One implication is that experienced candidates are likely to be challenging to find compared to other countries, such as the United States, that have a greater supply of directors. This places greater importance on a director's social capital as it is a way for boards to access their connections' human capital, such as their skills and experiences, without searching for additional directors. Another implication is that New Zealand is likely to have a more concentrated and closely connected corporate network allowing firms better access to other's skill sets. The close-knit

corporate network has also been described by New Zealand capital market regulators (Financial Markets Authority, 2014) and prior studies (Firth, 1987; Murray, 2001; Hawarden & Stablein, 2008; McCaffrey, 2012). Therefore, connectivity may be a more salient board attribute in New Zealand compared to other countries, making its investigation a crucial venture. An effort has been made to hand-collect data over a long time period for the New Zealand setting. The 15-year period of in-depth information on board attributes offers a wider scope and thus understanding of board capital in New Zealand.

Third, New Zealand boards are indeed rebalancing their roles in terms of advising and monitoring managers. A study of 658 directors solicited in Australia, Canada, New Zealand and the United States, reveals that directors are more actively involved in decision-making, citing examples of strategy development and implementation discussions, and describing the board as a strategic asset. This finding suggests that directors' attributes are becoming more important for advising and partnering with management in strategic planning (Anderson et al., 2007). As their necessary skills grow, it is likely that finding a mix of directors to meet all required duties will become more difficult, increasing the importance of gaining access to additional human capital via other methods. Social capital can assist boards in their pursuit of playing a greater advisory role (Larcker et al., 2013). Thus, the impact of connectivity is an important question for New Zealand boards.

1.2.3. Corporate Governance

In recent times, the role of the board has received increased attention from regulators and practitioners (Adams et al., 2010). One concern, as indicated earlier, is the idea of 'over boarding', where directors have too many obligations to devote the time necessary to a company. With regard to board appointments, the Australian Shareholders Association (ASA) has argued directors should sit on no more than five boards concurrently. The United States Council of Institutional Investors suggested that directors with full-time positions should serve on a maximum of two other boards (Kiel & Nicholson, 2006). Additionally, these directors are more likely to hold positions at private

companies and not-for-profit organisations (Horton et al., 2012), further exacerbating their commitments. These aspects indicate that the industry view's excessive directorships to be detrimental to firms, raising questions about the consequences of too much connectivity. On the other hand, the corporate governance requirements in New Zealand impose a need for expert, qualified and independent directors. The requirements would more than likely increase the number of boards a director sits on if there is a limited supply of capable directors (Financial Markets Authority, 2014). Against the negatives of having busy directors, connectivity gives directors access to a greater pool of skills, experiences and knowledge. Thus, if there are benefits from connectivity, which is far from proven, then it is a balancing act, with boards who are too well-connected more likely to do more harm than good. This thesis is motivated by this on-going debate as well; it seeks to provide evidence on the implications and optimum range of connectivity that regulators and practitioners can consider for policy reporting and implementation.

1.3. Research Objectives and Key Findings

This thesis investigates the social capital of directors in public firms that is intrinsically acquired from the boardroom network of listed firms within New Zealand. The importance of social capital for firms is tested by creating measures inspired by SNA. The aim is to address one key research question: *Is social capital an effective director attribute?* More specifically, the three empirical studies in this thesis address the following key research questions:

1. *What are the determinants of a director's social capital?*

As discussed above, the prior literature provides contrasting evidence on the impacts of social capital and inadequately controls for human capital. Thus, we begin the empirical analysis by exploring the relationship between the connectivity and human capital of a director and attempt to determine if a director's human capital drives social capital. Overall, the results suggest a positive and significant relationship between human capital and connectivity where greater human capital results in greater connectivity. We also find that the positive impact of human capital on social

capital increases for directors with low levels of connectivity, but the impact becomes less important for directors with high levels of connectivity. This suggests that increasing social capital may be one way to supplement boards with low human capital (Boxman, De Graaf, & Flap, 1991). Overall, we find that human capital is an important aspect to control for when examining the importance of social capital. The inconsistent treatment of human capital in previous connectivity studies may, in part, explain the mixed findings.

2. *Is social capital valued in the director labour market?*
    (a) Do firms appoint directors with greater connectivity?
    (b) Does the market value the appointment of directors with greater connectivity?

In the second empirical study, we begin investigating the value of social capital at the director level by examining whether connectivity is conducive to further board appointments, after controlling for other factors, including human capital. We find that connectivity has a positive effect on a director's ability to secure additional board appointments, above and beyond human capital. The first interpretation for this finding is that firms value social connectivity because it assists the board in their advisory and monitoring capacities. The second one is that connectivity is related to board appointments because of the relationships that the social network facilitates. Thanks to their network, well-connected directors may have a greater chance of being selected as a potential candidate (Cai, Nguyen, & Walkling, 2017). This finding is robust after controlling for human capital and other director attributes. However, we also document that there is no significant average market reaction to firms that appoint well-connected directors. This result suggests that greater connectivity allows directors to access new board positions despite connectivity not being valued by the market. We discuss several possible interpretations for this finding within the chapter which call for further research of social connectivity by taking a long-term view of its value contribution.

3. *Does social capital impact firm performance?*

In the final study, we ask whether social capital matters at the board level over the longer-term. Specifically, we examine the impact that the board's social connectivity has on future firm performance based on a variety of performance measures. The key findings collectively suggest that board connectivity improves firm performance. Our results support the earlier work of Horton et al., (2012), Larcker et al. (2013), and Fogel, Ma and Morck (2015) who find a positive relationship between social connectivity and firm performance. However, this thesis conducts the analysis using more extensive human capital controls which helps to solve the ambiguous findings of prior work. We also find that the relationship is non-linear, whereby too much connectivity can impair firm performance. The evidence suggests that too much connectivity induces an information overload from the external network connections (Jackson & Farzaneh, 2012; O'Reilly, 1980; Omer et al., 2014b).

Unlike previous studies on social capital, which tend to examine the impact on all companies, we further examine whether the positive relationship depends on the firms need for resources. We find that firms requiring more from their boards than other firms (i.e. complex firms, growing companies and firms with less connected CEOs) achieve greater firm performance benefits from connectivity. In these situations, better connected boards utilise their greater access to network resources, such as the strategies and experiences of other boards, to assist the firm in improving firm performance.

1.4. Key Contributions

1.4.1. Academic contribution

This thesis makes a number of important contributions to the literature. First, it contributes to the sparse New Zealand literature on the attributes of effective boards. Because of the small size of the market, its geographically isolated nature, and the small pool of directors, New Zealand boards are more likely to value social capital (McCann, 2003). Our findings support the importance of social capital within the New Zealand context, where boards have better access to the skill sets

and knowledge of directors on other boards (Statistics NZ, 2005, 2006; NZ Government, 2013; Legatum Institute, 2018).

Second, this thesis contributes to the finance literature on corporate social networks (e.g. Andres et al., 2013; Larcker et al., 2013) by disentangling social capital from human capital. The ambiguity in the extant literature on the importance of social capital may be due to the fact that human capital and social capital are inter-related (Bourdieu, 1986; Coleman, 1988; Boxman et al., 1991; Shuller, 2001; Roberts & Lacey, 2008; Nyberg & Wright, 2015). Utilising measures of the most important human capital attributes identified in the literature, we construct a novel and detailed human capital index. The strong relationship we find between social capital and human capital necessitates the inclusion of human capital as a control variable in future social capital studies. Inclusion of a detailed and in-depth measure of human capital in examining the importance of social capital has not previously occurred.

Third, we find results that support the value of social capital after controlling for the effect of human capital. The results directly contribute to the finance literature assessing the impact of board connectivity on firm performance, supporting the earlier work of Horton et al., (2012), Larcker et al. (2013), and Fogel, Ma and Morck (2015). We also add new evidence to this literature by showing that connectivity is more beneficial for particular types of firms, and that too much connectivity can impair firm performance. This thesis also contributes to the broad area of corporate governance in the finance and management literature investigating the importance of the board of directors (e.g. Carpenter & Westphal, 2001; Coles & Hoi, 2003; Ferris et al., 2003; Fich, 2005; Fich & Shivdasani, 2007; Cashman, Gillan, & Whitby, 2013; White et al., 2014; Cai et al., 2017).

1.4.2. Practical contribution

We acknowledge that a director's connectivity is a difficult aspect to fully observe. Nevertheless, we contribute new findings to a range of stakeholders that are still useful for their

decisions. For instance, the empirical findings indicate that well-connected directors contribute more value to firms that have an increased need for informational resources, such as low board human capital. This sheds important light on the benefits of connectivity for firms under these constraints. Governance experts suggest that shareholders should therefore pay attention to the value of director networks in the companies they are invested in (Larcker & Tayan, 2015). However, the challenge for firms is to avoid becoming too connected as we show that this can be harmful for firm performance. CEOs and current directors, who are actively involved in selecting new board members (Shivdasani & Yermack, 1999; Corrales & Lee Hsien, 2015), should find this useful for managing board connectivity. One particular issue that demonstrates the importance of managing connectivity is preventing the board from becoming too busy. Recently, concern has been raised about a New Zealand chairman and his ability to effectively meet his board responsibilities. This concern came about after some poor firm performance outcomes being attributed to the board's poor monitoring and advising. The media portrayed the chairman as a "boardroom heavyweight" (Hunter, 2018), due to concurrently sitting on the boards of multiple large listed firms. This suggests that there are some warning signals for too much connectivity and investors may find the results useful when analysing firms as potential investments.

As mentioned earlier, in some countries, preventative measures have been introduced to limit the number of board seats held concurrently (Kiel & Nicholson, 2006) and stop directors from compromising their ability to perform well on the boards they sit on (Ferris et al., 2003). In support of this argument, we show that there is a potential limitation to connectivity, whereby too much can impair firm performance. However, we also supply robust evidence on the benefits of connectivity for practitioners. Connections to other boards can provide directors access to a greater pool of skills and knowledge for oversight and advisory.

1.5. Thesis Structure

This chapter has provided a brief introduction on the background of the board of directors and social capital, outlined the motivations, research questions with key findings and contributions. In Chapter 2, we discuss the extant literature on social capital theory and its financial and corporate implications. Chapter 2 concludes with a review of the relevant New Zealand literature and describes the New Zealand context.

Chapter 3 provides a detailed discussion of SNA and descriptive statistics of the social network measures we employ. Chapter 4 documents and comments on the human capital attributes of directors. The remaining structure of this thesis consists of three inter-connected studies that investigate the board of director's social capital.

Chapter 5 answers the first research question: *"What are the determinants of a director's social capital?"*. It examines the social capital that directors intrinsically acquire from the corporate social network and investigates the relationship between a director's social connectivity and human capital. Chapter 6 answers the second research question: *"Is social capital valued in the director labour market?"*. To address the question, this chapter investigates whether connectivity results in additional board appointments to infer the value that firms place on connectivity. We also study the market reaction to the appointment of directors to evaluate the value that shareholders place on connectivity. Chapter 7 shifts the focus on directors to the board and addresses the third research question: "*Does social capital impact firm performance?".* Lastly, Chapter 8 provides a summary of the key conclusions, contributions and research limitations.

Chapter 2

Social Network Theory

Literature Review

2.1. Introduction

Prior research has offered several theories regarding the role of the board of directors. In this chapter, we review two interconnected perspectives of the board's role, the agency and resource dependence theories, whose theoretical arguments underpin the empirical work of this thesis. This chapter continues by developing an understanding of the channels by which social capital is constructed. This attribute has been shown to impact corporate financial outcomes by for instance, increasing firm performance (Horton et al., 2012). To establish the foundations of social capital, this chapter reviews the long-standing literature on social capital and how it has grown and adapted to its definition of today. Further, this chapter explains how this thesis measures social capital, more specifically, connectivity. Finally, we provide a review of the related New Zealand literature and an overview of the New Zealand context.

2.2. Research Framework

2.2.1. The traditional view of the board

The board of directors has largely been studied under the realm of agency theory (Adams et al., 2010). The traditional agency theory perspective argues that there is a misalignment in incentives between a company's shareholders and managers resulting from the separation of ownership and control (Berle & Means, 1932), the so-called principle-agent problem. Specifically, agency theory argues that managers will seek to engage in self-serving decisions which can reduce shareholder value. The board's role within this framework is to act as shareholder advocates by monitoring the performance and decision-making of managers (Fama, 1980; Fama & Jensen, 1983b, 1983a).

As such, studies largely focused on investigating how effectively the board can monitor management, typically focusing on issues such as the board's composition in terms of size and independence (Hermalin & Weisbach, 1988; Yermack, 1996; Bhagat & Black, 1999; Coles, Daniel, & Naveen, 2008). Over time, this field of study began to look at the unique attributes of directors to better understand what an effective director looks like (Johnson et al., 2013). For example, female directors may enhance the independence of the board (Fondas & Sassalos, 2000), as they take their role more seriously (Huse & Grethe Solberg, 2006), promoting better corporate governance (Carter, Simkins, & Simpson, 2003). Different experiences may positively impact a director's ability to monitor managers (Hillman & Dalziel, 2003). For instance, prior CEO experience can be helpful when assessing whether the acquisition decisions of managers will add value for shareholders (Kroll, Walters, & Wright, 2008). Financial expertise may help the board reduce earnings management (Xie et al., 2003) due to an increased ability to monitor the firm's financial processes..

2.2.2. The broader view of the board

Although monitoring is an important aspect of the board's role, it is not the entirety of their responsibilities. Resource dependence theory contends that, in addition to their monitoring role, boards provide key management with advice and counsel (Hillman & Dalziel, 2003) and access to channels of information for their decisions (Hillman et al., 2009). As such, directors need to bring more than just monitoring ability to their role. In particular, their value comes from the skills, knowledge, experiences and connections they can use to assist management (Pfeffer & Salancik, 1978; Hillman & Dalziel, 2003).

An interesting attribute of a director is their social connections, particularly with other directors. The interlock literature argues that two firms sharing the same director, facilitates the flow of information between the firms when directors communicate. Companies exist within vast networks that are linked via chains of interlocked directors (Burt, 1980). Directors' connections facilitate information flows between firms, providing access to skills, experiences and knowledge beyond the human capital the director brings as an individual (Pfeffer & Salancik, 1978). Social networks increase the opportunity for directors and thus firms to gain greater and faster access to information (Wasserman & Faust, 1994). Social network theory describes the value residing in connections to others as an important component of social capital.

2.2.3. Definition of social capital

Social network theory is generated from 'social capital theory' which describes a range of different outcomes from the social relations with others. Hanifan (1916; 1920) describes social capital as a quality that a group of individuals collectively create, referring to things in people's lives, such as social integration, goodwill, reciprocity and trust. Human nature results in individuals, groups and families forming communities that accumulate social capital through close association, to improve both the individual and the communities' quality of life. This perspective focuses more on the internal quality of relationships reflecting intimacy and emotional connection. Over time, the definition of social capital has evolved to include descriptions such as 'networks'

(Jacobs, 1961), ‘resources from favours’ (Hararay, 1969), ‘embeddedness’ (Granovetter, 1985), ‘connections’ (Bourdieu, 1986), ‘outcomes’ (Coleman, 1990), and ‘opportunity’ (Lin, 1999).

Burt (1992) extended the term social capital to mean the value that can be extracted from the social relationships within / between groups or organizations and between individuals. More specifically, connections provide individuals access to others’ skills, experiences and knowledge beyond the human capital of the individual (Pfeffer & Salancik, 1978). Burt (1992) argues that social networks are a conduit for social capital that may provide substantial information and control benefits.

2.2.4. Interlock networks and social capital

As discussed in the previous section, within the context of the corporate environment, two firms are connected (interlocked) when one or more directors sit on the board of both firms (Burt, 1980).[4] Studies have argued that interlocks create networks enabling directors to learn from their peers by observing first-hand the implementation of new practises, sharing their positive experiences and critical mistakes, allowing directors to provide better advice to management (Mizruchi, 1996). For instance, interlocking firms are shown to follow similar value-enhancing acquisition activities (Haunschild, 1993) and anti-takeover provisions (Davis, 1991), provide experience for firms that are going public (Field, Lowry, & Mkrtchyan, 2013), and spread beneficial corporate policies such as well-designed remuneration packages (O'Reilly et al., 1988; Wong, Gygax, & Wang, 2015) and corporate disclosure practices (Cai, Dhaliwal, Kim, & Pan, 2014). Interlocks facilitate beneficial business relationships such as providing favourable financing arrangements (Houston et al., 2014) and lowering the cost of equity financing (Fonseka, Farooque, Rajapakse, & Tian, 2018), or providing better contractual relationships between firms within a supply chain (Schoorman, Bazerman, & Atkin, 1981). While the literature provides

[4] Some studies refer to an interlocking board occurring when an executive at two different firms sit on each other’s board (Larcker & Tayan, 2015). We refer to the definition of two firms interlocked when they have at least one director in common.

evidence on the positive consequences of board networks, a lot of attention has been given to the negative influence of these networks.

2.2.5. Negative consequences of interlock networks

Interlocks have been shown to reduce corporate governance quality (Larcker & Tayan, 2010), lead to the spread of bad practices such as managing earnings (Chiu et al., 2013), the backdating of stock options (Armstrong & Larcker, 2009; Bizjak, Lemmon, & Whitby, 2009), and the sharing of bad information inducing the replication of mistakes in strategic decisions (Mizruchi, 1996). There are also studies that suggest networks can overload boards with information resulting in poor strategic decision-making (O'Reilly, 1980; Chewning & Harrell, 1990; Swain & Haka, 2000; Omer et al., 2014b). In some cases, the adverse impacts of interlocks have led to regulatory reforms, such as the "Save Italy" decree, prohibiting interlocking directorships in the financial sector (Drago, Ricciuti, & Santella, 2015).

Another concern related to interlocking directorships is that directors who hold multiple board positions can become too busy to carry out their duties effectively. Directors on multiple boards must spread their time and attention across several firms which the literature suggests cannot be done efficiently and effectively once a critical number of positions is reached. As a result, board interlocks may impact on the board's monitoring and advising efforts (Core, Holthausen, & Larcker, 1999; Fich & White, 2003; Fich & Shivdasani, 2006). These adverse factors may reduce firm value (Non & Franses, 2007; Jiraporn, Kim, & Davidson Iii, 2008). It is therefore not obvious whether interlock networks are value creating or value destroying.

2.2.6. Social Network Analysis

One limitation of the interlock literature is that it only considers the direct connections between firms. More recently, studies have applied Social Network Analysis (SNA) to broaden the idea of social capital. SNA considers the implications of the wider network established via the indirect connections that interlocks create (Wasserman & Faust, 1994). Social network analysis

argues companies exist within vast networks that are linked via chains of interlocked directors that can allow greater amounts of information, such as others' experiences, to be exchanged. For instance, firm B has a director who also sits on firm A's board, and another director who sits on the board of firm C. The interlock literature would not recognise A and C as being connected, whereas SNA would argue that they are linked via firm B.

SNA is the empirical measurement of network connectivity which emerged in the 1960's and 1970's. More specifically, SNA analyses the structure of social relationships by drawing on graph theory and employing computational models to measure various aspects of the network structure and the centrality of those within the network (Freeman, 2004). SNA has been used by researchers as a way to study the inter-relations among firms (Mizruchi & Galaskiewicz, 1994) and more recently, the finance literature has begun to employ SNA to examine director and other corporate networks (e.g. Hochberg, Ljungqvist, & Lu, 2007; Larcker et al., 2013).

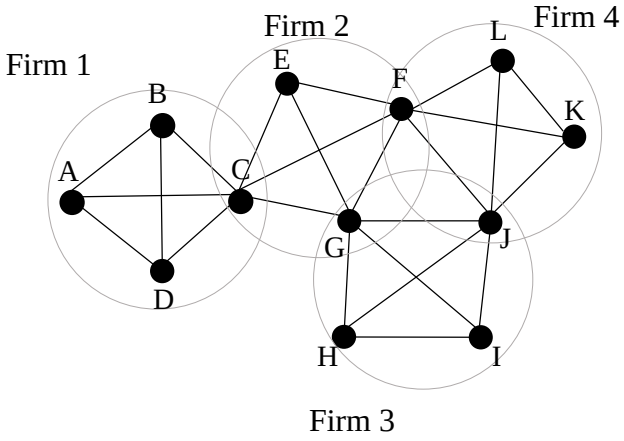
2.3. Measuring Social Capital

2.3.1. Network structure

To demonstrate the network flow and the broader connections an interlock creates, a simple example using 12 directors and four firms is given by Figure 2.1. Director A is directly connected to Directors B, C and D, while being indirectly connected to all other Directors. Firm 1 has one director sitting on Firm 2's board (Director C), directly connecting Firms 1 and 2. This link is commonly known as a board interlock which is the underlying structure that forms the director network. Meanwhile, Firms 3 and 4 are indirectly connected to Firm 1. Firm 4 is directly connected to Firms 2 and 3, and indirectly to Firm 1 via Firms 2 and 3. These indirect connections provide additional channels for resource sharing. While measuring interlocks is relatively straight forward, as they are the direct connections between firms and are very visible, SNA has developed a number

of tools that allow us to measure the indirect connections between firms, such as the linkages between Firms 1, 3 and 4.

Figure 2.1: Small Network Example



This graph provides an example of a board interlock network consisting of four firms and 12 directors. Director A is directly connected to Directors B, C and D, while being in-directly connected to all other Directors. Firm 1 has one director sitting on Firm 2's board (Director C), directly connecting (interlocking) Firms 1 and 2.

SNA primarily uses four measures of connectivity that capture different aspects of an individual's connections in a network: Degree (Nieminen, 1974), Closeness (Sabidussi, 1966), Betweenness (Freeman, 1977), and Eigenvector (Bonacich, 1972, 1987). SNA refers to them as network centrality measures. We employ these measures of social capital, and additionally create a factor of the four connectivity measures using Principal Components Analysis (PCA) which will be discussed following the description of the connectivity measures. We rely primarily on the PCA measure in this thesis as it simplifies the analysis by incorporating the four individual connectivity measures. Throughout the thesis, this measure is defined as Aggregate Connectivity (*AGG*) representing a director's or board's overall connectivity.

2.3.2. The centrality measures

The first measure is referred to as *Degree* which captures the number of direct connections a director has with other directors in the network (Nieminen, 1974; Freeman, 1979). *Degree* is

similar to the interlock measure used in previous board interlock studies (Non & Franses, 2007; Santos, Da Silveira, & Barros, 2009; Chiu, Teoh, & Tian, 2012). *Degree* is measured as the number of unique direct connections between Director *i* and all other directors: *j*, i.e:

$$C_{it}^{D} = \sum_{j=1}^{n-1} \delta(i,j)\,, \quad j \neq i, \tag{2.1}$$

where *δ(i,j)* is a dummy variable that equals one if directors *i* and *j* sit on one or more of the same boards, and zero otherwise.[5] Referring to Figure 1, Director C has 7 direct connections to Directors A, B, D, E, F, and G and essentially interlocks Firm 1 with Firm 2 by being a member of both boards. *Degree* represents the direct information shared between two directors (or firms) (Freeman, 1979). A higher *Degree* score indicates a director with many direct connections to other directors, and hence more opportunities to exchange or acquire information. To take into account differences in network size, we normalise *Degree* by dividing $C_{i,t}^{D}$ by (n – 1), where n is the number of directors in the network in the corresponding year (Hochberg et al., 2007; Horton et al., 2012). The normalised measure can be interpreted as a director's proportion of the maximum direct connections possible within the network. Normalising the scores by *n-1* bounds each measure between 0 and 1. It is worth noting that the network changes as directors resign from boards, or are appointed to new boards, as new directors are introduced to the network, and as new firms list or existing firms delist. As such the raw values need to be normalised to make the values comparable between years (Freeman, 1979).

The second measure we employ is *Closeness* (Sabidussi, 1966; Freeman, 1979). Figure 1 demonstrates that while Director A is not directly connected with Director E, the directors are indirectly connected, through Director C by one degree of separation, and through Directors B and D by three degrees of separation. *Closeness* measures the distance between a director and every

[5] We define a director as a director or an alternative director position held on the board of a firm for the majority of one year.

other director in the network. In line with Freeman (1979), *Closeness* is defined as the sum of the inverse of the shortest distance between Director *i* and all other directors in the network:

$$C_{it}^{C} = \sum_{j=1}^{n-1} d(i,j)^{-1}, \quad j \neq i, \tag{2.2}$$

where *n* is the total number of directors in the network and $d(i,j)$ is the shortest distance between Director *i* and directors *j*. A higher closeness score represents a director with closer connections that enables quicker and more readily available information and resource exchange. One issue is measuring the distance of directors who are not connected at all. This can occur with firms where none of the directors sit on other boards (isolated firms) or where several firms are connected together from multiple directors but are not connected to the main network (satellite networks) (Opsahl, Agneessens, & Skvoretz, 2010). We set the distance between disconnected directors to 0. (Opsahl et al., 2010). *Closeness* is normalised by dividing by *(n-1)* representing the percentage of the maximum *Closeness* possible for a given Director *i*.

The third measure is *Betweenness* (Freeman, 1979). This measures the volume of information being passed through a director sitting in between two other directors. Betweenness measures the degree of control that a director has of the network flow, potentially restricting the information being passed through the network (Freeman, 1979; Borgatti, 2005). For instance, in Figure 1, Director C sits in between Directors A and E. Director C can potentially exert control over the information received from Director A by withholding it from Director E, and vice versa. At the firm level, Director C can potentially control information flowing between Firms 1 and 2, such as new investment opportunities or corporate practices. However, Director G is limited in their ability to control information between Firms 2 and 3, as communication can also be obtained through information passing through Director F and J via Firm 4. This limits Director G's ability to be the sole controller and beneficiary of the channelled resources. Freeman (1979) constructs the *Betweenness* measure as the probability that *i* falls on a randomly selected shortest path that links two directors *(h,j)*. By doing so, *Betweenness* considers the likelihood of information being

circumvented through other channels to capture the probability of Director *i* successfully controlling the information flow, i.e:

$$B^{B}_{(h,i,j)t} = \frac{g(h,i,j)}{g(h,j)}, \tag{2.3}$$

where $g(h,j)$ is the maximum number of communication paths another director could be in a position to control. Therefore, the information passing between Directors *(h,j)* can be completely controlled by Director *i* when there are no other directors in between Directors *(h,j)*, such that $B^{B}_{(h,i,j)t} = 1$. To measure the overall *Betweenness* of Director *i*, we follow Freeman (1979) and take the sum of the proportions of all the shortest paths linking two Directors which pass through Director *i*:

$$C^{B}_{i,\tau} = \sum_{h<}^{n-1} \sum_{j}^{n-1} B^{B}_{(h,i,j)t}, \quad where\ h \neq i \neq j, \tag{2.4}$$

where *n* is the number of directors in the network and $B^{B}_{(h,i,j)}$ is defined as per Equation (2.3). We normalise *Betweenness* by expressing it as the proportion of its maximum value possible in year *t*. The maximum value for C^{B}_{it} is essentially the most central point a director can sit, that being $\frac{n^2-3n+2}{2}$ (Freeman, 1979). The final measure is the relative *Betweenness* centrality of Director *i* in year *t* which is:

$$C'^{B}_{it} = \frac{2(C^{B}_{it})}{n^2-3n+2}, \tag{2.5}$$

where C^{B}_{it} is defined by Equation (2.4) and *n* represents the number of directors in the network.

The fourth measure is *Eigenvector* (Bonacich, 1972), which expands on the *Degree* measure. Specifically, *Eigenvector* combines a director's *Degree* score with their direct connections' *Degree* scores and so on. The calculation is performed using the power iteration (eigenvalue algorithm) method, to derive the eigenvector of the matrix that document's the connections of all directors, then solving for its eigenvalue (Barnea & Guedj, 2007). *Eigenvector* can be interpreted as capturing the power and prestige of a director's connections. A high *Eigenvector* director has

more direct connections to well-connected directors, resulting in faster and increased access to information and resources. *Eigenvector* is defined as the sum of Director *i*'s first degree connections to all other directors (*δ(i,j)*) in the network, weighted by the *Eigenvector* of the directors to which Director *i* is connected to, i.e.

$$C_{it}^{E} = \frac{1}{\lambda}\sum_{j=1}^{n} \delta(i,j) C_{jt}^{E}, \quad j \neq i, \tag{2.6}$$

where C_t^E is the *Eigenvector* score for a particular director, $\delta(i,j)$ is defined at Equation (2.1), and λ is a constant, defined as the maximum possible eigenvector for a given network in year *t*. Connections to a highly connected director will increase a director's *Eigenvector* score more than connections to less connected directors. This may enhance a director's prospects of obtaining beneficial informational resources. Table 2.1. provides the centrality measures for each director in the small network example given by Figure 2.1.

Table 2.1: Social Network Centrality Measures of Example Directors in Figure 2.1.

Panel A: Raw centrality measures				
Director	**Degree**	**Closeness**	**Betweenness**	**Eigenvector**
A	3	6.2	0.0	0.14
B	3	6.2	0.0	0.14
C	4	8.5	24.0	0.34
D	3	6.2	0.0	0.14
E	6	7.0	0.0	0.27
F	3	8.5	13.5	0.43
G	6	8.5	13.5	0.43
H	6	6.5	0.0	0.24
I	3	6.5	0.0	0.24
J	3	8.0	6.0	0.40
K	6	6.5	0.0	0.24
L	4	6.5	0.0	0.24

Panel B: Normalised centrality measures				
Director	**Degree**	**Closeness**	**Betweenness**	**Eigenvector**
A	27.27%	56.06%	0.00%	19.48%
B	27.27%	56.06%	0.00%	19.48%
C	54.55%	77.27%	43.64%	48.40%
D	27.27%	56.06%	0.00%	19.48%
E	27.27%	63.64%	0.00%	37.74%
F	54.55%	77.27%	24.55%	60.42%
G	54.55%	77.27%	24.55%	60.42%
H	27.27%	59.09%	0.00%	33.70%
I	27.27%	59.09%	0.00%	33.70%
J	54.55%	72.73%	10.91%	57.01%
K	27.27%	59.09%	0.00%	33.70%
L	27.27%	59.09%	0.00%	33.70%

2.3.3. Prior SNA studies within finance

The finance literature has begun to employ SNA to investigate the impact of social capital on firms. Studies have demonstrated positive impacts from connectivity including better financial reporting quality (Omer et al., 2014a), firm performance (Larcker et al., 2013) and managerial planning (Schabus, 2018), less earnings management (Fogel et al., 2015), and the adoption of similar corporate finance policies (Fracassi, 2017). Evidence also suggests that connectivity can improve corporate governance (Horton et al., 2012) such as better detecting CEO missteps because of the board's increased credibility and access to information (Fogel et al., 2015), and reduce

information asymmetry for sophisticated investors (Akbas, Meschke, & Wintoki, 2016). Connectivity may also impact firm acquisition behaviour by enabling the firm to identify acquisition opportunities through their network and alleviate information asymmetry (Schonlau & Singh, 2009). Specifically, the evidence suggests that connectivity contributes to the board's access to information, access to valuable resources, ability to coordinate actions and efficacy as shareholder advocates.

Connectivity has also been associated with negative outcomes such as weaker corporate governance (Barnea & Guedj, 2007), including managerial entrenchment (El-Khatib et al., 2015), resulting in negative firm performance (Andres et al., 2013). Well-connected directors may overload the board with too much information from their connections which could result in the firm making less timely decisions or poor decisions regarding the firm's future plans (O'Reilly, 1980; Chewning & Harrell, 1990; Jackson & Farzaneh, 2012). Contagion theory suggests that value-destroying corporate practices may spread throughout networks (Chiu et al., 2013). It has also been argued that well-connected directors may feel more committed to their network rather than shareholders, limiting their efficacy to make good monitoring decisions (Barnea & Guedj, 2007). Given the empirical evidence of both positive and negative outcomes from social networks, it is not clear whether connectivity is value enhancing or destroying.

2.4. New Zealand Literature Review

Prior literature has shown that board interlocks are common in New Zealand (Fogelberg & Laurent, 1973; Firth, 1987; Roy, Fox, & Hamilton, 1994; Murray, 2001). A key reason for this is the small pool of candidates with the requisite skills and experience to serve as directors. This leads to the same directors being appointed to multiple boards. However, the scant and predominantly outdated literature has not investigated the financial consequences and other impacts of social capital using SNA.

Laurent (1971), one of the earliest New Zealand studies, analyses 160 listed firms and finds that 65.5 percent of directors held multiple board appointments, averaging 3.1 boards per director. In a later paper, Fogelberg and Laurent (1973) investigate interlocking boards in New Zealand and discovered that interlocks mostly occurred within firms that were competitors, suppliers, customers, or financial organisations.

Firth (1987) investigates the characteristics and the extent of interlocks among New Zealand firms using the full sample of listed companies in 1972 and 1984 (247 and 221 respectively). He compares the firms between the two years and finds that while the number of firms dropped from 1972 to 1984, the number and fraction of directors with multiple directorships increased. In 1972, 15 percent of directors held multiple directorships, increasing to 19 percent in 1984. On average, companies in 1984 had 7 interlocks, while one firm had a total of 34 interlocks. In comparison, the average number of interlocks per company in Australia was 6.3 (Stening & Wai, 1984). Firth also finds that only 11 percent of firms were not connected to another firm and that the average number of directorships held per director was 1.28 (1.38) in 1972 (1984).[6] Additionally, around 12 percent of interlocks were between competitors. These results suggest that firms became more closely connected over this time period. Consistent with resource dependence theory, the findings of Fogelberg and Laurent (1973) and Firth (1987) suggest that firms may also benefit from interlocks by gaining access to critical information and other resources from connections with horizontal or vertical business contacts.

Leading on from Firth (1987), Roy et al., (1994) employ a similar sample and find a decrease in the average number of interlocks per firm between 1987 and 1993, from 4.42 to 2.6. The average number of directorships held per director also declined, from 1.35 in 1987 to 1.22 in 1993. They find that the fraction of directors holding more than one directorship was 14.86 percent in 1993, down from 20.59 percent in 1987. The authors attribute the decline in connectivity to the 1987

[6] They also report the average number of 'multiple' directorships, that is the mean number held by directors who held more than one directorship to have been 2.83 in 1972 and 3.00 in 1984.

stock market crash impacting the results. The 1987 crash dramatically reduced the number of New Zealand listed companies. Fox and Walker (2001) support these results, although they report a marginal increase in the fraction of multiple directors from 13.6% in 1999 to 17% in 2001. This finding suggests that the occurrence of multiple directors and thus interlocks, began to increase again.

Alexander, Murray and Houghton (1994) compare a sample of Australian and New Zealand firms in 1991 to studies of the United States, Canada and the United Kingdom. The paper concludes that Australia, New Zealand and Canada have a small number of corporate directors holding a large number of board positions, a pattern not as prominent in the United States and United Kingdom.

Wood (2010) analyses the largest component of the New Zealand network of 230 firms in 2009, which consisted of 97 firms 42%. He finds that on average, firms had 3.65 interlocks per firm, much lower than the values for the United States (8.83) and Australia (5.89), as well as those found in the earlier New Zealand studies of Firth (1987) and Roy et al., (1994). One explanation is that the New Zealand sample had 20 less financial firms than Australia and the United States, which is suggested to have lowered the network scores because financial firms typically have more interlocks than other industries (Roy et al., 1994).

Murray (2001) discusses the New Zealand corporate network and reports the characteristics of a range of well-connected directors. She supports Wood (2010), arguing that interlocks in New Zealand are formed by a relatively few number of individuals, establishing a small tight community of directors which may have positive and negative outcomes for shareholders.

Some of the New Zealand studies have also highlighted the dangers of connectivity. Fogelberg and Laurent (1973) and Firth (1987) both show that a lot of board interlocks exist between firms that are competitors, suppliers or customers of each other. This raises obvious concerns about collusion and price fixing. Additionally, Murray (2001) argues that a small handful

of directors are able to exert a lot of influence over the network. She also argues that powerful directors may have prevented the introduction of new directors, intentionally keeping the network small and concentrated. This small community of directors may prevent others from gaining the opportunity to obtain the requisite board experience that firms desire, either creating or exacerbating the director labour market issue.

Very few studies have directly investigated the implications of board connections in New Zealand. Roudaki and Bhuiyan (2015) investigates the influence of interlocking networks on firm performance in New Zealand. The sample includes 276 firm years (41 different companies) and 1,783 directors covering every second year from 1999 to 2011. Firm performance is measured using return on assets, return on sales, and a dummy variable that equals one if the firm has negative profit. They argue that New Zealand listed firms are highly interlocked, even though the number of interlocks declines post 2003. They find a negative impact of interlocks on firm performance, providing evidence consistent with the director busyness hypothesis (Fich & Shivdasani, 2006), and against the benefits of social capital (Mol, 2001). They report that their paper is the first study of New Zealand Stock Exchange (NZSX) interlocks since the 2004 corporate governance regime was introduced, which indicates that there have been very few studies on board connections to date, and more importantly, using SNA.

Another related study is Jahan's (2018) thesis on multiple directorships in New Zealand. The sample includes 116 different firms, 1,022 firm year observations over the 2005 to 2014 period. More specifically, she considers the prestige of the directorships and finds that prestigious multiple directorships are positively associated with firm performance while non-prestigious multiple directorships are negatively or unrelated to their firm's performance. She argues that the prestige of directors' connections matter and should be taken into account when investigating future board network studies.

Perhaps the closest analysis to this thesis, in terms of the measurement of social connectivity, is McCaffrey (2012). He constructs a network of 350 New Zealand organisations (publicly listed, private and governmental), and 1,428 directors using SNA measures: Degree, Betweenness and Eigenvector. He concludes that 54 organisations form the centre of the network, with 24 firms at the core. Mighty River Power is the most connected, exceeding all other firms for the three SNA measures. Only 15 percent of directors hold more than one board position, with a maximum of 7 concurrent board seats held. Additionally, 30 percent of the network's core are female directors, despite women making up a much smaller percentage of the directors and directorships (Pashootanizadeh, 2013). In essence, female directors are more likely to be highly connected, potentially driven by a shortage in 'qualified' female directors during a time when companies are trying to increase board gender diversity. This report describes some interesting points about the network of a cross-section of New Zealand firms. However, there is no analysis of social connectivity impacts.

The extant New Zealand literature suggests that New Zealand firms have historically been more connected than similar firms in other countries, although the connectivity of firms has declined over time. Despite being more connected, only one study and one thesis appears to have considered the firm performance implications of connectivity, but only based on direct connections. The purpose of this thesis is to add to the scant literature on New Zealand boards, and particularly on the implications of social connectivity.

2.5. The New Zealand Context

The New Zealand Stock Exchange (NZX) was initially established in 1866 in the South Island city Dunedin, followed by the first New Zealand stock market boom from the financing of gold dredging companies (NZ History, 2018). In 1974, and handful of regional exchanges that had appeared across the country merged to form one national exchange, the NZSE. New Zealand experienced a major stock market crash in 1987, which shortly followed a prolonged bull market

and the deregulation of financial markets in 1984. This bill was one of several neoliberal economic policies passed by the Fourth Labour Government, known as Rogernomics. The economic shift sparked a trail of failures as there were over 300 listed companies in 1987, dropping to 140 by 1993. The crash ignited changes to the standards and regulation of the finance industry and the governance of the stock exchange (Grant, 2010). Investor sentiment remained languished until the early 2000s around the time that corporate governance became an important area of focus. Following poor growth and performance, the NZX re-emerged as a publicly listed entity on its own exchange (Grant, 2010).

In the wake of a mass of corporate collapses around the world, practitioners, regulators and academics raised questions about the standard of corporate governance practices within firms (Adams et al., 2010). New Zealand firms were also under question, especially after several high-scale company collapses and the collapse of over 50 finance companies in 2007 and 2008 (Reddy, Locke, & Scrimgeour, 2010). In 1993, new legislation made it mandatory for listed companies to report corporate governance information in annual reports including directors' names, remuneration, interests and share dealings (Hossain, Prevost, & Rao, 2001). However, it was not until 2003 that New Zealand regulators stepped up the standard and enforcement of its corporate governance, following a major overhaul of the corporate governance rules by The New Zealand Securities Commission (NZSC), New Zealand Institute of Directors (IOD) and the New Zealand Stock Exchange (NZX). The corporate governance principles then became more aligned with international standards.

Since 2003, there had been no significant update to the NZX rules, until 2017. The NZX issued a new corporate governance best practice code encompassing eight principals aimed at aligning with international best practice, increasing shareholder protection and potentially reducing costs for issuers (Chapman Tripp, 2017). The NZX corporate governance code follows a 'comply or explain' approach for a set of 'flexible' principles, although it also includes several prescriptive mandatory requirements.

A range of provisions in the New Zealand corporate governance code could influence the board's social connectivity. These provisions regard the size, composition and leadership of boards. For instance, Listing Rule 3.3.1 mandates that boards should have a minimum of three directors (excluding alternate directors) with at least two residing in New Zealand. Listing Rule 3.3.1 further states that there should be at least two independent directors; when there is eight or more board members, the greater of three, or one third, must be independent. Listing Rule 3.6.1 states that the audit committee should consist of a director who has an adequate accounting or financial background. Listing Rule 3.6.1 further states a range of responsibilities for a firm's audit committee. An increase in legal proceedings going after directors, such as the Mainzeal trial (Anthony, 2018), also demonstrates that the liability of directors is increasing. These responsibilities require directors with good board experience to meet these demands. The NZX code also recommends that there should be a board diversity policy that aims to achieve certain objectives, such as a balance of gender (NZX limited, 2017b, 2017c).

The aforementioned corporate governance requirements increase the demand for expert, qualified and independent directors. However, the apparently "small pool of qualified and experienced directors" in New Zealand (Financial Markets Authority, 2014 p. 13), would more than likely increase the number of boards a director sits on, increasing their connectivity. The requirements also increase the importance of social capital for boards in that the range of responsibilities that are expected to be met by directors, require a range of appropriate skills, knowledge and expertise, which connectivity can provide. The corporate network in New Zealand is also argued to be interconnected by capital market regulators (Financial Markets Authority, 2014) and prior literature (Firth, 1987; Murray, 2001; Hawarden & Stablein, 2008; McCaffrey, 2012).

Social capital is a highly valued attribute in New Zealand in general. The Legatum Prosperity Index scored New Zealand as the country with the strongest social capital. This index measures the strength of social capital in relationships, including personal, family and community

relationships. indicating that New Zealand generates considerable social capital, including support, trust and respect. This results in free bi-directional information flows between people, along with a strong sense of community. Translating this into the board arena, we would expect directors to be more willing to share experiences and knowledge, even with those they are not directly connected to i.e. friends of friends. The high social capital culture of New Zealand (McCann, 2003; Legatum Institute, 2018) suggests that the board of directors' social capital may be a suitable, important and thus effective board attribute within this unique environment.

2.6. Conclusions

This chapter outlines the theoretical framework for this thesis and the related literature. We discuss the role of the board of directors from the agency and resource perspective, two interconnected theories that have been numerously tested and proven to have an impact on the way the board conducts its duties. In particular, resource dependence theory explains the board's advisory role and providing the firm access to their social capital. We discuss the concept of social capital in detail and explain how this attribute can provide boards greater ability to meet their board responsibilities through access to information and other critical resources shared between boards that are connected. We discuss how this attribute has been shown to impact corporate financial outcomes in positive ways by contributing to the board's role. We also discuss some of the negative aspects of connectivity. We review the long-standing literature on social capital, explain how this thesis constructs the measures of social capital using Social Network Analysis (SNA), and we review the recent finance literature that has begun to employ SNA. Our review of the New Zealand literature demonstrates a significant gap in the literature about the board of directors and their social capital. We further show that the New Zealand context demands more research on this topic because of several factors. These include promoting capital market integrity and providing research on connectivity as a board attribute because of its importance to New Zealand's social

and regulatory setting. In the following chapter, we describe the data, sample and descriptive statistics of the social capital measures employed in this thesis.

Chapter 3

Directors' Social Capital

3.1. Introduction

This chapter provides descriptive statistics of the social network measures employed in this thesis. We begin with describing the sample and data sources, and the sample construction of directors. We report and discuss director network characteristics, annual sample statistics of the four centrality measures *Degree*, *Closeness*, *Betweenness* and *Eigenvector*. We explain the main measure employed for investigating the importance of social capital. Finally, we report descriptive statistics of the social capital measures and report the top connected directors in 2015.

3.2. Data Sources

The sample is drawn from the New Zealand stock exchange covering the 15-year period from 2000 to 2015. Directors are mainly identified using the companies register of the Ministry of Business Innovation and Employment provided by Information Logistics Company Limited. Director information is hand collected from a variety of sources including annual reports, company announcements and internet sources such as LinkedIn, Bloomberg, and the National Business Review. Mergers and acquisitions data are obtained from Bloomberg. Firm-level accounting and market data are mainly collected from Thomson Reuters Datastream, Eikon and annual reports. The data and sample employed in each study is subsequently detailed throughout the thesis.

3.3. Sample and Summary Statistics

To construct the list of directors, we use the sample of firms listed on the New Zealand Stock Exchange (NZSX) between 2000 and 2015. We obtained the list of firms from the New Zealand Exchange (NZX) Company Research database which initially totalled 2,473 firm-year observations consisting of 279 unique firms. We identified directors that were on the board of one or more of the firms in the sample between 2000 and 2015. A director, if they only hold one directorship, remains in the network sample until the firm is either struck-off (de-registers as a company) or goes into receivership (when a director is longer in an authoritative position to carry out their role). The companies register of the Ministry of Business Innovation and Employment was mainly used, provided by Information Logistics Company Limited, and then cross-checked with data provided by the NZX and annual reports.[7] This data provides full names of current and historical directors, appointment and resignation dates, and residential addresses. We matched each sample firm with its registered company and obtained the director information. The SIRCA corporate governance database is used to identify directors of firms listed on the ASX. Annual reports were used for firms such as trusts and other overseas firms. The final sample includes a total number of 2,432 unique directors and 12,211 director-year observations. We construct the director networks from this list.

3.3.1. Director network characteristics

Table 3.1 summarizes the overall director network for each year, detailing the three largest components[8] and overall network *Connectedness*.[9] Table 3.1 shows that for each year the director network consists of one large connected component and a number of smaller components. The

[7] We thank the NZX, Companies Office and Information Logistics Company Limited for their helpful assistance.
[8] A component is a connected group of directors whereby every director is directly or indirectly connected through directors holding multiple directorships.
[9] Connectedness is measured by 1-(the proportion of pairs of directors that are directly and indirectly un-connected). If all directors are connected, Connectedness = 100%.

largest connected component includes an average of 67% of all directors in a year and declines from 71% in 2000 to 63% in 2015. This suggests that there is an increase in smaller isolated groups of directors. The second and third largest connected components include an average of 2.9% (1.8%) of all directors in a year. The size of both components increases from 2000 to 2015 while the size of the largest connected component decreases. We observe the highest network *Connectedness* in 2000 and 2005 while the number of components is lowest (36 in 2000 and 2005), and the percentage of directors in the largest component is highest (71% and 74% respectively). This demonstrates that the greater proportion of directors in the main connected network and less number of connected components, increases connectivity. Table 3.1 indicates that overall director connectivity has declined over the sample period. Network *Connectedness* declines from 51% in 2000 to 40% in 2015. It also shows the network is indeed dynamic, consists of many smaller networks, and changes structure from year to year.

Table 3.1: Director Network Characteristics

Network Statistics	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average
N Components	36	42	39	41	42	36	41	40	38	41	46	43	47	48	45	41	42
N Largest Component	501	460	508	482	557	598	534	554	524	533	472	518	498	458	481	485	510
%	71%	63%	70%	68%	69%	74%	68%	70%	68%	70%	60%	69%	65%	60%	63%	63%	67%
N 2nd Largest	17	17	17	27	58	25	24	19	27	15	29	17	10	18	16	24	23
%	2.4%	2.3%	2.3%	3.8%	7.2%	3.1%	3.1%	2.4%	3.5%	2.0%	3.7%	2.3%	1.3%	2.4%	2.1%	3.1%	2.9%
N 3rd Largest	15	16	11	10	10	9	11	14	16	14	28	10	9	15	15	22	14
%	2.1%	2.2%	1.5%	1.4%	1.2%	1.1%	1.4%	1.8%	2.1%	1.8%	3.6%	1.3%	1.2%	2.0%	2.0%	2.8%	1.8%
Avg Size excl Largest	6	7	6	6	6	6	6	6	7	6	7	6	6	6	7	7	6
Connectedness	51%	40%	49%	46%	48%	55%	47%	49%	47%	49%	37%	48%	43%	36%	39%	40%	45%

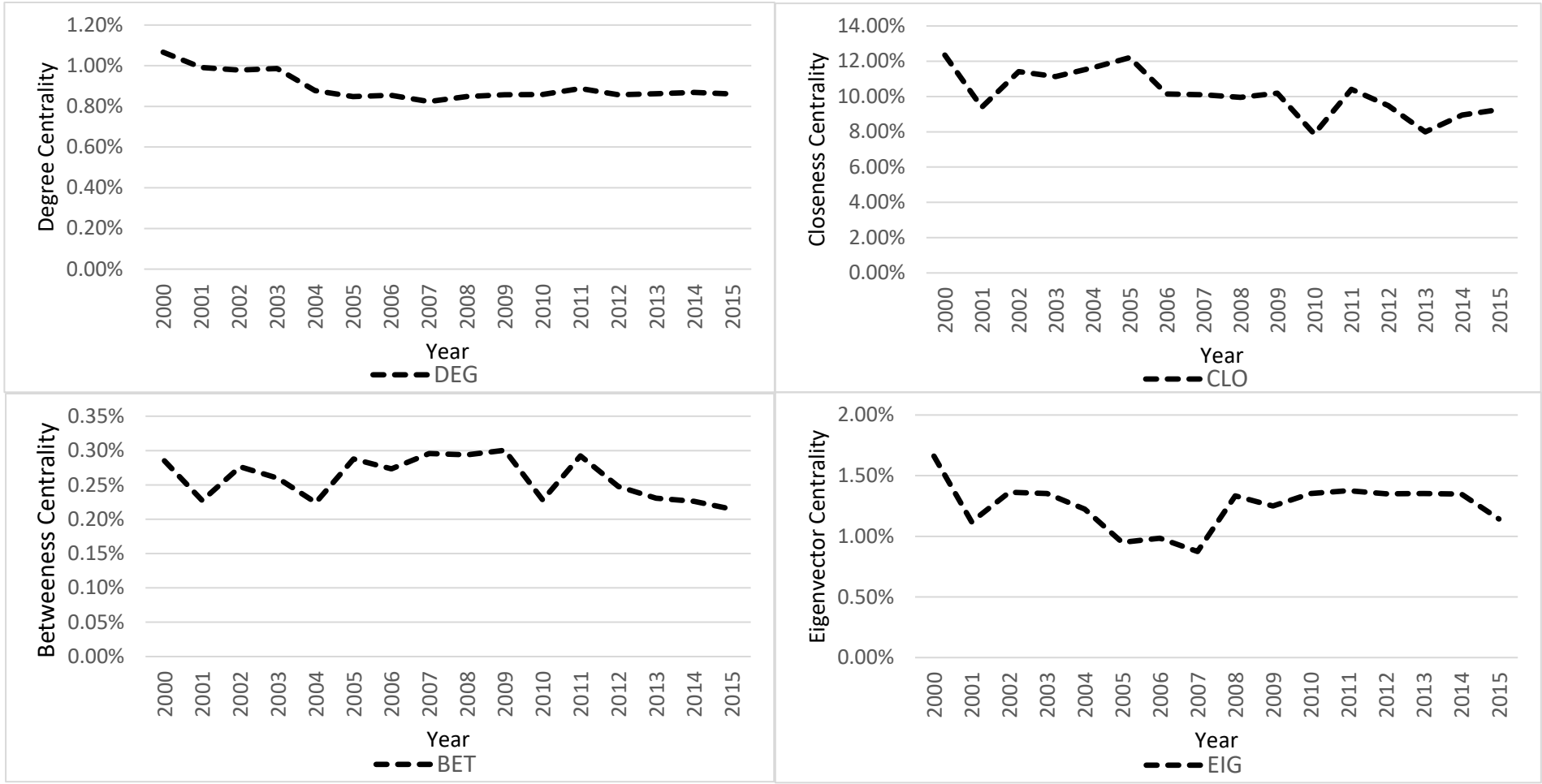
This table provides annual summary statistics and sample averages of director network characteristics from 2000 to 2015. *N Components* represents the number of sets of directors that are connected in the network, whereby any director in the component can access any other director through linkages to other boards. *N Largest Component* represents the number of directors that are connected in the largest of the *N Components*. Likewise, *N 2nd largest* and *N 3rd Largest* represent the number of directors that are connected in the 2nd and 3rd largest components, respectively. *Avg Size excl Largest* represents the average number of directors in a component, excluding the largest component. *Connectedness* is measured by 1-(the proportion of pairs of directors that are directly and indirectly un-connected). If all directors are connected, Connectedness = 100%.

3.3.2. Annual sample statistics of centrality measures

Figure 3.1 further presents the annual averages for the centrality measures from 2000 to 2015 and shows that average connectivity declines over time, albeit with considerable fluctuations in the measures. This suggests that on average, directors are becoming less connected. *Degree* declines, from 1.1% in 2000 to 0.9% in 2015, indicating a 0.2% drop in the average percentage of the maximum possible value for *Degree*. The decrease in *Degree* is partly the impact of the drop in average board size. This trend is also similar to Larker et al., (2013) (US), Omer et al., (2013) (US) and Andersen and Gilbert (2014) (Australia), studies that are of similar time periods yet in different markets.[10] Similarly, *Closeness* also decreases over time. On average, directors are closest to one another in 2000, dropping to a low of 7.9% in 2010. However, we begin to observe closer connections again, increasing to 9.3% in 2015. This is mainly due to an increase in the size of the largest connected component in the network, which increases from the inclusion of 60% of directors in 2013 to 63% in 2015 (shown in Table 9). *Betweenness* declines from 0.29% in 2000 to its lowest of 0.21% in 2015, an average drop of 0.08% suggesting less opportunity for controlling information. *Eigenvector* declines from 1.7% in 2000 to a low of 0.9% in 2007, before increasing to 1.1% in 2015. While *Degree* and *Eigenvector* show lower averages between 2007 and 2009, *Betweenness* is at its highest. This is due to *Betweenness* capturing the importance of a director's intermediate position and therefore a reduction in board size is expected to have a lesser impact on *Betweenness.* We also observe average board size at its lowest during these years. We see volatile changes in *Closeness* and *Eigenvector* due to these measures largely capturing the importance of indirect connections, and therefore are affected more by changes in the composition of the network. Furthermore, as the New Zealand market is small with few listed firms, firms dropping in and out of the sample have a large impact on the connectivity measures.

[10] However, these studies report measures at the firm level.

Figure 3.1: Annual Average Figures of Director Centrality Measures 2000 to 2015



This figure presents four line graphs of annual averages of the four centrality measures of social capital: Degree (*DEG*), Closeness (*CLO*), Betweenness (*BET*), Eigenvector (*EIG*).

3.4. Measuring Aggregate Connectivity

To measure the overall connectedness of a director, we aggregate the four centrality measures using principal component analysis (PCA). We employ PCA as an effective way to combine the different network dimensions into a single measure of connectivity. This method has been used by numerous researchers to account for the multidimensionality of social capital and examine several indicators simultaneously (e.g. Cashman et al., 2013; Larcker et al., 2013; Omer et al., 2014b). The PCA procedure principally extracts and compresses all the common data from the four centrality measures into components that capture the essence of the original data.[11]

3.5. Descriptive Statistics

Table 3.2 provides descriptive statistics of the four centrality measures and the PCA. Panel A reports standard deviations, coefficient of variation statistics, and Pearson (Spearman rank) correlation coefficients. PCA works best if the measures are highly correlated, there are three or more, and the data points have enough variation. We observe that the centrality measures are positively correlated with coefficients ranging between 0.203 and 0.867. This suggests the different dimensions have some common properties but are also distinct from each other. Standard deviations suggest that the data has variation as the statistics are greater than zero. The coefficient of variation (CoV) represents the unit of variability with respect to the mean of a sample variable. In Panel A, the CoV statistics show that the measures are relatively spread out. *DEG* and *CLO* have lower degrees of variation compared to *BET* and *EIG*. For instance, the standard deviation of *EIG* is 398% of the mean whereas *DEG* is 57.65%.

[11] PCA is the eigen decomposition of the covariance matrix = $(x^T x)$ = w (eigens).

Panel B of Table 3.2 presents the PCA output. PCA creates four new components 1 to 4 which are uncorrelated. Component 1 has an eigenvalue of 2.229 and captures the most variation in the centrality measures (Variance explained = 55.72%). This component therefore explains the largest part of the centrality measures and extracts the most important information and similarity in the data (Abdi & Williams, 2010). We use this component as our social capital measure, social connectivity (*AGG*). Components 2 to 4 have eigenvalues under 1, suggesting that the loss of information is low excluding these vectors. Additionally, in Panel C, the output for Cronbach's (1951) 'The Alpha Validity Test' shows a test scale of 0.723 for *AGG*. This value is within the acceptable range of 0.70 to 0.95 (Bland & Altman, 1997; Tavakol & Dennick, 2011), suggesting that the connectivity factor is statistically reliable. Panel D reports correlations between *AGG* and the centrality measures. We observe coefficients all above 0.50, suggesting that the first component has a strong relationship with the four variables and thus represents the measures well.

Table 3.2: Sample Statistics of Centrality Measures and Principal Component Analysis

Panel A: Standard deviation and Pearson (Spearman rank) pairwise correlations above (below) diagonal						
	SD	CoV	DEG	CLO	BET	EIG
DEG	0.51%	0.576	1.000	0.567	0.520	0.449
CLO	6.96%	0.69	0.462	1.000	0.369	0.867
BET	1.01%	3.88	0.687	0.313	1.000	0.278
EIG	4.97%	3.98	0.442	0.273	0.203	1.000
Panel B: Principal Component Analysis						
			Component 1	Component 2	Component 3	Component 4
DEG			0.605	-0.144	-0.168	-0.765
CLO			0.450	0.114	0.875	0.142
BET			0.519	-0.559	-0.288	0.579
EIG			0.403	0.809	-0.352	0.244
Eigenvalue			2.229	0.819	0.698	0.254
Variance explained %			55.72	20.49	17.45	6.34
Cumulative %			55.72	76.21	93.66	100
Panel C: Cronbach's Alpha Validity Test						
			Item-test correlation	Item-rest correlation	Average inter-item correlation	Alpha
DEG			0.876	0.744	0.263	0.517
CLO			0.692	0.441	0.444	0.706
BET			0.744	0.520	0.393	0.660
EIG			0.648	0.377	0.488	0.741
Test scale = mean (standardized items)					0.397	0.723
Observations						12211
Panel D: Correlations for Aggregate Connectivity and centrality measures						
			DEG	CLO	BET	EIG
AGG (Pearson pairwise)			0.903	0.671	0.775	0.602
AGG (Spearman Rank pairwise)			0.805	0.902	0.507	0.823

This table presents sample statistics and principal component analysis (PCA) for the social capital measures employed in this thesis. Panel A reports standard deviations, covariance of determination (*CoV*) and correlations for the four centrality measures used to measure social capital: *Degree (DEG), Closeness (CLO), Betweenness (BET)* and *Eigenvector (EIG).* Panel B reports the PCA for the centrality measures. Panel C reports the Cronbach's Alpha test statistics for the validity of the first principal component (Component 1), used to create *Aggregate Connectivity (AGG).* Panel D reports correlation coefficients for *AGG* and the four centrality measures. Coefficient of variation (CoV) is defined as the ratio of the standard deviation to the mean for each centrality measure. All variables are defined in Appendix A1.

3.6. Top Connected Directors in 2015

Table 3.3 presents the top connected directors in 2015 in terms of *Degree*, *Closeness*, *Betweenness* and *Eigenvector* C*entrality*, and the PCA measure of *Aggregate Connectivity*. Table 3.3 shows that most of the top connected directors score high in more than one connectivity dimension and that the aggregate PCA measure is picking up these directors. We also observe that a number of directors that score highest for *Eigenvector* sit on just one board, Fonterra Group Limited: David Macleod, Ian Read, Ian Farrelly, John Monaghan, Leonie Guiney, Malcolm Bailey, Reindert Spaans, and Simon Israel. John Wilson and Ralph Norris, who also sit on the

Fonterra board, are both highly connected across the other connectivity dimensions, resulting in the high *Eigenvector* scores for the other Fonterra directors. This suggests that *Eigenvector* does indeed measure the connections resulting from being on the same board as other well-connected directors. We observe that of the 28 different directors, there are five females, and all except Fonterra Director Leonie Guiney, hold multiple directorships. It is also interesting that the maximum number of directorships held in 2015 was 5. Alistair Bruce and Sean Joyce each held 5 listed directorships, and neither director scored high enough to be ranked in the highest 10 centrality measures. This indicates that the greater the directorships held does not necessarily correlate to the greatest level of connectivity.

Table 3.3: Top Connected Directors in 2015 by 10 Highest Social Capital Measures

Director	Degree	Closeness	Betweenness	Eigenvector	Aggregate Connectivity	Total Score	Directorships
Abigail Foote	1					1	3
Bruce Harker			1			1	3
David Jackson				1	**1**	**2**	2
David Macleod				1		1	1
Eduard Van Arkel	1	1				2	4
Humphry Rolleston	1	1	1		**1**	**4**	4
Ian Read				1		1	1
Ian Farrelly				1		1	1
James Ogden		1	1			2	3
Joanna Perry			1			1	3
John Anderson	1	1			**1**	**3**	4
John Waller	1	1			**1**	**3**	3
John Wilson	1	1	1	1	**1**	**5**	2
John Monaghan				1		1	1
Keith Smith	1					1	3
Kimmitt Ellis	1					1	4
Leonie Guiney				1		1	1
Malcolm Bailey				1		1	1
Mark Tume	1					1	3
Michael Stiassny	1					1	4
Michael Dossor			1		**1**	**2**	2
Nicola Shadbolt				1	**1**	**2**	2
Norah Barlow		1	1	1	**1**	**4**	4
Ralph Norris	1	1	1	1	**1**	**5**	3
Reindert Spaans				1		1	1
Richard Didsbury		1	1			2	3
Robert Campbell	1	1	1		**1**	**4**	4
Simon Israel				1		1	1

This table presents the top ten connected directors during the year 2015 by each social connectivity measure, *DEG*, *CLO*, *BET*, *EIG* and *AGG*. *Total Score* in column 7 is the number of times the director scored in the top ten of a social connectivity measure. *Directorships* is the number of board appointments the director held in 2015.

3.7. Conclusions

In this chapter, we report the data, sample and summary statistics of the social capital measures employed in this thesis. The sample is constructed from the New Zealand Stock Exchange (NZSX) between 2000 and 2015. Consistent with prior SNA studies, we find that the director network consists of one large connected component and a number of smaller components. The largest connected component includes an average of 67% of all directors in a year and declines from 71% in 2000 to 63% in 2015. This downward trend is also consistent with prior SNA studies (e.g. Larcker et al., 2013). Similarly, we find that connectivity declines over the sample period, albeit with considerable fluctuations in the measures. This finding suggests that on average, directors are becoming less connected in New Zealand, but are still closely connected when we compare the measures to overseas SNA studies (e.g. Horton et al., 2012). To measure the overall connectedness of a director, we aggregate the four centrality measures using principal component analysis (PCA). which has been previously used by researchers in finance examining connectivity (e.g. Cashman et al., 2013; Larcker et al., 2013; Omer et al., 2014b). Descriptive statistics of the four centrality measures and the PCA measure *AGG* are reported and discussed which shows that *AGG* explains the largest part of the centrality measures (Abdi & Williams, 2010). Our tests show that *AGG* has a strong relationship with the four variables and thus represents the measures well. In the next chapter we discuss the definition of human capital and document the human capital of the sample directors. Chapter 5 includes a comprehensive discussion about the difference between social capital and human capital and the importance of separating the two when investigating the importance of the different board attributes.

Chapter 4

Directors' Human Capital

4.1. Introduction

In this chapter, we document, compare and discuss the human capital attributes of directors on the boards of New Zealand listed firms. We begin by exploring the definition of human capital and the board of director human capital literature. We review, motivate and describe the human capital variables employed in this thesis and explain in more detail how and where the data is collected from. Subsequently, we provide sample statistics of director attributes beginning with a comprehensive data exploration of directors' human capital and concluding with the biographies of highly connected directors. Besides developing a good understanding of the people appointed to New Zealand listed firms, the key takeaway of this chapter is that we identify the most important human capital attributes of the board. We take this information into Chapter 5 to examine the relationship between directors' social capital and human capital.

4.2. Human Capital

4.2.1. What is human capital?

Capital is a productivity input used for creating value and is most commonly considered to be a financial or tangible asset (Becker, 1994). In the early 1960's *human* capital emerged as a theoretical concept for explaining economic growth. Human capital refers to the skills and

knowledge of an individual, which is typically acquired through investments in education, training and experiences (Schultz, 1961; Becker, 1964). Human capital theory argues that the value of people's personal attributes should be considered of comparable value to the traditional capital factors such as land, plant and equipment.

4.2.2. Why is human capital important for the board?

Within the context of corporate boards, human capital is defined by Carpenter and Westphal (2001) as an individual's skills and experiences which enable a director to effectively fulfil their role. Therefore, directors are appointed to the board based on their ability to meet the blended role of oversight and advisory (Carpenter & Westphal, 2001; Withers et al., 2012). The board, as a unified group, should have a range of skills that allow it to effectively carry out all the board's duties including relevant business experience, specialist skills, in-depth knowledge of current industry trends, and adequate board expertise. Therefore, directors require specific human capital that enables them to effectively fulfil their duties (Wells & Mueller, 2014).

Given the range of human capital attributes that different people have, it is necessary to know the skills, experiences and expertise of directors who sit on the boards of publicly listed firms. The extant literature argues there is much more to be done, in terms of investigating what the important human capital attributes are (Kor & Sundaramurthy, 2009; Johnson et al., 2013). This chapter explores director attributes and reveals the types of directors in New Zealand firms. To control for human capital when considering the impact of social capital, we first need to understand the human capital attributes of directors, and particularly what attributes are perceived as important. Currently, the literature on the attributes and skills of New Zealand directors is sparse. This is particularly concerning given the perception that the number of qualified director candidates in New Zealand is limited. Later chapters build upon the findings of this chapter to control for human capital when considering the impact of social capital.

4.3. Human Capital Literature Review

Researchers have argued that board members' individual human capital shapes the way they govern and provide advice to management (Hillman & Dalziel, 2003) and an array of studies have begun to identify particular aspects of human capital that are considered important (see Johnson et al., 2013 for a review). Prior studies find that education (Darmadi, 2013), prior experience (Gray & Nowland, 2013), professional expertise (Rosenstein & Wyatt, 1990; White et al., 2014; Gray & Nowland, 2015), and industry experience (Dass, Kini, Nanda, Onal, & Wang, 2014) are all important features of an effective director. In terms of education, it has been shown that specific educational qualifications are an important attribute of quality directors. For instance, directors from prestigious schools, with postgraduate degrees, and degrees from developed countries or specific disciplines are found to impact firm performance (Darmadi, 2013), while current directors with MBA degrees or a CPA qualification may be more attractive to firms (Cashman, Gillan, & Whitby, 2010; Cashman et al., 2013).

The literature also contends that experience impacts a director's ability to monitor, advise and effectively carry out their roles (Hillman & Dalziel, 2003), makes them better collaborators (Westphal, 1999), and more influential and effective in interpreting business situations (Westphal & Milton, 2000). Directors with prior director experience are shown to be most valuable when appointed to less-experienced boards (Gray & Nowland, 2013). International experience (Herrmann & Datta, 2005; Johnson et al., 2013; Hsiang-Lan, 2014; Volonté & Gantenbein, 2014) and industry experience (Perry & Peyer, 2005; Dass et al., 2014) are also found to be beneficial for directors facing a range of different challenges (Masulis, Wang, & Xie, 2012; Dass et al., 2014). For instance, Volonté & Gantenbein (2014) find directors with international experience is positively related to firm performance for firms operating in several geographical segments.

Prior CEOs have tacit skills and bring important executive experience to the board that can only be learnt through direct experience (Johnson et al., 2013) including strategic and operational

experience (Larcker & Miles, 2011). These CEO-related skills held by board members may assist firms undertaking growth opportunities (Fich, 2005), such as making better acquisition decisions (Kroll et al., 2008). CEO experience is also valued by investors when making important strategic decisions, such as selecting a new CEO (Tian, Haleblian, & Rajagopalan, 2011). Additionally, investors value outside CEO-directors more than non-CEO outside directors (Fich, 2005; Fahlenbrach, Low, & Stulz, 2010), suggesting that the experience CEOs bring may be more important than other human capital attributes. A survey of directors at the largest 250 United States companies conducted by Donatiello, Larcker and Tayan (2017) finds that the CEOs role is perceived as requiring a unique skill set.

The literature suggests that directors' professional expertise provides the firm with a broader knowledge base and different perspectives (Gray & Nowland, 2015), which enhances managerial monitoring (Anderson et al., 2011), and enables directors to effectively advise on a range of firm issues (Johnson et al., 2013). As such, directors with academic backgrounds (White et al., 2014), banking expertise (Booth & Deli, 1999), financial expertise (Rosenstein & Wyatt, 1990; Xie et al., 2003; DeFond, Hann, & Hu, 2005), and managerial skills (Fich & Shivdasani, 2006), have been shown to bring different knowledge that benefits the firm. For example, directors with financial backgrounds on the board or audit committee may reduce earnings management due to a deeper understanding of financial information (Xie et al., 2003). Directors who are commercial or investment bankers may provide debt market expertise and enable firms to secure more favourable financing from debt sources (Booth & Deli, 1999; Güner, Malmendier, & Tate, 2008). In addition, Gray and Nowland (2015) find that shareholders value the appointment of directors that bring *missing or new knowledge and skills* to the board including missing legal, accounting, banking, outside CEO and consulting expertise. This suggests that a director who widens the range of skills and knowledge on the board is more valuable to the firm than appointing more of the same directors. Likewise, Rosenstein and Wyatt (1990) find that shareholders value the appointment of financial outside directors higher than the appointment of other professions.

Additionally, directors from good performing companies are considered desirable (Fama & Jensen, 1983b), gaining additional board seats (Ferris et al., 2003), while poor performance leads to poor reputational outcomes. For example, directors resigning from companies in financial distress, are shown to hold fewer board seats in the future (Gilson, 1990). This suggests that an individual with more directorships and positive past performance indicates someone with strong board expertise. Additionally, directors with firm-specific founder experience on the board are found to positively impact entrepreneurial firms' sales growth (Kor & Sundaramurthy, 2009) and founder managers may also contribute to firm performance beyond the early stages of starting up (Fischer & Pollock, 2004).

Creating a diverse board featuring a range of gender, culture and ethnicity, is also becoming an important consideration for firms when appointing new directors (Wells & Mueller, 2014). Board diversity may impact the perspective of the board (Van der Walt & Ingley, 2003), increase firm value and gender-diverse boards may devote more attention to monitoring (Adams & Ferreira, 2009). Board diversity may also facilitate the receptivity of boards to exchange human capital resources, ideas and innovation (Kaczmarek, Kimino, & Pye, 2014).

4.4. Data

For this thesis, we define an individual directors' human capital as the collective skills, knowledge and experiences that a director brings to the board. We begin by examining the attributes of New Zealand directors that prior literature has shown to be desirable.

4.4.1. Data sources and sample

For this study we hand-collect information on the characteristics and attributes of directors of New Zealand publicly listed firms between 2000 and 2015. In line with prior literature, we employ a number of human capital measures. Having identified our sample of firms and directors, we sought director-level characteristics and biographical information primarily from annual reports

and appointment announcements, supplemented by web sources including Linkedin, newspaper articles and the Bloomberg database. Firm-level data are collected from Thomson Reuters Datastream.

4.4.2. Sample statistics

The sample includes a total number of 279 unique firms, 2432 unique directors, and 12,211 director-year observations. Table 4.1 reports the annual sample statistics of firms and directors. We observe the number of listed firms substantially increases by 28% from 2000 to 2005, driven by 57 initial public offerings (IPOs) (Chi, McWha, & Young, 2010) and 92 new share listings (NZX Limited, 2017a). The number of directors however only increases by 15% from 2000 to 2005, while average directorships held increase marginally from 1.21 to 1.24.[12] This relationship appears to indicate that few new directors were introduced over this period with firms preferring to appoint existing directors instead. Although average directorships show an increase through to 2005, the median remains at 1 across the sample years. Additionally, 75% of directors hold less than 2 board positions per year. Therefore, unlike earlier studies of New Zealand directors (Laurent, 1971; Firth, 1987; Roy et al., 1994), it appears that only a small proportion of directors hold multiple board positions. Consistent with prior New Zealand research (Koerniadi & Tourani-Rad, 2012), the average (median) board size in our sample is 6 (6). Further, the board size declines over the sample period, consistent with Boyle & Ji (2013). The drop in the size of the largest board in 2001 is due to Air New Zealand reducing its board size after emerging from financial difficulties. We see a slight effect due to the GFC in 2008 and 2009 where the number of firms drop. There are also 12 de-listings in 2006, which results in a reduction in average directorships, which subsequently remain below 1.24.

[12] The difference between directors and directorships is that a director is an individual person and a directorship is a board position. A director can have one or more board positions which we alternatively refer to as directorships.

Table 4.1: Annual Sample Statistics

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
N Firms	132	144	142	144	166	169	161	167	163	158	155	152	154	153	155	158	2,473
N IPOs	21	4	5	6	15	6	7	10	3	1	2	4	2	6	12	4	108
N Directors	702	733	729	711	811	811	784	795	765	766	785	751	764	762	769	773	12,211
N Directorships	850	887	880	871	1002	1009	951	961	935	924	934	904	911	913	928	946	14,806
Avg Directorships	1.21	1.21	1.21	1.23	1.24	1.24	1.21	1.21	1.22	1.21	1.19	1.20	1.19	1.20	1.21	1.22	1.21
Med Directorships	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
p75 Directorships	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Max Directorships	5	5	5	5	6	5	5	5	5	5	5	6	5	5	5	5	6
Avg Board Size	6.4	6.2	6.2	6.0	6.0	6.0	5.9	5.8	5.7	5.8	6.0	5.9	5.9	6.0	6.0	6.0	6.0
Med Board Size	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
p75 Board Size	7	8	8	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Max Board Size	15	18	14	14	14	14	14	15	13	14	13	13	13	12	13	13	18

This table presents annual sample statistics of the full sample. *N Firms* represents the number of firm observations in the sample, *N IPOs* represents the number of initial public offerings that were issued, and *N Directors* represents the number of director observations in the sample. *Directorships* represents the number of board positions the sample directors held, and *Board Size* is the number of directors on a board of a firm.

4.4.3. Variables

To measure director characteristics and human capital, we collect information on a range of variables based on prior literature. We use a number of binary measures to denote the presence of a particular characteristic or human capital attribute (Hillman, Cannella Jr, & Harris, 2002; Johnson et al., 2013). We also use count measures to assess the amount of a human capital attribute (Johnson et al., 2013). Appendix A1 provides the list of variables with definitions. These variables fall under the following broad categories:

- Director characteristics
- Education
- Director experience
- Director expertise
- CEO experience
- Other specific experience
- Professional expertise
- Industry experience

4.4.3.1. Director characteristics

The director characteristics we consider are demographic identifiers: Age, Gender and Place of Residence. *Age* is the director's age in a particular year, where this is available. *Female* is a dummy variable that equals one if the director is classified as a female and zero otherwise. *New Zealand* is a dummy variable that equals one if the director resided in New Zealand in a given year and zero otherwise.

Age is an indicator of general experience and maturity in business as opposed to measuring particular human capital. Older directors are expected to be able to resolve governance dilemmas because of their maturity. For instance, Bilimoria and Piderit (1994) find evidence to suggest that older directors bring wider perspectives for audit, compensation and nominating committee positions than younger directors because of their length of time in the business environment. Where a person lives can act to some degree as a measure of nationality and thus national culture (Ruigrok, Peck, & Tacheva, 2007). New Zealand-based or native directors may therefore have an

advantage over foreign directors by being more familiar with the New Zealand context. Overseas-based directors may also be appointed to boards for reasons other than their personal attributes, such as being more independent (Ruigrok et al., 2007) or acting as foreign shareholder representatives.

Several studies investigating female board representation find mixed results (Hillman et al., 2002; Rose, 2007; Adams & Ferreira, 2009). Studies suggest that woman have different human capital compared to male directors (Westphal & Milton, 2000; Hillman et al., 2002) suggesting that they bring different skill sets not because they are female, but because they have led different careers. However, Vinnicombe, Singh, Burke, Bilimoria, & Hus (2008) argue that women bring specific contributions to the board if their personalities, backgrounds and behaviours are different to the men of the board. This suggests that women can bring innate attributes that are different to men. Women directors may also lead to more civilised, sensitive behaviour and enhance the independence of the board (Fondas & Sassalos, 2000), as they take their role more seriously (Huse & Grethe Solberg, 2006), bringing positive benefits to firms. For instance, Carter, Simkins and Simpson (2003) find that the percentage of gender diversity on boards is positively related to firm value and argue that gender diversity promotes better corporate governance. There has also been great debate about the gender gap whereby academics and practitioners argue there is a lack of female representation on boards. As a result, many countries have been promoting gender diversity predominantly through regulation and principles of best practice.

4.4.3.2. Education

Some education measures can be linked to more than one kind of attribute (Johnson et al., 2013). For example, a director with an accounting degree from a prestigious school can represent financial expertise, the level of education, or status. For this study, we focus on the director's *level* of education. Upper-echelon theory suggests that higher education level indicates higher levels of intellectual competence and knowledge (Hambrick & Mason, 1984). This approach is similar to one of the education components for measuring board heterogeneity employed by Anderson et al.,

(2011). To measure education, we determine the highest academic qualification a director has and use dummy variables to group directors by their highest qualification. *Undergraduate* equals one if the director has either a bachelor's degree, including LLB's. *Postgraduate* equals one if the director has either an honours degree, JD, masters, postgraduate diploma/certificate, MBA, or PhD. Additionally, we create a dummy variable *No Degree* that equals one if a director has no degree-level qualification or has not reported any education.

4.4.3.3. Director experience

To measure director experience (depth), we count the number of years a director has served on the boards of the firms in the sample (Gray & Nowland, 2013). We also measure the breadth of director experience by the total number of current public company directorships held in a particular year. We exclude experience on boards of not-for-profits, private companies, or overseas firms as the available data on these directorships is incomplete. This provides a measure of experience purely on New Zealand public company boards (Fich & Shivdasani, 2006).

4.4.3.4. Director expertise

We also create two dummy variables based on the status of the best company that a director sits on. Specifically, *NZX10* measures whether a director sits on at least one *NZX10* firm's board while *NZX50* measures whether a director sits on at least one *NZX50* firm's board in a particular year. These two variables measure the skills obtained from servicing larger firms as serving larger, more publicly visible firms may generate different experiences than smaller firms (Ferris et al., 2003; Cashman et al., 2013). For instance, larger firms can be more complex (Coles et al., 2008), requiring directors to have a more diverse range of operational knowledge. Additionally, directors who sit on the boards of larger firms are likely to have higher status, motivating them to be more cautious when advising management in board meetings (Jensen, 1993).

4.4.3.5. CEO experience

To measure CEO experience, we begin with three measures. First, we create a dummy variable *Prior CEO Experience* which combines information on former CEO positions held. The dummy variable is equal to one if the director held at least one CEO position prior to the current year at another firm either in New Zealand or abroad. Second, we create two additional dummy variables to investigate current CEOs. *Current CEO (listed)* equals of if the director is currently a CEO at a listed firm either in New Zealand or abroad and *Current CEO (non-listed)* equals one if the director is a current CEO at an un-listed firm either in New Zealand or abroad.

4.4.3.6. Other significant experiences

Other significant experiences that we consider include merger and acquisitions (*M & A*), and international experience. *M & A* is the cumulative number of completed deals a director has been associated with (Cashman et al., 2013). The data is sourced from Bloomberg which provides information of deals going back to 1993. We include associations with firms that have completed an acquisition, completed a sale, or were the target of a completed merger or acquisition. These associations are included because the human capital view emphasizes the attainment of skills and knowledge through experience (Schultz, 1961; Becker, 1964, 1994). A director is expected to have acquired experience through providing management with firm and industry specific expertise and advice during the *M & A* activities (Hillman & Dalziel, 2003). International experience is a dummy variable equal to 1 if the director has had international exposure predominantly through sales, or who lived or worked abroad (Herrmann & Datta, 2005; Johnson et al., 2013; Hsiang-Lan, 2014; Volonté & Gantenbein, 2014).

4.4.3.7. Professional expertise

To determine a directors' professional expertise, we use prominent categories identified in previous studies that examine directors' human capital (Perry & Shivdasani, 2005; Gray & Nowland, 2013, 2015). We classify each director into one of 14 career categories based on their main professional expertise: academic, accountant, agriculturist, banker and financier, consultant,

doctor and medical professional, economist, scientist, engineer, general executive, lawyer, military and politician. We do find some directors make substantial career changes, such as from engineering to management consulting. Where a director has expertise in more than one category, we select the primary category based on the most experience in terms of time spent in that profession. However, we only report the six most common categories. Outside of these six the number of directors is too small to obtain reliable results. Additionally, we classify directors into a separate additional category if they become professional directors, individuals who have taken up a full-time career sitting on boards, having developed a diversity of experience (Larcker & Miles, 2011), and essential skillsets for their roles (Wells & Mueller, 2014). Further to these categories, a director is classified as a financial expert if she has any of the following financial qualifications: Chartered Accountant (CA), Associate Chartered Accountant (ACA) and Certified Management Accountant (CMA), Certified Public Accountant (CPA) and Chartered Financial Analysts (CFA).

4.4.3.8. Industry experience

To measure industry experience, we use the same informational sources as that of professional expertise and identify the industries of the previous and current careers for each director using the Industry Classification Benchmark level one coding system. We create a dummy variable for each different industry and assign the value of one if a director has significant working experience in that industry. The Industry Classification Benchmark level one coding system includes 10 industries, namely: banking and finance (financials), basic materials, consumer goods, consumer services, health, industrials, oil & gas, telecommunications, technology, and utilities. Additionally, we include a dummy variable for directors with experience in farming, fishing and forestry (FFF). FFF is a primary industry in New Zealand, and therefore may be important to consider separately. Again, we only report the statistics for the most common industry categories.

4.5. Descriptive Statistics

4.5.1. Director characteristics

Annual sample statistics for director characteristics are presented in Table 4.2. The average director is aged 57 and ranges from 24 (KidiCorp Group Limited Director Derek Handley) to 88 (William Goodfellow in 2005 and Albert Harris in 2015), while the average director age (untabulated) at the time of first appointment to a public board is 51. Over time, the average age slowly increases from 54 in 2000 to 58 in 2009 and stays consistent from then on. This suggests that prior to 2009, fewer younger or new directors were being selected. Table 4.2 also shows that the average number of years a director has spent on boards declines, albeit marginally, from 2011. This observation suggests that in recent years more new directors are being appointed to boards. 70% of directors reside in New Zealand, 21% in Australia, 3.5% in Asia and Japan, 3.2% in the USA, 2% in Europe (including the UK), and less than 1% reside elsewhere.

Table 4.2 shows that the total sample average for female directors is 9% but has increased annually from 5% in 2000 to 16% in 2015. This demonstrates that firms are increasing efforts toward creating more gender diverse boards. This is especially true for the top 50 firms by market capitalisation. In addition, females hold 17% of directorships in 2015. Over the past five years, there has been an increasing awareness of the need to improve diversity on New Zealand corporate boards. Efforts to increase diversity include the 25 Percent Group initiative launched in 2012, aiming to lift female representation on boards to 25% by 2015 and the Institute of Directors 2012 Mentoring for Diversity programme. This programme has been broadened to include ethnicity, age, skillset and background. The New Zealand Stock Exchange also initiated changes in 2012, requiring issuers to disclose the gender composition of their directors and evaluate performance of their diversity policy (Chapman Tripp, 2017). Table 2 also shows that the percentage of new females on boards also increase while new male directors decrease. This suggests that boards when appointing a new director are more likely to appoint a woman.

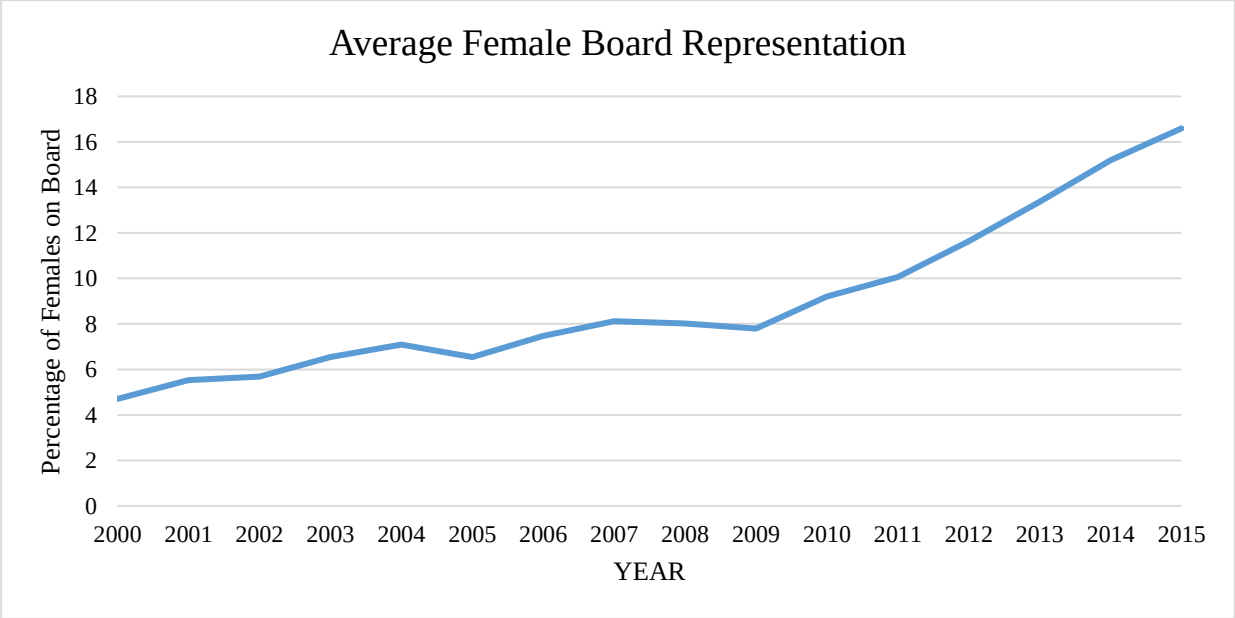
Table 4.2: Director Characteristics 2000 to 2015

Director Characteristics	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average
Age & Gender																	
Avg Age	54	54	54	55	55	56	56	57	57	58	58	58	59	58	58	58	57
Max Age	84	85	85	86	87	88	80	81	82	83	84	85	85	86	87	88	85
Min Age	30	26	24	25	33	34	29	30	31	32	30	27	32	33	34	33	30
% Female Directors	5	5	6	7	7	7	8	8	8	7	9	9	11	12	14	16	9
% Female Directorships	5	6	6	7	7	7	7	8	8	8	9	10	12	13	15	17	9
New Directors																	
N New Male Directors	70	118	118	79	102	77	66	96	68	69	79	75	89	84	57	65	82
N New Female Directors	5	11	8	13	12	6	8	13	5	4	15	7	21	19	20	22	12
% New Female Directors	7	9	6	14	11	7	11	12	7	5	16	9	19	18	26	25	13
Director Experience																	
Avg Years	5.1	5.1	5.3	5.6	5.7	6.3	6.6	6.7	7.0	7.4	7.4	7.5	7.2	7.1	7.1	7.0	6.5
Nationality %																	
New Zealand	65	66	68	69	72	73	75	72	74	75	73	70	68	69	68	68	70
Australia	24	23	22	20	20	20	18	20	18	18	20	22	23	21	20	20	20
America	4	4	4	3	3	2	3	3	3	2	2	2	2	4	4	5	3
Asia_Japan	5	4	4	4	3	2	2	2	2	2	3	4	5	5	5	4	4
EU_UK	2	2	2	4	2	2	2	2	2	2	2	1	1	2	2	3	2
Other	1	1	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0

This table provides annual summary statistics of director characteristics including age, gender, new directors, average years of board experience and nationality. All variables are defined in Appendix A1.

To take a further look into the board of director gender diversity drive, we report the average gender composition of New Zealand boards over time. Figure 4.1 provides additional evidence for the impact of the recent diversity drive for New Zealand boards. The percentage of females on boards increases, exponentially. Over 11 years, from 2000 to 2011 we observe a 5% increase, and between 2011 and 2015, a 7% increase. Although these changes suggest the diversity drive has made some impact, there is still a way to go before reaching the 25% target.

Figure 4.1: Average Female Board Representation 2000 to 2015



This figure provides a line graph of the annual averages of the percentage of female directors on a board.

4.5.2. Human capital attributes

4.5.2.1. The average director

Table 4.3 presents the characteristics and human capital of the average director in the sample.[13] Overall the results are largely as we would expect. The average director tends to be male, in their 50s, resides in New Zealand, and holds an undergraduate or postgraduate degree. The average director has around 6.5 years of director experience, holds 1.2 directorships, and has been involved with about 2.1 M & A deals. We also find that around 40% of directors sit on the board

[13] For a review of the director attributes, please see Appendix A1.

of an NZX50 firm and 41% are a current or prior CEO. On average, 44% of directors hold international experience, only slightly less than Volonté & Gantenbein's (2014) average of 48% for the Swiss stock market. We also identify the most common professional areas and industry experience of New Zealand directors. Directors are typically either a general executive (32%); an accountant, CFO or financial controller (18%), or a banker (including broker, fund manager and finance professional) (16%). The proportion of directors with these professions are similar to Gray & Nowland's (2013) sample of Australian directors. 11% of directors list their current profession as professional director, and the most common industry experience is in banking and finance, consumer goods and services, and industrials.

4.5.2.2. Comparison of average directors by gender

As noted, there has been a push for more female representation on boards. Therefore, we also compare the characteristics and human capital of male directors to female directors. The average female director is younger by about 5 years and sits on more boards. Female directors are more educated than men are. Compared to men, 12% more females have university degrees. Additionally, 75% of female directors have a postgraduate qualification. This suggests that a higher proportion of women have more, and higher levels of education, compared to men. The average female director also has more M & A experience, suggesting that sitting on larger boards increases exposure to large-scale investments. These results support the stream of literature which argues that women directors are likely to have greater human capital than male directors (Hillman et al., 2002; Singh, Terjesen, & Vinnicombe, 2008; Terjesen, Sealy, & Singh, 2009). However, while women have greater human capital in some areas, they have an average of 2.2 years less board experience, 18% less prior CEO experience, and are less likely to be current CEOs. These findings support the study by Singh, Terjesen, and Vinnicombe (2008) who find that women of the FTSE firms in the UK are more educated but possess less CEO/COO experience.

While woman have less board and CEO experience, the average female is also more likely to sit on the board of larger firms. Specifically, 3% (9%) more women sit on the board of an NZX10

(NZX50) firm than men which suggests that larger firms are more serious about diversity efforts. In terms of professional expertise, the average female is less likely to be an accountant or banker, but more likely to be a professional director with banking and finance industry experience. We find that a higher proportion of female directors are academics, politicians (untabulated), consultants or lawyers, suggesting these professions may be a way for women to overcome 'glass ceiling' barriers into the board room (Adams & Flynn, 2005).

4.5.2.3. Comparison of average directors and new directors

We compare new directors with the average director to see if there are differences in the characteristics and human capital of newly appointed directors. First, we find that 13% of new directors are female compared to the sample average of 9%. This difference is significant at the 1% level and supports our previous findings in Figure 4.1 that more females are being appointed to boards.[14] The average new director is younger by almost 5 years, is more likely to reside overseas, and is slightly more educated in terms of undergraduate level education. A new director is more likely to be the CEO of an unlisted company but is less likely to have prior CEO experience, possibly related to their younger age. New directors have 12% more international experience, a considerable gap given the hypothesised benefits of international experience for directors (Spencer Stuart, 2017b). A new director is less likely to be a professional director or a financial expert, although there is no significant difference between accountants, bankers or general executives. There is also a significant difference in industry experience, whereby new directors are less likely to have consumer, agricultural or industrial experience.

[14] Adams and Ferreira (2009) find that a female is more likely to be appointed to a board if there is already a female board member.

Table 4.3: Average Directors Characteristics and Human Capital Attributes 2000 to 2015

	Average Director	Avg Male Director	Avg Female Director	Mean Difference (Male - Fem)		Avg New Director (Years<=0)	Mean Difference (New-Avg)		Avg New Male Director	Avg New Female Director	Mean Difference (Male - Fem)	
Obs	12211	11142	1069			1501			1312	189		
Female (0/1)	9%	0%	100%	-	-	13%	4%	a	0%	100%	-	-
Age (Years)	56.2	56.7	52.0	4.7	a	51.4	-4.8	a	51.9	48.4	3.5	a
New Zealand (0/1)	70%	71%	66%	5%	a	57%	-13%	a	57%	57%	0%	-
Undergraduate (0/1)	35%	35%	38%	-3%	c	34%	-2%	-	33%	36%	-3%	-
Postgraduate (0/1)	35%	34%	43%	-9%	a	40%	5%	a	38%	48%	-9%	b
No Degree (0/1)	30%	31%	19%	12%	a	27%	-3%	a	28%	16%	12%	a
Director Exp (Years)	6.53	6.72	4.53	2.20	a	0.00	-6.53	a	0.00	0.00	0.00	-
Directorships (N)	1.21	1.21	1.25	-0.04	b	1.03	-0.18	a	1.03	1.03	0.00	-
NZX10 (0/1)	9%	9%	12%	-3%	a	6%	-3%	a	5%	8%	-2%	-
NZX50 (0/1)	40%	39%	48%	-9%	a	33%	-7%	a	31%	41%	-10%	a
Prior CEO Experience (0/1)	41%	42%	25%	18%	a	32%	-9%	a	33%	24%	8%	b
Current CEO (listed) (0/1)	14%	15%	5%	10%	a	13%	-1%	-	15%	3%	11%	a
Current CEO (non-listed) (0/1)	12%	12%	9%	3%	a	15%	3%	a	15%	14%	1%	-
International Experience (0/1)	44%	45%	41%	4%	b	57%	12%	a	56%	59%	-3%	-
M & A Experience (N deals)	2.1	2.0	3.2	-1.2	a	0.0	-2.1	a	0.0	0.0	0.0	-
Professional Expertise (0/1)												-
Accountant	18%	18%	14%	4%	a	17%	-1%	-	18%	12%	6%	c
Banker	16%	16%	10%	6%	a	17%	1%	-	18%	11%	6%	b
Consultant	9%	9%	15%	-6%	a	11%	1%	-	9%	19%	-9%	a
Financial Expert	24%	24%	20%	3%	b	20%	-4%	a	20%	15%	5%	-
General Executive	32%	32%	32%	0%	-	32%	0%	-	32%	32%	0%	-
Lawyer	7%	7%	14%	-8%	a	7%	-1%	-	6%	12%	-6%	a
Prof Director	11%	10%	18%	-8%	a	7%	-4%	a	6%	12%	-6%	a
Industry Experience (0/1)												-
Banking & Finance	45%	44%	54%	-11%	a	43%	-1%	-	44%	42%	1%	-
Consumer Gds & Sces	41%	41%	44%	-3%	c	36%	-5%	a	34%	47%	-12%	a
Farming, Fishing, Forestry	13%	13%	8%	6%	a	10%	-3%	a	10%	6%	4%	-
Industrial	16%	16%	13%	4%	a	13%	-3%	a	13%	11%	2%	-

Note: [a, b, c] denotes significance at 1%, 5%, 10% level respectively. All variables are defined in Appendix A1.

4.5.2.4. Biographies of the average director

Based on the director statistics in Table 4.3, we searched for the average director and female director in the year 2015. Table 4.4 and 4.5 report the biographies of Nigel Morrison and Justine Smyth. Nigel Morrison is a financial expert who has held several senior financial positions in the consumer services and finance industry both in New Zealand and overseas. He is currently the CEO of Skycity Entertainment Group which is the only listed directorship he holds. On the other hand, Justine Smyth holds several board positions, including Auckland International Airport, Spark New Zealand, Lingerie Brands, a company she founded, and the Breast Cancer Foundation. Justine is also a Fellow Chartered Accountant with substantial experience in the financial services, consumer services, and retail industries. Her biographies describe her as regarded highly for her experience in governance, mergers and acquisitions and extensive small and medium business experience. There is a lot of similarity between the two directors demonstrating the significance of human capital for both genders, including professional financial expertise, industry experience, and international management. Both directors were also prior partners at a 'Big 4' accounting firm where they obtained significant corporate finance experience. While Justine has substantial financial expertise and other commercial experience, Nigel has more board experience, is older, and has been a senior manager of corporations for over 20 years.

Table 4.4: Profile of the Average Director

Nigel Barclay Morrison (2015)

Managing Director

Age:	56
Residence:	Auckland, Herne Bay
Education:	Bachelor of Commerce, University of Melbourne. INSEAD Advanced Management Programme.
Directorships:	Skycity Entertainment Group Ltd
Director experience:	6 years
Professional expertise:	Accountant, Financial Expert (Chartered Accountant, Certified Public Accountant, Member of the Securities Institute in Australia)
Career:	Over 18 years' experience in the gaming industry prior to joining Skycity Entertainment Group Ltd as Managing Director and Chief Executive officer in 2008. He held various senior management positions throughout Australasia and Asia including Chief Financial Officer and Chief Operating Officer, Crown Limited and Group Chief Financial Officer, Galaxy Entertainment Group Limited. Prior to his career in casinos in 1993, Nigel was a Corporate Finance Partner with

	Ernst & Young in Melbourne, specialising in the gaming industry. In 2009, Awarded CPA Australia's highest acknowledgment for career achievement.
Total compensation:	$3,670,666

Nigel Morrison stepped down as chief executive officer in May 2016 and is currently a partner at an investment management firm, St Lewis Capital.

Table 4.5: Profile of the Average Female Director

Justine Bronwyn Gay Smyth (2015)

Independent Director, Committee Chair

Age:	49
Residence:	Auckland, Milford
Education:	Bachelor of Commerce, University of Auckland, Program for Management Development, Harvard Business School.
Directorships:	Auckland International Airport Spark New Zealand - Chair of Human Resources Committee, Member of Audit & Risk Committee Lingerie Brands Limited New Zealand Breast Cancer Foundation
Director experience:	3 years
Professional expertise:	Accountant, Financial Expert (Fellow Chartered Accountant)
Career:	Justine's background is in finance and business management as tax partner of Deloitte, Group Finance director of Lion Nathan in Sydney and owner of a retail clothing business with brands across Australasia. Former board member of the Financial Markets Authority and a former Deputy Chair of New Zealand Post Limited. Experience in retail, governance, mergers & acquisitions, taxation and financial performance of large corporate enterprises and the acquisition, ownership, management and sale of small and medium enterprises.
Total compensation:	$150,562 - Auckland International Airport $180,983 - Spark New Zealand

4.5.2.5. Directors grouped by firm size of directorships

Table 4.6 provides a comparison of directors who either sit on an NZX10 board, NZX50 board or *Other* board. We first observe that women are 4% more frequent on the boards of NZX10 than *Other* companies, supporting the earlier results in Table 4.3. NZ10 Directors are significantly more educated and have more director experience and expertise. Specifically, 14% more *NZX10* directors have a degree qualification, while 15% more have postgraduate education compared with *Other* directors. The differences are highly statistically significant at the 1% level and suggests that among the top largest firms, postgraduate level education is valued. Additionally, as would be expected, directors on the largest firms possess considerably more human capital. NZX10 directors sit on an average of 0.48 more boards and are 12% more likely to be prior CEOs, albeit they are less likely to be current CEOs. These findings suggest that prior CEO experience is of importance

for larger firms (Tian et al., 2011), but that the time demands of being a CEO make a person less likely to sit on an NZX10 board. Additionally, larger firms appoint directors who sit on other public boards, although this could be the consequence of the best candidates being in demand. Directors of larger firms also have 3.7 more *M & A* deals. In terms of expertise, NZX10 directors are more likely to have accounting, financial or legal expertise and be a professional director. We also see an increase in industry experience except for farming, fishing, and forestry, which is significantly lower.

Table 4.6: Average Directors by Firm Size of Directorships 2000 to 2015

	NZX10 Directors	NZX50 Directors	Other Directors	Mean Difference (NZX10-Other)	
Obs	1110	3715	7386		
Female	12%	10%	8%	4%	a
Age	57.6	57.1	55.3	2.3	a
New Zealand	71%	61%	75%	-4%	a
Undergraduate	34%	38%	35%	-1%	-
Postgraduate	46%	37%	32%	15%	a
No Degree	20%	25%	34%	-14%	a
Director Exp (Years)	7.68	7.04	6.10	1.58	a
Directorships	1.59	1.31	1.11	0.48	a
NZX10	100%	0%	0%	100%	-
NZX50	100%	100%	0%	100%	-
Prior CEO Experience	49%	47%	37%	12%	a
Current CEO (listed)	14%	13%	15%	-0.5%	-
Current CEO (non-listed)	10%	10%	13%	-3%	a
International Experience	48%	51%	41%	7%	a
M & A Experience	4.5	4.0	0.8	3.7	a
Professional Expertise					
Accountant	22%	21%	16%	6%	a
Banker	12%	18%	15%	-2%	b
Consultant	9%	8%	10%	-1%	-
Financial Expert	28%	27%	21%	7%	a
General Executive	27%	29%	34%	-7%	a
Lawyer	12%	8%	6%	6%	a
Prof Director	15%	14%	9%	6%	a
Industry Experience					
Banking & Finance	47%	49%	42%	5%	a
Consumer Gds & Sces	46%	39%	41%	5%	a
Farming, Fishing, Forestry	8%	12%	14%	-7%	a
Industrial	20%	21%	13%	7%	a

Note: [a, b, c] denotes significance at 1%, 5%, 10% level respectively. All variables are defined in Appendix A1.

4.5.2.6. Directors grouped by performance

Table 4.7 provides a comparison between director characteristics and human capital, grouped by the past performance of the firms they serve on. Past performance (*PastPerf*) is measured each year for the firms at which a director serves using the firms prior year total stock market returns,

and market value-weighted across all board seats held (Similar to Cashman et al., 2013). We rank directors based on *PastPerf* and assign each director to one of three groups. Group 1 includes directors in the lower quartile of past performance, Group 2 includes directors between the 25th and 75th percentile of past performance, and Group 3 includes directors in the upper quartile of past performance.

The findings suggest that directors in Group 2 have more human capital than directors in the high and low past performance groups. Specifically, a higher proportion of directors within the average past performance range have university-level education and more experience on boards, as a prior CEO, and in M & As. They are also more likely to have financial or banking expertise, and banking, finance or industrial industry experience. They are older, on average by 1-2 years, and less likely to reside in New Zealand. These directors are also more likely to sit on the board of a large firm, whereby 12% (49%) sit on the board of an NZX10 (NZX50) firm, much higher than the other two groups. This suggests that directors with more human capital, especially board experience and financial or banking expertise, may prefer to sit on boards of larger, more mature firms that are less likely to have extreme performance results. This could be due to avoiding reputational penalties (Fama, 1980; Fama & Jensen, 1983b).

Table 4.7: Average Directors by Past Performance 2000 to 2015

	1 Low 25th PastPerf	Mean Difference (Med-Low)		2 Med PastPerf	Mean Difference (Med-High)		3 High 25th PastPerf	Mean Difference (High-Low)	
Obs	3101			5880			3044		
Past Performance	-36%	42%	a	6%	-61%	a	67%	102%	a
Female	8%	2%	b	9%	0%	-	9%	1%	b
Age	55.2	1.6	a	56.8	0.6	b	56.2	1.0	a
New Zealand	72%	-6%	a	67%	-8%	a	75%	2%	b
Undergraduate	34%	3%	a	37%	1%	-	35%	2%	-
Postgraduate	34%	2%	-	36%	2%	c	34%	0%	-
No Degree	32%	-5%	a	28%	-3%	a	31%	-1%	-
Director Exp (Years)	5.56	1.54	a	7.10	0.44	a	6.66	1.09	a
Directorships	1.11	0.17	a	1.28	0.10	a	1.19	0.07	a
NZX10	4%	8%	a	12%	4%	a	8%	4%	a
NZX50	24%	26%	a	49%	11%	a	39%	15%	a
Prior CEO Experience	38%	5%	a	43%	2%	-	41%	3%	b

Current CEO (listed)	15%	-1%	c	14%	0%	-	14%	-2%	b
Current CEO (non-listed)	13%	-1%	-	11%	0%	-	12%	-1%	-
International Experience	45%	0%	-	45%	2%	c	43%	-2%	-
M & A Experience	1.1	1.8	a	2.9	1.1	a	1.8	0.7	a
Professional Expertise									
Accountant	16%	4%	a	19%	1%	-	18%	3%	a
Banker	14%	4%	a	18%	4%	a	14%	0%	-
Consultant	10%	-1%	c	9%	-1%	-	10%	9%	-
Financial Expert	20%	6%	a	26%	2%	b	24%	4%	a
General Executive	34%	-3%	a	30%	-2%	b	33%	-1%	-
Lawyer	7%	0%	-	8%	1%	-	7%	0%	-
Prof Director	8%	4%	a	12%	1%	-	11%	3%	a
Industry Experience									
Banking & Finance	40%	9%	a	49%	6%	a	42%	2%	c
Consumer Gds & Sces	40%	1%	-	41%	0%	-	42%	2%	-
Farming, Fishing, Forestry	12%	0%	-	12%	-1%	b	13%	2%	a
Industrial	13%	4%	a	18%	2%	b	16%	3%	a

Note: [a, b, c] denotes significance at 1%, 5%, 10% level respectively. All variables are defined in Appendix A1.

4.5.2.7. Directors grouped by directorships 2000 to 2015

Table 4.8 provides a comparison between the characteristics and human capital of directors holding one directorship and directors holding multiple directorships. We find that directors with multiple directorships typically have significantly more skills and experiences than those that do not. Generally, the directors are older by 2.3 years, 2% more are female and 21% more reside in New Zealand. In terms of human capital, the proportion of those with undergraduate education is 9% higher, and those with postgraduate education is 2% higher. Looking at CEO and other experience, directors holding multiple directorships are more likely to have prior CEO and M & A experience but are less likely to have international experience or be current CEOs. In terms of professional expertise, there is a higher proportion of accountants, bankers, and financial experts, and as we would expect, professional directors. These differences are also highly significant at the 1% level. We also observe an increase in industry experience. The largest increase is 14% for banking and financial industry experience. These differences are also highly significant at the 1% level. The findings strongly suggest that in addition to director and CEO experience, financial skills and experiences are highly desired human capital factors considering that a large proportion of directors with these skills also sit on multiple boards. It is also clear that time constraints impact the number of directorships held. To explain, we observe that 3% less are current CEOs, while 17% more are professional directors who are also older and have likely retired.

Table 4.8: Average Directors by Directorships 2000 to 2015

	1 Directorship	2+ Directorships	Mean Difference (High-Low)	
Obs	10354	1857		
Past Performance	10%	11%	1%	-
Female	8%	10%	2%	a
Age	55.8	58.1	2.3	a
New Zealand	67%	88%	21%	a
Undergraduate	34%	43%	9%	a
Postgraduate	34%	37%	2%	b
No Degree	32%	20%	-11%	a
Director Experience (Years)	6.08	9.05	2.97	a
Directorships	1.00	2.40	1.40	a
NZX10	7%	23%	17%	a
NZX50	35%	65%	30%	a
Prior CEO Experience	40%	48%	8%	a
Current CEO (listed)	15%	12%	-3%	a
Current CEO (non-listed)	12%	9%	-3%	a
International Experience	45%	40%	-6%	a
M & A Experience	1.7	4.5	2.9	a
Professional Expertise				
Accountant	16%	27%	10%	a
Banker	15%	20%	5%	a
Consultant	10%	9%	-1%	-
Financial Expert	21%	36%	14%	a
General Executive	33%	25%	-8%	a
Lawyer	7%	8%	1%	-
Prof Director	8%	25%	17%	a
Industry Experience				
Banking & Finance	43%	56%	14%	a
Consumer Gds & Sces	40%	46%	6%	a
Farming, Fishing, Forestry	12%	16%	3%	a
Industrial	15%	21%	6%	a

Note: [a, b, c] denotes significance at 1%, 5%, 10% level respectively. All variables are defined in Appendix A1.

4.5.3. Biographies of top connected directors

In this section, we look at the characteristics and human capital of the top connected directors ranked by *Connectivity* in 2015. Table 4.9 presents the biographies of the top ten directors which suggests that such directors have high human capital and similar backgrounds. Firstly, the ages range from 58 to 76 which exceeds the age of the average director, 56. All directors reside in New Zealand, and most have at least a university degree. They all sit on large company boards, hold multiple directorships, and have multiple years of board experience with most exceeding the full sample average of 6.5 years' experience. Four of the directors have prior CEO experience, two have international experience, while nine have M & A experience, suggesting that M & A experience is common among highly connected directors. Of particular importance is the overlap in the type of firms the directors govern. Five of the top connected directors sit on the Fonterra

board, four on T&G Global's board, and two sit on Summerset Holdings, Sky Network Television, and Property for Industry. Moreover, Humphry Rolleston and John Waller both sit on the boards of Sky Network Television and Property for Industry which suggests that the same group of directors are being appointed to the same boards. There is a high proportion with the same experiences, and many have been partners or senior executives of large accounting and financial firms and hold chairman positions concurrently with several other board positions. Table 4.9 suggests that these top-connected directors are commonly accountants, investment professionals, or banking executives, and have prior director, CEO and M&A experience.

Table 4.9: Biographies of Top 10 Connected Directors in 2015

Name	Age	Gender	Residence	University Education	University	No Listed Boards	Directorships	Years Exp	Prior CEO Exp	Exec Director	Current CEO Listed Firm	Current CEO Non-listed Firm	Intl Exp	M and A Exp	NZX50 Director	Professional Expertise	Industry Experience	Total Compensation from Listed Firms
David Jackson	-	Male	New Zealand	Postgrad		2	FONTERRA CO-OPERATIVE GROUP LIMITED, NUPLEX INDUSTRIES LIMITED	11	-	-	-	-	Yes	Yes	Yes	Accountant, Financial Expert	Consumer Gds, Consumer Sces, Farming, Fishing, Forestry	340,897
Over 30 years with accounting firm Ernst & Young in a variety of roles includoing Audit Partner, and served as Chairman of the board of management for the firm in New Zealand from 1999 to 2002. With Ernst and Young, David gained experience in Asia, the UK, U.S.A. and South America working with major national and international clients for over 30 years.Serves on the board of Mitre 10 (New Zealand) Limited, Chairman of The Dame Malvina Major Foundation, and was previously Chairman of The New Zealand Refining Company Limited.																		
Humphry Rolleston	66	Male	New Zealand	None reported	Cathedral Grammar School	4	INFRATIL LIMITED, MERCER GROUP LIMITED, PROPERTY FOR INDUSTRY LIMITED, SKY NETWORK TELEVISION LIMITED	29	-	-	-	-	-	Yes	Yes	Financier, Investor	Finance, Industrial, Consumer Gds	273,699
Long-term business partner of Allan Hubbard, South Canterbury Finance. Owns a number of private companies involved in tourism, security, manufacturing and finance. Chairman of Simmonds Lumber Pty Limited, chairman of ANZCRO Pty Limited Director, shareholder of Matrix Security Group Ltd, director of Asset Management Limited, director of Spaceships Limited, director and shareholder of Stray Limited, director and shareholder of Media Metro Limited, chairman and shareholder of Murray & Co. Limited, chairman and shareholder of Murray & Company Wealth Management Ltd, chairman and shareholder of FDJ Murray & Company Holdings Ltd, director and shareholder of McRaes Global Engineering Limited. FInstD, FNZIM.																		
John Anderson	70	Male	New Zealand	Undergrad	Victoria University of Wellington	4	APN NEWS & MEDIA LIMITED, NPT LIMITED, STEEL & TUBE HOLDINGS LIMITED, T&G GLOBAL LIMITED	5	Yes	-	-	-	-	Yes	Yes	Banking Senior Executive, Financial Expert	Banking, Finance, Consumer Sces	344,493
Began a career in accounting, followed by sharebroking in Melbourne. Helped form South Pacific Merchant Finance, and became Chief Executive of Southpac in 1979, then CEO of the National Bank. Oversaw the National Bank's merger with Rural Bank in 1992 and Countrywide Bank in 1998. Formerly the CEO of the ANZ National Bank. Currently chairman of NPT Limited, Steel & Tube Holdings Limited, deputy chairman of Turners & Growers Limited and director of the Commonwealth Bank of Australia. In 2012, was awarded an Honorary Doctorate of Commerce by Victoria University of Wellington. A Fellow of the New Zealand Institute of Chartered Accountants, Fellow of the Institute of Financial Professionals New Zealand, Fellow of the Institute of Directors, Life member of Australian Institute of Banking and Finance Professionals. Knighted in 1994.																		
John Waller	62	Male	New Zealand	Undergrad	University of Canterbury	3	FONTERRA CO-OPERATIVE GROUP LIMITED, PROPERTY FOR INDUSTRY LIMITED, SKY NETWORK TELEVISION LIMITED	6	-	-	-	-	-	Yes	Yes	Partner Pricewaterhouse Coopers, Financial Adviser	Banking, Finance	358,500
Previously a partner of Price Waterhouse Coopers for over 20 years. He was also a member of its board and led its advisory practice for many years. Previously a Member of the New Zealand Takeovers Panel. Past chairman Bank of New Zealand, director National Australia Bank, director of National Equities Limited and BNZ Investments Limited. Serves on the board of Haydn & Rollett Limited and Donaghys Limited. ONZM, Dist F Inst D.																		
John Wilson	-	Male	New Zealand	Undergrad	Massey University	2	FONTERRA CO-OPERATIVE GROUP LIMITED, T&G GLOBAL LIMITED	11	-	-	-	-	-	Yes	-	Dairy farmer	Consumer Gds, Farming, Fishing, Forestry	483,000
Previously he served as the inaugural chairman of the Fonterra Shareholders' Council. He serves on the executive board of the New Zealand China Council. Lives on his dairy farm near Te Awamutu and jointly owns a dairy farming business based near Geraldine, South Canterbury. Director of Winterburg GP Limited and Bendigo Terrace GP Limited. Ceased to be a director of Rangiattack Farming Company Limited. MInstD.																		

Table 4.9 (cont): Biographies of Top 10 Connected Directors in 2015

Name	Age	Gender	Residence	University Education	University	No Listed Boards	Directorships	Years Exp	Prior CEO Exp	Exec Director	Current CEO Listed Firm	Current CEO Non-listed Firm	Intl Exp	M and A Exp	NZX50 Director	Professional Expertise	Industry Experience	Total Compensation from Listed Firms
Michael Dossor	76	Male	New Zealand	Diploma in Agriculture		2	T&G GLOBAL LIMITED, TURNERS LIMITED	24	Yes	-	-	-	-	Yes	-	Agriculturist	Finance, Consumer Gds, Farming, Fishing, Forestry	90,500
Mr Dossor had an association with T&G spanning over 50 years, commencing in 1963 when he began working for Fruit Distributors, of which T&G later became the majority shareholder. He joined the board of directors of T&G in 1991 as a non-independent director, and was managing director from 2003 to 2005. Michael Dossor was chairman of Turners Group NZ from 2003 until its takeover by Turners Limited in November 2014. A director of Turners and Growers and is a director of McKay Shipping. Michael represents the interest of the investment company Bartel Holdings Limited, which has a 7.01% shareholding in Turners Limited. Michael holds a Diploma in Agriculture.																	
Nicola Shadbolt	59	Female	New Zealand	Postgrad	University of Nottingham, University of Canterbury, Massey University	2	FONTERRA CO-OPERATIVE GROUP LIMITED, FONTERRA SHAREHOLDERS' FUND	5	-	-	-	-	Yes	-	Yes	Academic	Consumer Gds, Farming, Fishing, Forestry	165,000
A professor of Farm and Agribusiness Management at Massey University, serves on the boards of the Manager of the Fonterra Shareholders' Fund, the International Food and Agribusiness Management Association, and Hopkins Farming Group Limited. She represents New Zealand in the International Farm Comparison Network in Dairying. Nicola and her husband live in the Pohangina Valley in the Manawatu, which is the base for the five farming and forestry equity partnerships they run, which include two dairy farms. MInstD.																		
Norah Barlow	58	Female	New Zealand	Undergrad	Victoria University of Wellington	4	COOKS GLOBAL FOODS LIMITED, EVOLVE EDUCATION GROUP LIMITED, METHVEN LIMITED, SUMMERSET GROUP HOLDINGS LIMITED	6	Yes	-	-	-	-	Yes	Yes	Accountant, Professional Director, Financial Expert	Finance, Health	245,000
An accountant by profession, operating her own partnership for a number of years, prior to becoming the group accountant, then CEO of NZX and ASX-listed Summerset Group. Now a professional director and holds a number of directorships, including Evolve Education Group Limited, Summerset Group Holdings Limited, Methven Limited, Cigna Life Insurance New Zealand Limited, Cooks Global Foods Limited and Vigil Monitoring Limited in New Zealand, and Estia Health Limited and Ingenia Communities Limited in Australia. She is also a ministerial appointee to the National Advisory Council for the Employment of Women, and is chair of the National Science Challenge 'Ageing Well'. In 2014 she was awarded an ONZM for services to business.																	
Ralph James Norris	66	Male	New Zealand	None reported	Lynfield College, no formal tertiary education	3	FLETCHER BUILDING LIMITED, FONTERRA CO-OPERATIVE GROUP LIMITED, FONTERRA SHAREHOLDERS' FUND	11	Yes	-	-	-	Yes	Yes	Yes	Banking, Senior Executive	Banking, Consumer Sces	509,815
A 40-year career in banking including CEO of the Commonwealth Bank of Australia until 2011 and served as CEO and Managing Director of Air New Zealand Limited from 2002 to 2005 and ASB Bank Limited from 1991 to 2001. Director of the Manager of the Fonterra Shareholders' Fund, Origin Energy Limited, chairman of Fletcher Building Limited, chairman of RANQX Holdings Limited. Member of the University of Auckland Council and the New Zealand Treasury Advisory Board. Sir Ralph was made a Knight Companion of the New Zealand Order of Merit in 2009 and a Distinguished Companion of the New Zealand Order of Merit for services to business in 2006. In 2012, he received an Honorary Doctorate of Business from the University of New South Wales. KNZM.																		
Robert Campbell	64	Male	New Zealand	Postgrad	Victoria University of Wellington, Massey University	4	G3 GROUP LIMITED, PRECINCT PROPERTIES NEW ZEALAND LIMITED, SUMMERSET GROUP HOLDINGS LIMITED, T&G GLOBAL LIMITED, TOURISM HOLDINGS LIMITED	8	-	-	-	-	-	Yes	Yes	Investor, Investment Advisor, Economist	Finance	367,125
Rob trained as an economist and has worked in a variety of capital market advisory and governance roles over a long period. Rob Campbell has over 30 years' experience as a director and investor. Currently the chair of Tourism Holdings Ltd, G3 Group Ltd, and a director of Precinct Properties NZ Ltd and T&G Global Ltd (Turners & Growers). He is a director of substantial private companies based in Australia and New Zealand. A director of or advisor to a number of hedge and private equity funds in a number of countries.																		

4.6. Conclusions

This chapter comments on the human capital of the directors of New Zealand publicly listed firms, identifies some of the most important human capital attributes of the board, and begins to show the relationship between human capital and social capital which will be continued in Chapter 5. Specifically, we find that education, particular areas of expertise, and international, transaction, and director experience are important attributes. We find that larger firms have directors with more human capital and directors with multiple directorships typically have more human capital than those that do not. The findings strongly suggest that education, director experience, prior CEO experience, and financial skills are highly desired human capital factors as a large proportion of directors with these attributes also sit on multiple boards. Finally, this chapter shows that top connected directors are most likely to sit on large company boards, hold multiple directorships, have similar experiences including being partners or senior executives of large accounting and financial firms.

This chapter can be used as a benchmark by providing practical information for appointment committees as a reference for board recruitment. This chapter provides information about the attributes of average directors, multiple directors, directors of large and small firms, gender-specific directors, and new directors. Shareholders can use the information as a benchmark for evaluating their investment companies. More importantly, this chapter contributes to the director attribute literature. A study of this detail on human capital within the New Zealand context has not been previously conducted.

Chapter 5

Determinants of Directors' Social Capital

"Human capital resides in individuals.

Social capital resides in social relations."

(OECD, 2001, p. 13).

5.1. Introduction

5.1.1. Context

Directors' connections facilitate information flows between firms, supplementing the board's human capital (Pfeffer & Salancik, 1978). However, the precise value of these social connections is still unclear in the literature. One issue with the prevailing literature is that the importance of social capital (a director's social connectivity) has not been examined conjointly with directors' human capital. Social capital differs from human capital in that it represents the potential information, ideas and resource flow from the social relations between individuals whereas human capital represents an individual's personal attributes (Becker, 1964; Burt, 1992). Human capital is likely to be interrelated with social capital (Coleman, 1988) and human capital has been extensively shown to impact the board's role (e.g. Anderson et al., 2011; Johnson et al., 2013; White et al., 2014; Hamori & Koyuncu, 2015). So, the question of whether the social capital of

directors, i.e. their connectivity, has a beneficial impact on firm outcomes, over and above the human capital of directors, remains largely unresolved.

5.1.2. Approach

This study examines the social capital of directors that is intrinsically acquired from the corporate social network. Specifically, we investigate the relationship between a director's connectivity and human capital. As noted above, directors' connections may be driven by their human capital attributes such that high social capital is simply an attribute of high human capital. For instance, a director with a highly desirable set of skills and prior knowledge is likely to be attractive to multiple firms, resulting in multiple board seats on better quality boards. Multiple board seats and sitting on more prestigious boards will result in greater connections and thus, higher connectivity. To examine the value of social capital, which we test in later chapters, we begin by exploring the determinants of social capital and attempt to determine if human capital drives social capital.

5.1.3. Results and discussions

The univariate results suggest that highly connected directors have greater human capital compared to low-connected directors. The human capital differences are statistically significant providing evidence of a positive relationship between social capital and human capital. Specifically, a highly connected director can be broadly characterised as a professional director with a university degree and financial or accounting expertise who has prior director experience, prior CEO experience, merger and acquisition experience, and prior industry experience. Conversely, a highly connected director is less likely to be a banker, consultant, general executive or current CEO. These aspects represent the human capital attributes of a well-connected director.

We conduct multivariate regression analysis employing a self-constructed measure of human capital to determine the relationship between human capital and connectivity. We replace the human capital variables with a human capital index (*HCI*) using nine of the attributes we identify

to be the most important. For our main analysis, we employ ordinary least squares regressions including levels and first differenced dependent and independent variables. Additionally, we employ quantile regressions to examine whether the relationship between connectivity and human capital varies depending on how much connectivity a director has. We also employ a logistic estimation to investigate whether human capital increases the likelihood of being a highly connected director. Overall, the results suggest a positive and significant relationship between human capital and connectivity where changes in human capital appear to predict changes in connectivity. The relationship also varies for directors with different levels of connectivity. Specifically, we find that human capital has a positive, but decreasing association with connectivity as the level of a director's connectivity increases. In addition to employing first-difference regressions, we employ fixed effects regressions controlling for year and director fixed effects to consider the time-invariant omitted variable bias and the simultaneity issue and our main findings remain unchanged. Moreover, the results suggest that human capital predicts connectivity and indicates that the growing finance literature investigating board connectivity must control for human capital when investigating the value of social connectivity. Our results suggest that, without controlling for human capital, social capital may simply be a proxy for the quality of a director which has been shown by the literature to influence firm performance and a variety of corporate decisions.[15] This suggests that prior connectivity studies may be unknowingly reporting results for the impact of board human capital not strictly social capital.

5.1.4. Contributions

The key contribution of this study is to provide evidence on the relationship between human capital and director connectivity. Studies to date exploring the impact of director social capital have tended to either exclude human capital measures, or control for it using just one or two

[15] Review the discussion of the human capital literature in Section 4.4 of this thesis.

proxies. The advantage of exploring New Zealand is that by studying a smaller market over a long time period, we were able to investigate a wider range of attributes.

Second, we employ quantile regression analysis which has not been commonly employed in this setting. This methodology allows the modelling of the relationship at various levels of connectivity, including the extreme tails. The results suggest that human capital is more important for gaining additional connectivity for directors who are less connected. Specifically, the relationship between social connectivity and human capital weakens as a director's own connectivity increases as social capital supplements or substitutes for human capital (Boxman et al., 1991). To our knowledge, this is the first study to employ quantile regression analysis in examining director attributes.

Third, we also construct a human capital index which is the first of its kind. This method essentially allows us to reduce a director's human capital, which covers several important board capital attributes, down to one measure. We also construct a composite measure of social capital employing principal component analysis which allows us to provide evidence on which type of capital, human or social, predicts the other. These measures also allow for clearer comparisons between directors which can be used in practical settings such as identifying board applicants with high capital or analysing boards for corporate governance decisions.

5.1.5. Structure

The rest of the chapter is structured as follows. Section 5.2 provides a background of the literature and develops the hypothesis with more detail on the relationship between human capital and social capital. Section 5.3 provides a description of the sample and data used in this study. Section 5.4 presents univariate analyses that determines the human capital differences between a high and low connected director and constructs the human capital index. Section 5.5 presents the multivariate results, testing a range of different relationships between human capital and connectivity. Section 5.6 presents robustness tests and Section 5.7 concludes the chapter.

5.2. Background and Literature Review

Studies of human capital and social capital have developed over a number of decades (Hanifan, 1916; Hanifan, 1920; Schultz, 1961; Becker, 1964; Granovetter, 1973). Human capital refers to the value of people's personal attributes such as the skills and knowledge acquired through experiences, training and education (Becker, 1964, 1993). Social capital is broadly defined as the value derived from social relationships, such as the ability to access information, resources, trust, and norms of reciprocity that social networks create (Burt, 1992). While the two forms of capital are distinct, they are interlinked. This point was clearly made in discussions at a U.S. human capital conference held in 2014 (Nyberg & Wright, 2015), which raises serious questions around the validity of studies that test the influence of social capital, particularly on economic outcomes, without including human capital. As a starting point to demonstrate this interlink, in the previous chapter, we demonstrated that highly connected directors tend to possess particular human capital attributes and in general to have higher aggregate human capital. This partial evidence raises the question of whether director connectivity may be driven by their human capital, or alternatively, connectivity may influence human capital (e.g. Anderson et al., 2011; Johnson et al., 2013; White et al., 2014; Hamori & Koyuncu, 2015). The following discussions highlight some of the issues which explains the endogenous link between human capital and social capital.

5.2.1. The development of human capital and social capital

Views on the link between human capital and social capital began to emerge in sociology during the 1980s (Bourdieu, 1986; Coleman, 1988). Coleman (1988) provides a useful discussion to understand the effect of social capital on the creation of human capital. He studies the links in an educational context using high school graduation as a measure of human capital. The findings broadly suggest that, a student with greater social capital within the family and the wider adult community encounters a more supportive environment allowing the student to build greater human capital. Principally, this suggests that social elements can play an important role in the

development of human capital. Glaeser (2001) extends on this fact by explaining that education influences the development of individual social capital, such as social skills gained through group work and learning how to deal with peers. This view suggests that the development of human capital also creates social capital. It also suggests that education can create social connections (Hwang & Kim, 2009; Horton et al., 2012) and homophily[16] (Berger et al., 2013) which can impact on how people work together. In relation to our study, this suggests we may face a potential reverse causality or even a simultaneity problem, in that social and human capital may influence each other. Therefore, trying to determine the value of one, without considering the other, may result in biased and unreliable findings.

5.2.2. Multiple directorships and higher quality directors

Fama and Jensen (1983) hypothesise that multiple directorships signal director quality. They suggest that directors with multiple directorships develop reputations as experts in monitoring managements' decisions, and as experts in the governance field. This suggests that the number of directorships proxies for or is driven by a director's human capital. A body of literature has shown this empirically, finding that directors holding multiple directorships are more experienced, competent, skilled and reputable (Fich & Shivdasani, 2007; Ahn, Jiraporn, & Kim, 2010; Cashman et al., 2012; Field et al., 2013). For instance, Field et al., (2013) find that busy directors are more experienced and more educated than non-busy directors. They estimate a logit regression and find that venture capital directors are more likely to sit on three or more boards if they are older, have an MBA from Harvard or Stanford, or are associated with a top venture capital firm. This suggests that higher quality directors are appointed to more boards because of their desirable attributes, and we expect sitting on more boards to increase a director's connectivity.

[16] Homophily refers to the tendency for people to develop a bond with similar others (Berger, Kick, Koetter, & Schaeck, 2013).

5.2.3. Professional expertise and beneficial relationships

In the seminal work of Pfeffer and Salancik (1978), they assert that boards are 'vehicles for co-opting important external organisations'. Put differently, directors are strategically chosen to open up communication links for the firm and establish beneficial relationships with key stakeholders. Therefore, firms may select directors with specific attributes to gain access to specific connections. White, Woidtke, Black and Schweitzer (2014) find that academic administrator directors, such as deans and chancellors, are appointed for their business connections gained from holding key leadership positions and relations with external groups. Houston, Jiang, Lin and Ma (2014) identify directors who hold or have held an important political or regulatory position and find that the firms they govern receive favourable bank lending terms. Mizruchi and Sterns (1994) find that firms with financial directors on boards will borrow more. They contend that these directors connect firms to financial institutions, increasing their access to external funding. These studies suggest that firms may appoint experts to facilitate beneficial business relationships. Therefore, academic, financial and political expertise may bring access to specific external parties, a form of social capital.

5.2.4. Director attributes, trust and power

Other functions of social capital may also be acquired through human capital, which may increase a director's ability to share with the board their knowledge and informational benefits of external connections (Glaeser, Laibson, Scheinkman, & Soutter, 2000). One of which is trust, which is formed by the close social relations among board members. Organisational behaviour research has shown that interpersonal trust enables groups to solve problems in a cooperative manner (Zand, 1972). A lack of trust is likely to induce boards to circumvent the influence of others and be unreceptive to their ideas. Another function is power, which refers to the ability to influence decisions and can be derived from the authority, knowledge, rank, or position of a director (Van den Berghe & Levrau, 2004). Directors who sit on other boards which are larger and better-performing, increase their power to influence discussions (Perry & Peyer, 2005). Multiple

board appointments themselves also authenticate directors (Fama & Jensen, 1983b; Perry & Peyer, 2005). These forms of social capital are interlinked with the individual directors' characteristics, human capital, and also with each other, influencing the performance of boards. For example, Shropshire (2010) discusses the individual attributes of interlocking directors, a measure of social capital, that may increase the receptivity of the board and their ability to transfer knowledge acquired from outside the organisation. She argues that these attributes include the length of board service, more experience at the focal firm, and status, such as being affiliated with a large or well performing firm. For instance, opinions based on outside experiences voiced by a long-serving director may be received more favourably by the board and acted on (Anderson et al., 2011; Spencer Stuart, 2017a). Therefore, human capital is also expected to enable directors to acquire social capital. This suggests that human capital correlates with or predicts social capital, specifically, connections, trust and power.

5.2.5. Social network studies

As a result of the blended line between human capital and social capital, it is important to consider whether the findings in corporate social network studies are robust to the influence of human capital. Social network studies in finance have considered firm level social connections in relation to various firm outcomes such as firm performance (Larcker et al., 2013), corporate actions (Ahn et al., 2010; Cai & Sevilir, 2012), and corporate governance (Jiraporn, Singh, & Lee, 2009; Fracassi & Tate, 2012; Fogel et al., 2015). Studies also specifically focus on certain types of connections such as financial and political ties (Mizruchi & Stearns, 1994; Faccio, Masulis, & McConnell, 2006; Engelberg, Gao, & Parsons, 2012; Houston et al., 2014), educational links (Cohen, Frazzini, & Malloy, 2008, 2010), CEO connections (El-Khatib et al., 2015), or ties to the CEO (Fracassi & Tate, 2012). Hochberg et al. (2007) is perhaps the first study to consider social networks in financial markets. Employing SNA, they investigate connected venture capital firms (via investments in the same portfolio company) and their investment behaviour. They conclude that better-connected firms experience better fund performance. However, the human capital of

the actual fund managers or the firm's directors is not controlled for. Rather, a firm-level measure of experience is employed. This paper presents an issue that is commonly observed in other social network studies, i.e., the omission of important human capital controls. As this thesis focuses on board connectivity, we will now review the board connectivity literature to highlight the empirical considerations for directors' human capital effects.

5.2.6. Board connectivity and human capital controls

Horton, Milo and Serafeim (2012) examine the implications of social networks in UK listed firms, and make a strong attempt at controlling for the board's human capital. They find that social capital is positively associated with firm performance and director compensation. To examine the effect of connectivity on firm performance, they include director busyness and the following human capital attributes: experience (the average tenure of the board), educational attainment (the proportion of directors with education at a top school), and the type of qualifications held (e.g. MBA, ACA, ACCA,[17] PhD). To examine the effect of connectivity on compensation, directors' human capital is controlled for using tenure and age, whether they attended a top school, level of education, general job skills, and indicator variables for nomination, remuneration, and audit committee membership. Horton et al., (2012) suggest that human capital can create social capital, explaining that a leading degree may help a person get a job but once in that job, they will benefit from the connections that the job helps to establish. Horton et al., (2012) suggest that controlling for education captures both the human and social dimension, which essentially biases against their results since human capital may partly predict a director's social capital. However, this paper strongly articulates that human capital is a crucial factor to isolate when investigating board connectivity. More importantly, that it's exclusion may bias findings on the importance of connectivity.

[17] The abbreviations MBA, ACA, ACCA and PhD, are for Master of Business Administration, individuals who are members of the Association of Chartered Accountants, and the Association of Chartered Certified Accountants, and individuals who have completed the Doctor of Philosophy degree, respectively.

Other studies to date only control for corporate governance or some director attributes (Omer et al., 2013; Andersen & Gilbert, 2014; Omer et al., 2014b), or use robustness tests to mitigate omitted variable concerns (Larcker et al., 2013). Larcker et al. (2013) look at board connectivity in the US and find that more central (connected) firms earn higher characteristic-adjusted returns and have higher growth in return on assets. Larcker et al., (2013) refer to the issue of higher-quality directors being correlated with connectivity or prestigious firms. To mitigate this concern they perform a robustness test using changes in future stock returns on changes in board connectivity, and include corporate governance controls. This approach essentially cancels out time-invariant human capital attributes, which covers some human capital attributes. However, others such as director experience measured in terms of years, or number of directorships, do vary over time.

Omer et al., (2013) also looks at US firms using director-level Closeness and Eigenvector centrality measures aggregated at the firm level, controlling for board busyness, independence and the number of outside CEOs on the board. In contrast to Larcker et al., (2013) who finds a positive relation for US firms, they find a negative relation between connectivity and firm performance. However, they do find that director connectivity is positively associated to the performance of firms with more investment opportunities. In a following paper using a more recent sample and with adjustments to the methodology, Omer, Shelly and Tice (2014b) control for the industry expertise of the board using the ”number of directors that [sic] serves concurrently on another board of directors within the same industry” and the “number of outside CEOs serving on the board of directors” (p.14). They show a positive and significant relation between connectivity and firm performance. Additionally, the director attributes, industry experts and outside CEOs, also show a positive relation with firm performance. Omer et al., (2014) also separately regresses firm performance on the connectivity of inside and outside directors to test whether the effects differ between groups. While the relationships are both positive, the effect of outside directors’ connectivity is stronger. As there are a number of human capital attributes that are not included, it

is difficult to determine whether the difference is related to human capital differences or connectivity differences.

Andersen and Gilbert (2014) use an Australian sample of firms to examine the relation between connectivity and firm performance. Controlling for gender and corporate governance (Henry, 2008), the main results suggest a significantly negative relationship between connectivity and firm performance. Andres, Bongard, & Lehmann (2013) examine director-level connectivity for German firms in relation to firm performance and compensation. Using fixed effects regressions and controlling for busyness, they find connectivity to be negatively associated with firm performance and positively associated with compensation. Akbas, Meschke and Wintoki (2016), who investigate social networks in US firms and the implications for sophisticated investors (option traders, short-sellers and institutional investors), find that firms with greater connectivity are more transparent, enabling sophisticated investors to better predict outcomes of returns, earnings, and news sentiment. There are no human capital controls included in the analysis. Barnea and Guedj (2007) investigate the social network of directors of S&P 1,500 firms and find that firms with greater connectivity have weaker firm governance. They include a variety of governance controls, and in additional tests, CEO Age, CEO Tenure, and CEO Gender. But they do not include director-level human capital attributes when investigating the impact of connectivity on firm governance. These studies are typically of larger markets using large samples, which limits the practicality of collecting director-level information necessary for measuring human capital. Nevertheless, we are still left wondering what are the residual impacts that connectivity has on firm outcomes.[18]

[18] Although, some databases do exist which provide information on directors, such as BoardEx (770,000 business leader profiles).

5.3. Hypothesis Development

Given the literature to date has not effectively controlled for human capital, consequently, this omission may be impacting researchers' findings on the impacts of board connectivity. For example, some find positive associations (Horton et al., 2012; Larcker et al., 2013; Omer et al., 2014b; Akbas et al., 2016), while others find negative associations (Barnea & Guedj, 2007; Andres et al., 2013; Omer et al., 2013; Andersen & Gilbert, 2014). Additionally, it is not clear whether connectivity has a marginal effect over and above being a proxy for human capital. These effects need to be disentangled to improve our understanding of the value a director brings to the boardroom. We have also discussed a range of studies that highlight some of the issues which provide an understanding of the endogenous link between human capital and social capital. This chapter seeks to address these concerns by examining the relationship between human capital and social connectivity. We have reviewed both theory and prior empirical studies which both suggest there is a positive relationship between the two forms of capital. Therefore, we expect a positive association hence the hypothesis:

H1: Human capital is positively related to social connectivity.

If the results provide evidence to support our hypothesis, then it can be asserted that human capital is an important omitted board attribute variable that should be appropriately accounted for in corporate social capital studies.

5.4. Data

For this study, we employ a hand-collected dataset of directors of New Zealand publicly listed firms covering the 16-year period from 2000 to 2015. The sample includes 279 unique firms, 2432 unique directors, and 12,211 director-year observations and we employ SNA to measure a

director's social connections (Wasserman & Faust, 1994).[19] All variables used in the analysis are described in Appendix A1.

Table 5.1 presents descriptive statistics for the variables used in this study. Panel A presents the connectivity measures which shows that *Closeness* is negatively skewed at -0.37. This suggests that there are a few directors who are driving average *Closeness* down as they are either disconnected from the main network and connected to smaller networks or are positioned quite far from the centre of the main network. The other centrality measures, *Degree*, *Betweenness* and *Eigenvector*, show positive skewness. This suggests that there is a small group of directors who are highly connected, either through sitting on multiple and/or potentially larger boards, while many firms only share one director in common. In particular, there are 18% who sit on more than one board and hold an average of 2.4 directorships (see Chapter 4: Table 4.8). These directors will drive the average *Degree* and *Eigenvector* measures up above the median. The skewed *Betweenness* distribution suggests that many firms only share one director in common. Therefore, a small number of directors have more power to control the network's information flow. As per the discussion in Chapter 3, we focus on the connectivity factor *AGG* as our measure of connectivity. Panel B presents director characteristics and human capital measures for the sample. As discussed in Chapter 4, the average director is 56.24 years old with a median of 56, has 6.5 years of board experience, with a median of 5, and holds 1.21 public directorships, with a median of 1 and a maximum of 6 public directorships. As *M & A* experience is skewed, we employ the natural log of *M & A* in the analysis. *Average Market Value* is the cumulative market value of the firms a director serves divided by the number of directorships held. We include this measure as a robustness test to attempt to control for any firm size effect of the directorships. This variable is winsorized at the 1st and 99th percentiles to reduce the effect of some extreme outliers we observed.

[19] Please review Chapter 2 for the measurement of social capital.

To reduce the positive skewness and any additional influence of outliers, we take the natural log of *Average Market Value (AMV).*

Table 5.1: Descriptive Statistics of Director Attributes

Panel A: Director connectivity measures									
	Mean	Median	SD	Min	P25	P75	Max	Skew	kurtosis
DEG	0.01	0.01	0.01	0.00	0.01	0.01	0.07	2.41	13.29
CLO	0.10	0.13	0.07	0.00	0.01	0.16	0.26	-0.37	1.59
BET	0.00	0.00	0.01	0.00	0.00	0.00	0.18	6.49	61.38
EIG	0.01	0.00	0.05	0.00	0.00	0.00	0.53	5.78	38.64
AGG	0.00	-0.26	1.49	-1.94	-0.91	0.27	17.70	3.01	18.33
Panel B: Director characteristics and human capital measures									
	Mean	Median	SD	Min	P25	P75	Max	Skew	kurtosis
Female (0/1)	0.09	0.00	0.28	0.00	0.00	0.00	1.00	2.92	9.52
Age (years)	56.24	56.00	9.45	24.00	50.00	63.00	88.00	-0.02	2.73
New Zealand (0/1)	0.70	1.00	0.46	0.00	0.00	1.00	1.00	-0.89	1.80
Undergraduate (0/1)	0.35	0.00	0.48	0.00	0.00	1.00	1.00	0.61	1.37
Postgraduate (0/1)	0.35	0.00	0.48	0.00	0.00	1.00	1.00	0.64	1.41
No Degree (0/1)	0.30	0.00	0.46	0.00	0.00	1.00	1.00	0.88	1.78
Director Experience (years)	6.53	5.00	6.57	0.00	2.00	10.00	53.00	1.83	8.33
Directorships (N)	1.21	1.00	0.57	1.00	1.00	1.00	6.00	3.32	15.87
Directorships (2+) (0/1)	0.15	0.00	0.36	0.00	0.00	0.00	1.00	1.94	4.76
NZX10 (0/1)	0.09	0.00	0.29	0.00	0.00	0.00	1.00	2.85	9.10
NZX50 (0/1)	0.40	0.00	0.49	0.00	0.00	1.00	1.00	0.43	1.18
Prior CEO Experience (0/1)	0.41	0.00	0.49	0.00	0.00	1.00	1.00	0.37	1.14
Current CEO (listed) (0/1)	0.14	0.00	0.35	0.00	0.00	0.00	1.00	2.06	5.24
Current CEO (non-listed) (0/1)	0.12	0.00	0.32	0.00	0.00	0.00	1.00	2.38	6.67
International Experience (0/1)	0.44	0.00	0.50	0.00	0.00	1.00	1.00	0.22	1.05
M & A Experience (N deals)	2.13	0.00	5.46	0.00	0.00	2.00	77.00	4.88	35.20
Professional Expertise (0/1)									
Accountant	0.18	0.00	0.38	0.00	0.00	0.00	1.00	1.66	3.77
Banker	0.16	0.00	0.36	0.00	0.00	0.00	1.00	1.90	4.59
Consultant	0.09	0.00	0.29	0.00	0.00	0.00	1.00	2.76	8.64
Financial Expert	0.24	0.00	0.42	0.00	0.00	0.00	1.00	1.24	2.54
General Executive	0.32	0.00	0.46	0.00	0.00	1.00	1.00	0.79	1.63
Lawyer	0.07	0.00	0.26	0.00	0.00	0.00	1.00	3.27	11.66
Prof Director	0.11	0.00	0.31	0.00	0.00	0.00	1.00	2.53	7.40
Industry Experience (0/1)									
Banking & Finance	0.45	0.00	0.50	0.00	0.00	1.00	1.00	0.22	1.05
Consumer Goods & Services	0.41	0.00	0.49	0.00	0.00	1.00	1.00	0.36	1.13
Farming, Fishing, Forestry	0.13	0.00	0.34	0.00	0.00	0.00	1.00	2.21	5.89
Industrial	0.16	0.00	0.37	0.00	0.00	0.00	1.00	1.85	4.41
Firm Size									
Avg Market Value $m	$3,138	$167	$13,200	$0.31	$34	$784	$126,000	6.19	44.39

This table presents descriptive statistics for the human capital and social capital variables employed in this study. The sample includes directors of New Zealand publicly listed firms between 2000 and 2015. Panel A reports descriptive statistics for the social capital measures *DEG*, *CLO*, *BET*, *EIG*, and the aggregate connectivity factor *AGG*. Panel B reports the director characteristics (*Female*, *Age* and *New Zealand*) and human capital variables employed in the analysis. All variables are defined in Appendix A1.

5.5. Results

5.5.1. Univariate Analysis

5.5.1.1. Attributes of high-connected versus low-connected directors

The analysis begins with a comparison between the lowest connected and highest connected directors. We focus our attention on the top and bottom 25% to determine whether there is a significant difference in the attributes of these two groups. For each year between 2000 and 2015, we rank each individual directors' aggregate social capital measure (*AGG*) from lowest to highest. We aggregate the top 25% connected directors and compare the average measures of their attributes against the average measures of the bottom 25% connected directors. This will initially test for differences in the attributes between high-connected and low-connected directors. Positive significant differences in human capital suggest that better connected directors have more of a particular human capital attribute (depending on the measure) than the least connected directors. We test for significance in the differences using the two-sample T-test and report the results for *Aggregate Connectivity* in Table 5.2.[20]

We find that on average, there are indeed significant differences between the two groups. Specifically, high-connected directors are older than low-connected directors by 1.3 years and a higher percentage of women are in the top 25th percentile compared to the bottom 25% *(difference = 3%, $p<0.01$).* The latter finding could be driven by recent attempts to increase gender diversity. A consequence of the push for more female directors appears to be that the same women are being appointed to multiple and more prestigious boards, resulting in greater connectivity.[21]

Highly connected directors are more likely to have a university degree. Specifically, there are 5% more directors who are highly connected with an undergraduate degree as their highest degree

[20] For simplicity of discussion we focus on *Aggregate Connectivity*, however the results for the other four social capital measures are provided on request.

[21] This is demonstrated in Chapter 4, Directors' Human Capital, where we find a higher percentage of women on the boards of larger firms and on average, we find that women hold a greater number of directorships.

level, and 4% more have postgraduate level education, significant at the 1% and 5% levels respectively. Turning to director experience, the average number of years on boards for highly connected directors is 7, which is 1.4 years more than the least connected directors *(difference, p<0.01)*. Similarly, the average number of directorships for highly connected directors is 1.7, whereas low-connected directors sit on a single board*)*. Highly connected directors are also more likely to have *NZX10* and *NZX50* board experience, *Prior CEO Experience, M & A* experience, and are less likely to be current CEOs *(p<0.01).* The fact that connected directors are less likely to be current CEOs is consistent with Larcker and Miles' (2011) director survey. Directors explained how CEOs are highly sought after for board positions, yet they are too busy with their own companies to engage and be available for critical board meetings. This suggests that CEO directors are less likely to sit on many boards, or to be on the boards of firms that would potentially require a greater time commitment, such as NZX50 firms.[22]

Looking at professional careers, highly connected directors are more likely to be accountants, financial experts, and professional directors (who hold on average 1.6 board seats), 5%, 8% and 15% respectively, compared to low-connected directors. One explanation for professional directors holding more board seats is they are often retirees who are less busy and therefore are able to sit on more public boards, which typically require a greater commitment than private boards.

For industry experience, we find no significant difference between the high and low connected groups for banking and finance experience. We find significantly higher proportions of highly connected directors with substantial experience in the consumer goods and services, farming,

[22] One concern raised was whether we controlled for the social connection from a CEO sitting on a board outside of their own firm. In all, the sample contains 1,544 director-year observations where the director is a current CEO of a publicly listed company in NZ. The vast majority of these observations are CEOs sitting on their own boards, with around 200 observations where a CEO sits on an outside board in addition to their own. Regarding the concern raised, only 186 observations involve a current CEO who doesn't sit on their own board but does sit on an outside board. Given the small number of instances, we did not include this indirect connection between boards. Additionally, our main focus is on director-to-director connectivity.

fishing and forestry, and industrial industries. This suggests that there is no particular industry experience related to high levels of connectivity, but it does suggest that industry experience in general is an important attribute for connectivity. These results clearly suggest that certain human capital attributes of directors are related to their level of connectivity.

Table 5.2: Attributes of High-connected versus Low-connected Directors

Variable	AGG p75 = 1 (High)	AGG p25 = 1 (Low)	Mean Difference (High - Low)	T/Z Stat	
Observations	3,052	3,054			
Female	10%	7%	3%	(3.50)	a
Age	56.9	55.6	1.3	(4.25)	a
NZ Resident	72%	74%	-2%	(-1.74)	c
Undergraduate	39%	34%	5%	(4.06)	a
Postgraduate	36%	32%	4%	(3.85)	a
No Degree	24%	34%	-10%	(-8.31)	a
Director Experience (Years)	7.04	5.60	1.44	(9.43)	a
Director Experience (ln(Years))	1.78	1.47	0.32	(13.74)	a
Directorships	1.72	1.02	0.70	(41.74)	a
NZX10	20%	0%	20%	(27.65)	a
NZX50	65%	11%	54%	(45.14)	a
Prior CEO Experience	43%	38%	5%	(4.24)	a
Current CEO (listed)	10%	16%	-6%	(-6.40)	a
Current CEO (non-listed)	9%	14%	-5%	(-5.74)	a
International Experience	45%	44%	1%	(0.54)	-
M & A Experience (ln)	0.87	0.26	0.61	(28.73)	a
Professional Expertise					
Accountant	21%	16%	5%	(5.35)	a
Banker	14%	16%	-2%	(-2.41)	b
Consultant	7%	11%	-4%	(-5.20)	a
Financial Expert	28%	20%	8%	(7.15)	a
General Executive	30%	34%	-4%	(-4.02)	a
Lawyer	8%	8%	0%	(-1.22)	-
Prof Director	21%	6%	15%	(17.23)	a
Industry Experience					
Banking & Finance	45%	44%	1%	(0.87)	-
Consumer Goods & Services	50%	36%	14%	(11.05)	a
Farming, Fishing, Forestry	20%	9%	11%	(12.29)	a
Industrial	21%	10%	11%	(11.93)	a

This table reports the human capital and other attributes for directors in the top 25% connectivity quantile versus directors in the bottom 25% connectivity quantile. Each year, directors are sorted into four quantiles based on their measure of *Aggregate Connectivity*. Directors in the top 25th percentile are in the High group and directors in the bottom 25th percentile are in the Low group. The second to last column of the table reports the average differences in the attributes between the high versus low connected directors, followed by the statistical significance based on a two-tailed two-sample t/z test with unequal variances. [a, b, c] denotes significance at the 1%, 5%, and 10% level respectively. All variables are defined in Appendix A1.

5.5.1.2. Attributes of extremely connected directors

The previous analysis shows that high-connected directors have more human capital than low-connected directors. Next, we investigate the top 10% of extremely connected directors to test

whether there is a significant difference between their attributes and the rest of the sample. This will provide additional evidence of the relationship between human and social capital by disclosing the characteristics of extremely connected directors and then determining whether they are any different to the rest of the entire sample. Each year, we rank each individual directors' social capital measure (*DEG, CLO, BET, EIG,* and *AGG*) from lowest to highest connectivity and pool the top 10% connected directors together. We compare the average measures of their attributes against the average measures of the other 90% of the sample. We report the results for *Aggregate Connectivity* in Table 5.3.[23]

Table 5.3 displays the mean differences between the two samples which show there are significant differences in the human capital attributes between an average connected director and an extremely connected director. We find similar results as in Table 5.2 although most of the human capital differences are greater. This further suggests a strong relationship between human and social capital, even after comparing the extremely connected to the average connected director. Some notable differences will be discussed next.

A higher percentage of women are extremely highly connected *(difference = 4%, p<0.01),* and extremely connected directors are more likely to live in New Zealand. The difference of 17% is statistically significant suggesting that living closer to a firm may increase a director's chances of being invited onto its board. The average number of directorships for extremely connected directors is 2.3, 1.2 more than average connected directors *(p<0.01)*, indicating that directorships are strongly related to connectivity. There is no significant difference for bankers whereas in Table 5.2 we find a statistically negative difference of 2%. These professionals are more likely to sit on the boards of their clients to monitor their performance more closely (Kroszner & Strahan, 2001). The difference of 22% in professional directors suggests that connectivity is a function of high board expertise and less busy directors in terms of other career commitments. For industry

[23] For simplicity of discussion we focus on *Aggregate Connectivity*, however the results for the other four social capital measures are provided in Appendix 5A.

experience, we find significantly higher proportions of highly connected directors who have substantial experience in the banking and finance industry, whereas in Table 5.2, we find no significant difference. The results in Tables 5.2 and 5.3 indicate that human capital is generally related to director connectivity. Highly-connected directors appear to have higher levels of education and more specific experiences such as international. They also appear to have expertise in the areas that corporate governance best practice deems important, such as financial acumen. Highly connected directors are also more likely to have less career commitments. This is demonstrated by the negative differences for current CEOs and general executives, and the positive differences for professional directors.

Table 5.3: Attributes of Extremely Connected Directors

	AGG p90 = 1	AGG p90 = 0	Mean Difference (AGG p90 - Non-AGG p90)	TStat	
Observations	1,237	10,974			
Female	12%	8%	4%	(3.47)	a
Age	57.6	56.1	1.6	(5.25)	a
NZ Resident	86%	69%	17%	(15.41)	a
Undergraduate	43%	35%	8%	(5.42)	a
Postgraduate	37%	34%	3%	(2.04)	b
No Degree	20%	31%	-11%	(-8.99)	a
Director Experience (Years)	8.12	6.35	1.76	(10.18)	a
Directorships	2.33	1.09	1.24	(43.33)	a
NZX10	30%	7%	23%	(17.28)	a
NZX50	78%	35%	43%	(33.69)	a
Prior CEO Experience	41%	41%	0%	(0.14)	-
Current CEO (listed)	6%	15%	-9%	(-11.29)	a
Current CEO (non-listed)	8%	12%	-4%	(-5.49)	a
International Experience	42%	45%	-2%	(-1.63)	-
M & A Experience (ln)	1.13	0.50	0.63	(19.94)	a
Professional Expertise			0		
Accountant	24%	17%	7%	(5.57)	a
Banker	15%	16%	0%	(-0.42)	-
Consultant	6%	10%	-4%	(-5.79)	a
Financial Expert	31%	23%	8%	(5.94)	a
General Executive	29%	32%	-3%	(-2.24)	b
Lawyer	8%	7%	1%	(1.20)	-
Prof Director	31%	9%	22%	(16.57)	a
Industry Experience			0		
Banking & Finance	50%	44%	6%	(4.00)	a
Consumer Goods & Services	49%	40%	8%	(5.67)	a
Farming, Fishing, Forestry	21%	12%	9%	(7.70)	a
Industrial	21%	15%	6%	(4.87)	a

This table reports director characteristics and human capital attributes for directors in the top 10% connectivity quantile *(AGG p90)* versus directors who are not in the top 10% connectivity quantile. The second to last column of the table reports the average differences in the attributes between the top 10% connected versus all other directors, followed by the statistical significance based on a two-tailed two-sample t/z test with unequal variances. [a, b] denotes significance at the 1% and 5% level respectively. All variables are defined in Appendix A1.

5.5.2. Human Capital Index

In our next step towards establishing whether there is a relationship between the human capital and social capital of directors, we construct a composite measure of human capital. Specifically, we reduce the individual human capital measures down to one index value by categorising each director into one of three categories across nine different human capital attributes each year. The individual categories are then combined to form a human capital index *(HCI)* which has a maximum possible value of 18. The director attribute literature and our analysis so far has shown that these 9 different aspects of human capital are important for corporate boards and/or to be related to connectivity.

5.5.2.1. Education

The first human capital attribute is education where we focus on the *level* of education (Shuller, 2001). We classify directors based on their highest qualification by assigning a director a score of 2 if their highest level of education is a postgraduate degree, 1 for an undergraduate degree, and 0 for no degree. A director with a score of 2 has the greatest amount of education. This approach is similar to Anderson et al., (2011) who categorise directors within three categories.

5.5.2.2. Director Experience

The next attribute is director experience where we focus on the depth of board experience measured by the number of years a director has served on the boards of the firms in the sample (Gray & Nowland, 2013). We classify directors based on the amount of director experience by assigning a director a score of 2 if they have four or more years' experience, 1 for directors with one to three years' experience, and 0 for one year or no experience. This approach is similar to the director experience measures employed by Gray and Nowland (2013) who investigate the value of prior director experience for Australian firms. A director serving their first year on a public board is expected to have accumulated no experience and therefore will bring little value to a

board. Directors who have served one to three years are expected to have some experience as they have been through at least one fiscal year, experiencing the annual audit process, the annual general meeting and the seasonal cycle. These directors are still in their first term, are likely to still be finding their feet and so may not contribute strongly to a board. Directors who have served more than three years are expected to have comprehensive knowledge of board responsibilities and a range of different experiences of the corporate environment. At least one third of the longest serving directors on a board are also required by the NZX to retire from the board each year (NZX Limited, 2017c, Rule 3.3.11). This suggests that a term of around three years should provide directors enough time to have gained a lot of board experience.

5.5.2.3. Director Expertise

We argue a director's expertise is inherently linked to the size of the firms they are directing. Directors of large firms are more likely to have dealt with a wide range of corporate issues, as they are more complex, more publicly visible and prestigious (Ferris et al., 2003), creating a superset of transferrable skills resulting from their oversight (Ferris et al., 2003; Cashman et al., 2013). This attribute is measured by classifying directors based on the size of the firms a director currently serves by assigning a director a score of 2 if they sit on at least one board of an *NZX10* firm, 1 for an *NZX50* firm, and 0 otherwise.

5.5.2.4. Prior CEO Experience

The next attribute is prior CEO experience.[24] We classify directors based on CEO experience at public or private firms by assigning a score of 2 if they have served as CEO of a public firm, 1 for serving as CEO of a private firm, and 0 for no CEO experience. A director with a score of 2 has a greater level of CEO experience as leading a public firm brings more relevant experience to a public board due to dealing with issues such as the strict regulatory responsibilities a public firm

[24] Current CEOs who have been a CEO prior to the respective year, are assigned "Prior CEO Experience". The only directors that do not fall in the "Prior CEO Experience" category, are those who have not previously been a CEO of a public or private firm for at least one year, as they have not had time to gain a decent amount of top management skill.

CEO must adhere to. For instance, CEOs of public firms must ensure that they adhere to NZX continuous disclosure rules (NZX Limited, 2017c), a responsibility private companies do not have.

5.5.2.5. International Experience

For international experience, we classify directors based on whether they have had international exposure predominantly through sales, or who lived or worked abroad (Herrmann & Datta, 2005; Johnson et al., 2013; Hsiang-Lan, 2014; Volonté & Gantenbein, 2014). We assign directors a score of 2 if they have international experience and 0 otherwise.

5.5.2.6. Merger and Acquisition Experience

Merger and acquisition experience is the next attribute, measured by the cumulative number of deals a director has been involved with (Cashman et al., 2013). We assign a director a score of 2 if they have been involved with three or more deals, 1 for directors involved with one or two deals, and 0 for directors with no deal experience.

5.5.2.7. Professional Skills

Professional skill is a composite measure that recognises whether a director has financial and / or legal acumen. We consider a director to have these skills if their main or secondary career falls within the accounting or banking categories or if they are a financial expert (see Appendix A1 for variable definitions). We assign a director a score of 2 if they have both financial and legal acumen, 1 for either financial or legal acumen, and 0 if they have no financial or legal acumen. We recognise a director with a score of 2 as having the most important professional skills that boards typically require (Equilar, 2016; Adams, Akyol, & Verwijmeren, 2017; Spencer Stuart, 2017b).

5.5.2.8. Professional Director

Additional to the professional skills of a director, we classify directors based on whether they have become professional directors. We assign a director a score of 2 if they classify as a professional director and 0 otherwise. Professional directors' primary role is to serve on boards (Wells & Mueller, 2014). To achieve this career, a director will have earned prestigious board

experience (Jahan, 2018), have held multiple leadership positions (Larcker & Miles, 2011) and have gained accredited memberships and training (NZX limited, 2017b). We expect professional directors to have acquired an appropriate level of governance expertise which encompasses a wide range of skills, experience and knowledge.

5.5.2.9. Industry Experience

Our final attribute for the human capital index centres on their diverse range of industry experience. Using the Industry Classification Benchmark level one coding system, we assign a director a score of 2 if they have substantial experience in all of the ten ICB industries, and 0 for no industry experience. For every industry a director has substantial experience in, they receive an additional score of 0.2, thus a director with 5 industries receives a score of 1.

5.5.2.10. Director Characteristics

Gender and place of residence are not included in the Index as the attributes are not considered to be human capital attributes in this study. Rather, they represent the general characteristics of directors. In New Zealand and also globally (Vinnicombe et al., 2008), gender equality has been a major area of interest in boards of directors. As a result, gender is more than likely a contributing factor towards being board appointed. Likewise, New Zealand-based or native directors are more than likely to have an advantage over foreign directors when applying for a board appointment. So, we believe these characteristics are important to control for in this study but we have chosen to do so separately from human capital, notated hereafter as *NZ*.

Additionally, *Directorships* is not included as it intersects between both human capital and social capital. Directors holding multiple directorships are expected to be more experienced, competent, skilled and reputable (Ferris et al., 2003). More importantly, our director networks are constructed by directorships - the links formed by directors who sit on more than one board. Therefore, the relationship between *HCI* and *AGG* may be biased by *Directorships* if this attribute was included in the Index. Additionally, *Directorships* is also considered to be a measure of how

busy a director is (Ferris et al., 2003; Cashman et al., 2012). Therefore, we keep directorships separate, notated hereafter as *DIR*.

5.5.2.11. Univariate analysis of the human capital index

Table 5.4 presents descriptive statistics for the human capital index. We observe that the average score is 6.08 with a median of 6.2 and ranges from 0 to 15.20.

Table 5.4: Descriptive Statistics of the Human Capital Index

Variable		Mean	Median	SD	Min	P25	P75	Max	Skew	Kurt
HCI		6.08	6.20	2.66	0.00	4.20	7.60	15.20	0.25	2.74
Human capital attributes										
	Dir Exper	Prior CEO	Dir Expert	M & A	Prof Skills	Prof Dir	Educ	Industry	Inter	
Mean	1.46	0.62	0.49	0.58	0.10	0.22	1.05	0.30	0.89	

This table presents descriptive statistics for the human capital index based on nine important individual director attributes: director experience, prior CEO experience, director expertise/prestige, merger and acquisition experience, professional skills, professional director, education, industry experience and international experience. Please see Section 5.5.2 for the full description of the index.

Table 5.5 presents Pearson pairwise correlation coefficients between the variables employed. The correlation between *HCI* and *AGG* is 0.3 which further suggests a positive relationship between human and social capital. *Female* (*FEM)* and *New Zealand* (*NZ)* are positively related to *AGG* although the coefficients are very low. As expected, *Directorships (DIR)* is highly correlated with *AGG* with a correlation coefficient of 0.69. As mentioned earlier, this relationship is mainly due to the way the underlying centrality measures are constructed. We also observe that *DIR* is positively related to *HCI*, indicating that Directorships is an important variable to include in regressions to better examine the relationship between *HCI* and *AGG*. We also include *Average Market Value (AMV)* in some models to attempt to control for any size impacts from the firms the directors serve on social capital. For example, larger firms in most cases have more complex operations and appoint a larger board to better manage the complexities. A larger board will increase a director's connectivity due to having more connections. Therefore, firm size could interfere with the relationship between human capital and social capital. As shown, the average size of firms is positively related to *AGG* and *HCI*. An explanation as to why we see positive associations is that large firms typically have more complex and wider contracting environments which would require relationships with more parties and better skilled and experienced directors.

The increased level of resources required by larger firms is typically supplemented with larger boards (Coles et al., 2008), directors with high human capital (Johnson et al., 2013), and connections (Pfeffer & Salancik, 1978; Hillman et al., 2009). Directors of larger firms may also be offered additional board appointments (Ferris et al., 2003), increasing their connectivity. All the correlation coefficients in Table 5.5 are significant at the 5% level except for the correlation of *FEM* and *HCI*. As all the director attribute variables are significantly correlated with each other, we conduct multicollinearity tests later in the analysis.

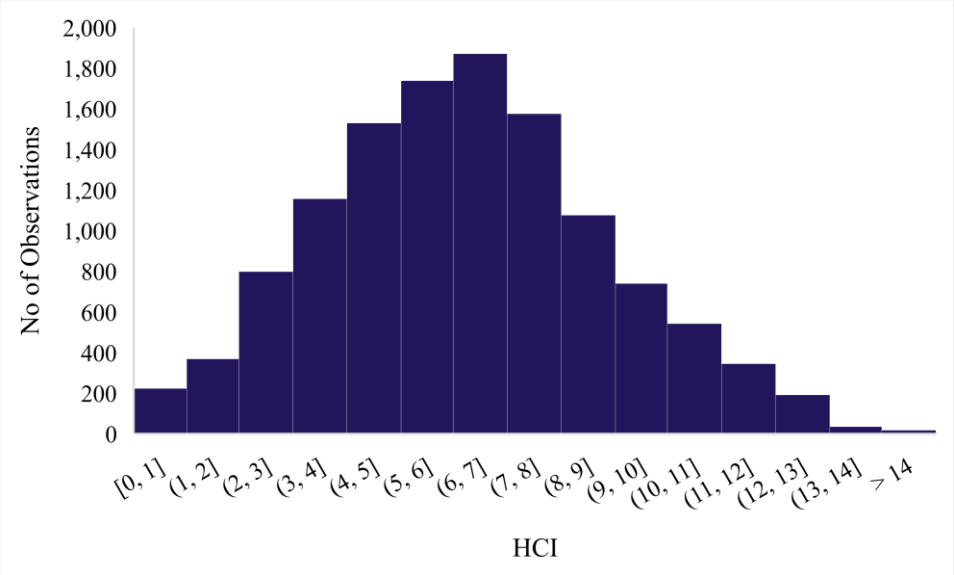
Table 5.5: Pearson Pairwise Correlations

	AGG	DEG	CLO	BET	EIG	HCI	FEM	NZ	DIR	AMV
AGG	1									
DEG	0.90	1								
CLO	0.67	0.46	1							
BET	0.78	0.69	0.31	1						
EIG	0.60	0.44	0.27	0.20	1					
HCI	0.30	0.32	0.21	0.25	0.06	1				
FEM	0.02	0.03	0.01	0.02	0.00	0.00	1			
NZ	0.07	-0.02	0.10	0.13	0.00	-0.16	-0.03	1		
DIR	0.69	0.72	0.30	0.76	0.16	0.28	0.02	0.16	1	
AMV	0.36	0.44	0.31	0.12	0.16	0.45	0.11	-0.38	0.09	1

This table reports Pearson pairwise correlations for the variables employed in the empirical analyses. All variables are defined in Appendix A1.

Figure 5.1 displays the *HCI* distribution which closely resembles a bell-shape. The distribution suggests that the average director tends to have human capital equal to the median and that there is a similar number of directors with high versus low *HCI* scores.

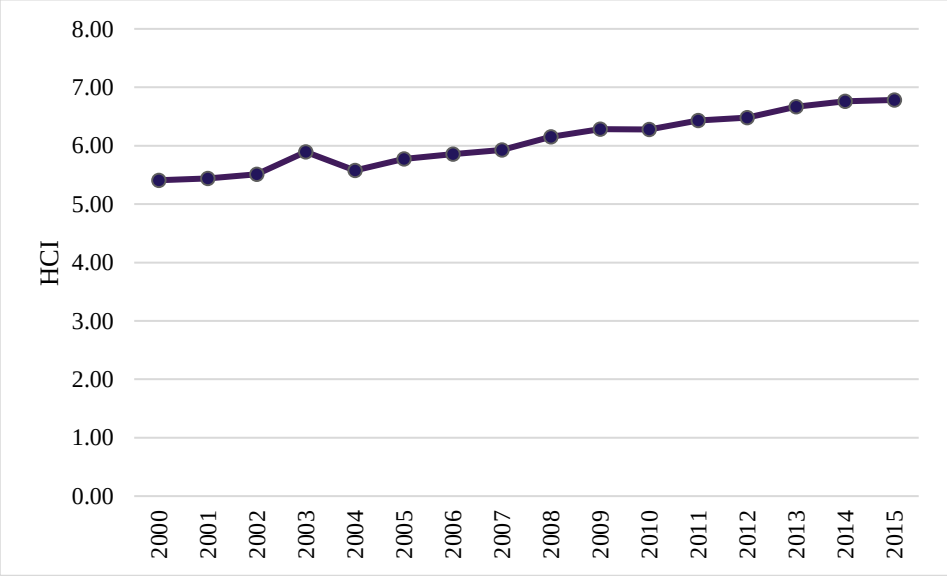
Figure 5.1: Human Capital Index Distribution 2000 to 2015



This figure is a histogram representing the distribution of the human capital index (*HCI*) for the sample.

Next, we look at the average measures of human capital over the sample period to see if there are any changes or trends over time. In Figure 5.2, we observe a steady increase in *HCI* from 2000 to 2015 with a notable jump in 2003 that returns to normal in 2004.[25]

Figure 5.2: Annual Sample Averages of the Human Capital Index 2000 to 2015



This figure provides a line graph of the annual sample averages of the human capital index (*HCI*) for the sample.

[25] We note that corporate governance and director biographical information in annual reports has generally improved over the years, providing better data sources for the collection of director attributes in later years. To complete the database, we conducted exhaustive web searches of each director throughout the whole sample period, especially in the earlier years.

We next undertake univariate analysis of the relationship between *AGG*, the variable of interest, and *HCI*, which measures director characteristics. The sample directors are ranked by their *AGG* measure and then sorted into quartiles. In Panel A of Table 5.6, we report the average estimates of *HCI*, *DIR* and *AMV* for each quartile. The first important result is that *HCI* monotonically increases across the social capital quartiles. Specifically, we observe statistically significant increases of 0.81 between the first and second quartiles, 0.40 between the second and third quartiles and 0.99 between the third and fourth quartiles. Overall, we observe a 2.19 increase in *HCI* between the high and low quartile. This indicates a strong relationship between an increase in social capital and an increase in human capital. To put the results into perspective, the difference of 2.19 between the High and Low quartile is nearly a full standard deviation of the *HCI*. We also find similar patterns between *AGG, DIR* and *AMV* with the exception that there isn't a significant difference in the average number of directorships between quartiles 2 and 3. Around 85% of the director observations only hold one directorship so there is not a substantial amount of variation in the lower quartiles. Nevertheless, the results do suggest that the number of directorships and firm size are positively related to connectivity and should be included in regressions.

Panel B of Table 5.6 reports the averages of *HCI* by gender and new directors. Contrary to prior assumptions that women lack relevant human capital for board positions (Burke, 2000), we find there is no significant difference in relevant human capital between men and women. This finding supports the study of Singh, Terjesen, and Vinnicombe's (2008) who suggest that new women directors of UK FTSE 100[26] firms have less board experience, CEO/COO experience but are more likely to be better educated and have international experience. Our findings suggest that while women may have lower attributes in some areas, as demonstrated in Chapter 4, they are offset by being stronger in other attributes. We find that new directors have less human capital, which is what we should expect. New directors typically haven't had the opportunity to gain much

[26] FTSE 100 is the abbreviation for Financial Times Stock Exchange's top 100 companies by market capitalization.

experience on New Zealand boards given that they have only obtained their first public board appointment. In particular, Table 4.3 showed that new directors have less experience on New Zealand public boards, are less likely to have large firm expertise, M & A experience or industry experience. New directors are however, more likely to have international experience and a postgraduate-level education.

Table 5.6: Univariate Analysis of Human Capital

Panel A: Univariate test of the relationship between human capital (HCI), director characteristics (DIR, AMV) and aggregate connectivity (AGG)

Variable	Quartiles				Mean Difference (High - Low)			
	Low	2	3	High	2 - Low (T Stat)	3 - 2 (T Stat)	High - 3 (T Stat)	(High - Low) (T Stat)
Observations	3,054	3,052	3,053	3,052				
HCI	5.03	5.84	6.23	7.22	0.81***	0.40***	0.99***	2.19***
					(13.25)	(6.12)	(14.30)	(33.46)
DIR	1.02	1.05	1.05	1.72	0.03***	0.00	0.67**	0.70***
					(5.30)	(0.10)	(1.72)	(41.74)
AMV	10.13	12.20	12.56	13.35	2.06***	0.37***	0.79***	3.22***
					(35.25)	(6.51)	(17.01)	(65.78)

Panel B: Univariate tests of human capital (HCI) differences between directors grouped by characteristics

	Obs	0	Obs	1	Mean Difference	T Stat
FEM	11,142	6.08	1,069	6.05	-0.04	(0.43)
New Director	10,710	6.38	1,501	3.92	-2.46 ***	(-41.68)

This table presents univariate analysis of director attributes. Panel A presents univariate tests for the relationship between human capital and social connectivity. Each year, directors are sorted into four quantiles based on their measure of *Aggregate Connectivity* (*AGG*). Directors in the top 25th percentile are in the High group and directors in the bottom 25th percentile are in the Low group. The Difference in the average *HCI* measures between quartile groups are tested for significance using the two-sample t-test with unequal variances. Panel B reports differences in human capital between female and male directors, new directors (Years=0) and non-new directors. Differences in means of *HCI* are tested using the two-tailed two-sample t-test with unequal variances. ***, ** indicates statistical significance at the 1% and 5% level, respectively. All variables are defined in Appendix A1

5.5.3. Ordinary least square regression analysis

5.5.3.1. The model

The results so far support our hypothesis of a significantly positive relationship. To further test this relationship, we employ multivariate analysis. We begin by estimating several ordinary least square (OLS) regressions with a panel data set. Panel data sets are often more efficient and accurate than one-dimensional cross-sectional or time-series data sets (Verbeek, 2012). Our sample is an un-balanced panel with 16 years and 2,432 individual directors yielding 12,211 director-year observations. First, to test the hypothesis we estimate the mean conditional relationship between human capital and social capital. We test this relationship with the following OLS model:

$$AGG_{it} = \alpha + \beta_1 HCI_{it} + \beta_2 FEM_{it} + \beta_3 NZ_{it} + \sum_{y=1}^{Y} \theta_y Year_{yt} + \varepsilon_{it} \quad (5.1)$$

Where AGG_{it} is the dependent variable for social capital, *Aggregate Connectivity*, HCI_{it} represents the index for director *i* in year *t*'s human capital, FEM_{it} is a dummy variable that equals one if the director is a female, in year *t*, NZ_{it} is a dummy variable that equals one if the director resides in New Zealand in year *t* and zero otherwise and $Year_{\mathrm{yt}}$ is a set of year dummies to control for time-series trends. Robust standard errors ε_{it} are clustered at the director level (Petersen, 2009) assumed to be I.I.D over directors and time.

In addition, we also estimate the regressions with *DIR* and *AMV* in some specifications to test the robustness of the relationship. The correlation coefficients in Table 5.5 indicate a positive relationship with *HCI* and *AGG* so we expect that including the variables will significantly reduce the explanatory power of *HCI* in regressions. *AMV* controls for any size effect on connectivity due to a director sitting on predominantly larger firms. Larger firms typically have larger boards to deal with more complex operations and which by extension may increase connectivity. We also include director age in some specifications. However, we do not typically include age as reliable

information on director age is missing for approximately 35% of the sample, consistent with previous studies (Cashman et al., 2012).[27]

5.5.3.2. Results and discussions

The OLS results for *AGG* are reported in Table 5.7.[28] In Column 1 of Table 5.7, we report the results for *AGG* as the dependent variable and *HCI*, *FEM* and *NZ* as explanatory variables. The directions of the relationships broadly agree with the correlations in Table 5.5. We observe that the coefficient on *HCI* is positive and significant at the 1% level. The positive association between human capital and connectivity suggests that directors with more human capital are better connected. The analysis suggests that a director at the 75th percentile of *HCI* (p75 = 7.5) achieves an *AGG* score that is 0.63 higher than a director at the 25th percentile of *HCI* (p25 = 4.20).[29] This change in connectivity is almost equivalent to the difference between a director at the 25th percentile of *AGG* and 50th percentile of *AGG*.[30] This evidence supports our hypothesis, predicting a relationship between human capital and social capital. Additionally, the strength of the relationship is economically significant. Directors with more skills, experience and knowledge typically have more board connectivity. Achieving a greater level of connectivity can be achieved by directors being appointed to more central boards, multiple boards, or larger boards, and directors may earn these appointments because of the demand for their human capital. The coefficients on *FEM* and *NZ* are positive and significant suggesting that women and directors who live in New Zealand are better connected than men and directors who live overseas.

[27] However, as Table 5.7 demonstrates (and in unreported tests controlling for age), we find qualitatively equivalent results with only some changes in the significance of the coefficients.

[28] Appendices 5B to 5E present OLS regressions for the relationship between *HCI* and *Degree*, *Closeness*, *Betweenness* and *Eigenvector* Centrality. We find similar results to Table 5.7 except that *Eigenvector* appears to have a low association with human capital as this measure is a measure of how connected a director's connections are as opposed to her own connectivity.

[29] We calculate the increase in connectivity by the difference between *HCI* at the 75th and 25th percentile multiplied by the coefficient on *HCI*: (7.5 - 4.2) * 0.191 = 0.6303.

[30] We calculate the movement along the connectivity distribution by the difference between *AGG* at the 50th and 25th percentile: -0.26 + 0.91 = 0.65

In Column 2 of Table 5.7, we include *DIR* (number of Directorships) in the regression. *DIR* has a strong positive association with connectivity, suggesting that a director who receives an additional directorship increases their *AGG* score by 1.7. This increase is greater than the difference between a director at the 75th percentile and a director at the 25th percentile of connectivity.[31] This result is expected as more board positions provide more access to other directors, and information, and therefore greater social capital. More directorships also increase the opportunity to control information in the network (measured by *Betweenness* which requires serving on at least 2 boards). We observe a considerable increase in the *r-square* of 297%, compared to the *r-square* in Column 1 suggesting that *Directorships* is a key variable. The coefficient on *HCI* is still positive and significant at the 1% level but as expected it does lose some explanatory power. The coefficient on *HCI* reduces from 0.191 to 0.07. This evidence suggests that greater social capital is positively related to human capital after controlling for the number of boards a director sits on.

Our findings remain similar after including *AMV* as a control variable, in Column 3 of Table 5.7. Human capital is positively related to connectivity and significant at the 1% level. The regression estimates in Column 4 include both *DIR* and *AMV*. The positive coefficient on *HCI* becomes insignificant and reduces to 0.01. This outcome shows that controlling for both firm size and the number of directorships in the same estimation reduces the significance and explanatory power of *HCI*. This is due to the positive and significant relationships we observe in the correlations between *AGG, HCI, DIR* and *AMV*. This suggests that the combination of being appointed to multiple larger, more central boards is more important for connectivity than human capital, and directors may earn these appointments because of the demand for their human capital. *NZ* is strongly (and positively) related to *AGG* after controlling for the size of the firms the

[31] We calculate the movement along the connectivity distribution by the difference between *AGG* at the 75th and 25th percentile: 0.27 + 0.91 = 1.18

directors serve, suggesting that regardless of the firm's size, living in New Zealand provides more director connections.

Columns 5 and 6 of Table 5.7 introduce directors' *Age* with and without *AMV*. We include how old a director is because being older would have provided more opportunities to be invited onto boards. In Column 5, the coefficient on *Age* is insignificant. But after controlling for the size of the firms a director sits on in Column 6, we observe that growing older by one year reduces connectivity by -0.006. The estimation results suggest that contrary to expectations, age has a small negative effect on connectivity. As Age is commonly employed as a measure of experience (Frijns et al., 2016), an explanation for this outcome could be that the *HCI* variable does a good job at picking up the relevant human capital attributes of directors eliminating the relevance of age as an observed factor of director experience.

Our analysis so far suggests that human capital is significantly related to how connected a director is. While prior literature provides a range of evidence on the relationship between human capital and firm outcomes, more recent literature investigating corporate social networks also supports a relationship between connectivity and firm outcomes. This overlap proposes that firm-related matters are influenced by both forms of board capital. Therefore, any future studies pertaining to the impact of connectivity should ensure that the impact of the board's human capital is seriously considered before making conclusions about the relevance of connectivity.

Table 5.7: OLS Regressions of Social Capital on Human Capital

	1 AGG OLS	2 AGG OLS	3 AGG OLS	4 AGG OLS	5 AGG OLS	6 AGG OLS
Constant	-0.920***	-2.025***	-3.492***	-4.415***	-2.659***	-3.730***
	(-9.24)	(-19.19)	(-19.74)	(-28.85)	(-12.99)	(-17.23)
HCI	0.191***	0.070***	0.115***	0.001	0.085***	0.025**
	(12.69)	(7.77)	(7.78)	(0.08)	(7.85)	(2.16)
FEM	0.216**	0.103	0.037	-0.068	0.163*	-0.045
	(2.31)	(1.38)	(0.40)	(-0.98)	(1.79)	(-0.52)
NZ	0.419***	-0.038	0.783***	0.304***	0.038	0.343***
	(6.76)	(-0.80)	(11.82)	(6.49)	(0.64)	(5.46)
DIR		1.700***		1.680***	1.688***	1.697***
		(18.41)		(18.90)	(17.80)	(18.39)
AMV			0.228***	0.213***		0.178***
			(17.71)	(21.44)		(14.47)
Age					0.001	-0.006**
					(0.24)	(-2.30)
Observations	12,211	12,211	12,025	12,025	7,400	7,304
R2	0.126	0.498	0.224	0.592	0.554	0.613
F Stat	17.93	44.41	36.97	82.57	36.91	57.57
p(F)	0.000	0.000	0.000	0.000	0.000	0.000
Year fixed effects	Y	Y	Y	Y	Y	Y
Max VIF	2.020	2.020	2.030	2.010	1.940	2.010
Mean VIF	1.820	1.79	1.830	1.750	1.710	1.750

This table presents results for OLS regressions where each observation represents a director for a given year between 2000 and 2015. The dependent variable is the aggregate connectivity measure *AGG*. The *t*-statistics are reported in parentheses below coefficients and are based upon robust standard errors clustered at the director level. Year dummies are included but not shown. ***, **, * indicates statistical significance at the 1%, 5% and 10% level, respectively. All variables are defined in Appendix A1.

5.5.4. First difference OLS regression analysis

The results from our analysis so far provide evidence that a director's human capital is positively related to their connectivity. As with most empirical studies, endogeneity is a potential concern. In particular, we may have unobservable heterogeneity (or omitted variables) existing in our main model presented at Equation (5.1). Unobservable heterogeneity can arise when there are differences among directors which are not measured. This means that instead of appearing as explanatory variables, they appear in the error term, ε. Economically, this can be a source of endogeneity if the potential differences between directors can affect both connectivity and the explanatory variables (Wintoki, Linck, & Netter, 2012). In our setting, the theory also suggests that this could be a concern. For example, the innate ability of a director could influence their connectivity as well as their human capital. Consider the model: $AGG_{it} = \alpha + \beta \boldsymbol{X}_{it} + \Upsilon \eta_i + u_{it}$,

where $\boldsymbol{X}$ is a vector of individual explanatory variables, η_i (1,….,*N*) represents the (un)observed variable such as directors' innate ability, $\Upsilon\eta_i + u_{it} = \varepsilon_{it}$ in which u_{it} then becomes the error term assumed to be I.I.D over directors and time.

Another potential concern is simultaneity in the relationship between connectivity and human capital creating a two-way causal effect. For instance, better connected directors might acquire more human capital from their connectivity, such as earning international experience from gaining overseas appointments through their connections, having more opportunities to experience a merger through sitting on multiple boards, or gaining board expertise through board connectivity. However, many of the human capital measures we employ are deemed exogenous. For instance, postgraduate education, professional expertise in accounting, or prior CEO experience cannot be directly acquired through being well connected. Nevertheless, we want to rule out any potential concerns of simultaneity by using a different framework.

5.5.4.1. The methodology

In this section, we employ first-difference OLS regressions to help mitigate the two sources of endogeneity discussed above. To do so, we examine whether changes in human capital affect contemporaneous and future changes in connectivity. We also examine the relationship in the opposite direction; whether changes in connectivity affect future changes in human capital. This specification aims to reduce the uncertainty around a simultaneity issue (reverse causality) and also controls for other director characteristics such as η_i that may be omitted in the prior regression analysis (omitted variable bias).

To undertake this analysis, the sample is reduced by taking observations for every third year. This approach is taken to create enough variation in the measures for the multivariate analysis to estimate successfully.[32] Specifically, we calculate the change in *AGG* and the independent

[32] Prior studies investigating board characteristics have taken similar approaches. For example, see Wintoki, Linck and Netter (2012) for a discussion on time-invariant variables and the methodologies employed.

variables between 2000, 2003, 2006, 2009, 2012 and 2015. The reduced sample includes 4,500 director-year observations resulting in 2229 changes. The average change in *AGG* is -0.13 with a median of -0.05 and standard deviation of 1.36. This suggests that changes in connectivity have on average been negative and the relative variability is fairly large (coefficient of variation = σ / |μ| = 1046%). Figure 4.2 in Chapter 4 shows connectivity declining from 2000 to 2015 which explains why we find the average change to be negative. The average change in *HCI* is 0.77 with a median of 1 and a standard deviation of 1.04, suggesting changes in human capital have on average been positive and less variable than connectivity.

We estimate the following model:

$$\Delta AGG_{it-(t-3)} = \beta_1 \Delta HCI_{it-(t-3)} + \beta_2 \Delta NZ_{it-(t-3)} + \beta_3 \Delta DIR_{it-(t-3)} + \beta_4 \Delta AMV_{it-(t-3)} + \sum_{y=1}^{Y} \theta_y Year_{yt} + \gamma \Delta \eta_{i-(t-3)} + u_{it} \quad (5.2)$$

where $\Delta AGG_{t-(t-3)}$ equals the three-year change in connectivity, $\Delta HCI_{it-(t-3)}$ equals the three-year change in human capital, $\Delta NZ_{it-(t-3)}$ equals the three year change in the director's place of residence, which can be one of three values, -1, 0, or 1.[33] $\Delta DIR_{it-(t-3)}$ equals the three-year change in the number of directorships held by a director, while $\Delta AMV_{it-(t-3)}$ equals the three-year change in the average size of the firms a director is on the board of. η_i is an assumed omitted time-invariant variable which will essentially be eliminated from the estimation procedure. Finally, we include year dummies $Year_{yt}$ to control for the time fixed effects on changes in connectivity. We exclude *FEM* from the regression as it doesn't change over the sample period.

5.5.4.2. Results and discussions

Table 5.8 presents the OLS estimates for Equation (5.2), where Columns 1 and 2 present contemporaneous changes of *AGG* on *HCI*. The coefficients on *HCI* are positive and significant

[33] Wooldridge (2009) explains that if a dummy variable has enough variation over time, it can be included in first differenced regression models.

at the 5% level after controlling for both *DIR* and *AMV*. These results suggest that current changes in human capital are positively related to current changes in director connectivity. Specifically, the results in Column 2 indicate that increasing human capital by one point over a three-year period also increases their level of connectivity by 0.042.

Columns 3 and 4 provide the results for future changes in *AGG* on current changes in *HCI* which again show positive and significant coefficients on *HCI*. The results in Column 6 indicate that when directors increase their human capital by one level over a three-year period, they achieve an increase in connectivity of 0.116. The coefficients on *HCI* are also higher in magnitude compared to those in Columns 1 and 2 suggesting that compared to the concurrent change, a three-year positive change in human capital leads to a greater positive change in connectivity over the next three-years. Overall, the evidence supports a predictive relationship between human and social capital whereby increases in human capital lead to increases in connectivity.

One observation worth addressing is the negative coefficient on Directorships in Columns 3 and 4. The results in Column 4 suggest that an increase in one directorship reduces a director's connectivity measure by 0.42 on average. This comes as a surprise as typically, if a director sits on a greater number of boards, their connectivity would be expected to increase, although contemporaneously. Thus, this finding merely suggests that directors who gain a directorship within the prior three years may typically step down from another one within the same period or in the following three-year period, and the overall average impact on connectivity is negative. It also suggests that that there is perhaps a maximum number of directorships that you can have, thus bearing no positive relation to connectivity.

We also take an alternative approach to investigate if connectivity significantly increases human capital due to the possibility that individual experiences obtained through connectivity add to a director's skill set. Specifically, Columns 5 and 6 present the reverse estimation of the relationship where we regress future changes in *HCI* on current changes of *AGG*. As expected, the

coefficients on *AGG* are insignificant which suggests that a change in connectivity does not relate to a future change in human capital. Therefore, increases in connectivity appear to have little effect on human capital. This evidence supports the direction of the human and social capital relationship when investigating the social capital aspect of director connectivity.

Table 5.8: First Difference OLS Regressions

	1 ΔAGG OLS	2 ΔAGG OLS	3 ΔAGG_{t+1} OLS	4 ΔAGG_{t+1} OLS	5 ΔHCI_{t+1} OLS	6 ΔHCI_{t+1} OLS
Constant	-0.226*** (-4.95)	-0.304*** (-6.07)	-0.404*** (-3.61)	-0.419*** (-3.76)	0.529*** (9.47)	0.522*** (9.38)
ΔHCI	0.062*** (3.59)	0.042** (2.53)	0.101** (2.24)	0.116** (2.53)		
ΔAGG					-0.001 (-0.05)	-0.015 (-0.63)
ΔNZ	0.210 (0.51)	0.283 (0.63)	0.404 (1.35)	0.400 (1.36)	0.330*** (3.03)	0.370*** (2.96)
ΔDIR	1.674*** (20.46)	1.671*** (20.42)	-0.443*** (-4.84)	-0.420*** (-4.61)	0.084 (1.36)	0.113* (1.82)
ΔAMV		0.115*** (5.57)		-0.014 (-0.31)		0.032 (1.12)
Observations	2,229	2,183	1,120	1,099	1,120	1,099
R2	0.583	0.592	0.044	0.042	0.037	0.042
F Stat	75.35	72.51	5.97	5.22	7.56	6.56
p(F)	0.000	0.000	0.000	0.000	0.000	0.000
Year fixed effects	Y	Y	Y	Y	Y	Y

This table presents results for OLS regressions where each observation represents a director for a given year between 2000 and 2015. The dependent variable is the three-year change in the aggregate connectivity measure *AGG*. Specifically, we calculate the change in *AGG* and the independent variables between 2003 and 2000, 2006 and 2003, 2009 and 2006, 2012 and 2009 and 2015 and 2012. The *t*-statistics are reported in parentheses below coefficients and are based upon robust standard errors clustered at the director level. Year dummies are included but not shown. ***, **, * indicates statistical significance at the 1%, 5% and 10% level, respectively. All variables are defined in Appendix A1.

5.5.5. Quantile regression analysis

So far, we have established a strong relationship between human capital and social connectivity. However, the analysis thus far only provides a partial view of the relationship. For instance, there may be a stronger relationship at lower levels of connectivity whereby human capital plays a more important role in gaining additional connectivity for low connected directors. However, human capital may have a lesser impact on connectivity for a director who is already well connected. Therefore, we would expect to find a decreasing effect of human capital on connectivity for better connected directors. To investigate this, we employ quantile regression which provides this capability.

Hao and Naiman (2007) show that quantile regression yields a more complete understanding of relationships by efficiently characterising data distributions. Corporate governance studies have begun to employ quantile regression approaches (Gao & Kling, 2008; Kuan, Li, & Liu, 2012; Armstrong, Blouin, Jagolinzer, & Larcker, 2015; Liu, Hsueh, & Wu, 2017). For example, Armstrong et al., (2015) investigate the relationship between tax avoidance and corporate governance and managers' equity incentives, enabling them to estimate the relation across the whole tax avoidance distribution. Similar to *AGG*, the tails of the tax avoidance distribution show extreme levels of tax avoidance. Analogous to prior tax avoidance studies, they find no relation at the conditional mean or median of the tax distribution. However, they discover a positive association between corporate governance mechanisms at low levels of tax avoidance, and a negative association for high levels of tax avoidance.

In addition to the theoretical rationale for using this approach, the technical reason why this approach is useful is because the *AGG* distribution is skewed, having long-tails with medians considerably less than the averages. Quantile regression model's data with heterogeneous conditional distributions (Badshah, Frijns, Knif, & Tourani-Rad, 2016; Liu et al., 2017), such as the asymmetric distribution of *AGG* (Zhu, Wang, Wang, & Härdle, 2016). By investigating the associations between human capital and *Connectivity* at different levels, we can provide a better description of the relationship (Koenker, 2005) in addition to the average relationship. Quantile regression analysis also estimates a conditional median or other quantile relationship and estimates standard errors by minimising the sum of the absolute residuals. Therefore, this approach is also less sensitive to outliers which enables the technique to add robustness to the results (Koenker & Bassett, 1978).

5.5.5.1. The Model

We investigate whether the relationship between human capital and connectivity varies along the aggregate connectivity distribution to identify whether human capital is positively and equally related to high levels, mid levels and low levels of connectivity. In particular, we employ a

simultaneous quantile regression model with bootstrapped standard errors (Koenker, 2005) using 500 replications of the conditional variances.[34] Quantile regressions (Koenker & Bassett, 1978) are estimated in the form:

$$Q\left(AGG_{it}^{q}\right) = \alpha^{q} + \beta_1^{q} HCI_{it} + \beta_2^{q} FEM_{it} + \beta_3^{q} NZ_{it} + \sum_{y=1}^{Y} \theta_y^{q} Year_{yt} + \varepsilon_{it}^{q} \quad (5.3)$$

Where AGG_{it} is a measure of the dependent variable *Aggregate Connectivity* at the Q[th] quantile for director *i* in year *t*. All other independent variables are consistent with Equation (5.1) and we estimate relationships at quantiles *(q)* 0.10, 0.25, 0.50, 0.75, and 0.90.

5.5.5.2. Results and discussion

Table 5.9 presents quantile regression estimates regarding the relationship between human capital and social connectivity. The coefficients on *HCI* are positive and significant at the 1% level and as predicted, the magnitude of the relationship varies across quantiles. For instance, in Panel A, we observe that a one standard deviation increase in *HCI* for a director with connectivity equal to the 10[th] percentile, is associated with an increase of 12.1%[35] in connectivity, while a one standard deviation increase in *HCI* for a director at the 90[th] percentile is associated with a 2.8%[36] increase in connectivity. The coefficient on *HCI* initially increases as connectivity rises, then declines from the 25[th] percentile. Looking at the importance of the relationship, the impact of *HCI* on *AGG* is stronger for directors with connectivity less than the 75[th] percentile and is highest at the 25[th] and 50[th] percentile. In summary, we observe that human capital increases social capital and has a greater positive impact for directors with lower levels of connectivity.

Overall the findings support our hypothesis, predicting a relationship between human capital and social capital but this relationship appears to be unequal across the connectivity distribution.

[34] The simultaneous quantile regression produces the same coefficients as the coefficients for quantile regressions estimated separately. However, it allows the coefficients describing different quantiles to be compared and tested for significant differences. This is due to the estimated variance-covariance matrix of the independent variables (VCE) including between-quantile blocks (StataCorp, 2011).

[35] The percentage change in *AGG* is calculated as (one standard deviation change in *HCI* × coefficient on *HCI* for q(10) estimation)/10[th] percentile *AGG* measure for the sample = (2.66 × 0.059)/|-1.29| = 12.13%.

[36] The percentage change in *AGG* is calculated as (one standard deviation change in *HCI* × coefficient on *HCI* for q(90) estimation)/90[th] percentile *AGG* measure for the sample = (2.66 × 0.016)/1.50 = 2.84%.

The results suggest that human capital is more important for gaining additional connectivity for directors who are less connected. This makes intuitive sense. In essence, poorly connected directors with greater human capital are likely to be more connected than poorly connected directors with low human capital due to the quality of their attributes being more attractive to firms. Directors with greater human capital would be in higher demand, increasing their chances of being appointed to other boards and more central, prestigious boards in the network. This impact is less important as a director's own connectivity increases as we would expect social capital to supplement human capital.

While the OLS estimates are generally insignificant for *Female*, the quantile estimates show that the relationship between *FEM* and *AGG* is positive and significant ($p<0.01$) up to the 75th quantile. This suggests that women are more connected than men provided that they are not in the highest 10% of connected directors. The difference in social connectivity between men and women also varies across the connectivity distribution with the largest difference at the 50th quantile. We find in Chapter 4 that the average female is more likely to sit on the board of larger firms, be appointed as a new director, and to sit on more boards than men. These observations would help to centralise females in the director network and by extension increase the connectivity of a female director, as demonstrated by the results.

Residing in New Zealand is negatively related to *AGG* in the upper and lower tails. This suggests that high-connected and low-connected overseas directors are more connected than New Zealand directors but no more connected at mid-levels of connectivity. *DIR* shows a positive relationship and increasing disparity across quantiles. For instance, an increase of one directorship at the 10th percentile is associated with a significant increase of 58.8% in connectivity, while an increase of one directorship at the 90th percentile is associated with a significant increase of 177.2%. This difference is quite substantial, and the relationships are statistically significant at the 1% level. This strong relationship is an outcome of how the centrality measures are constructed

which underlie *AGG*: Degree, Closeness, Betweenness and Eigenvector, and demonstrates the compounding effect of directorships on the indirect connectivity measures.

Panel B of Table 5.9 presents the results controlling for the average size of firms a director currently serves. By controlling for this characteristic, we can determine whether there is still a significant relationship between human capital and connectivity while omitting any influences from firm size. If there is, this merely suggests that the residual effect of human capital is still influential while excluding firm size effects on connectivity (larger firms also have larger boards) or large firm decisions. We find a similar pattern in the change of the coefficient on HCI compared to Panel A but the relationship becomes negative for directors with connectivity greater than the median. Directors with low connectivity (Quantile 10) achieve 1.44% more connectivity if *HCI* increases by one standard deviation, and 5.32% less connectivity for directors with high connectivity (Quantile 90). However, there is no significant relationship at the middle of the connectivity distribution. The results indicate that when size effects are controlled for, human capital is only advantageous for connectivity if a director is poorly connected. This is expected because if a director is already well-connected, there would be less expected benefits derived from increasing their personal skills, education, and experiences. We also observe that the coefficients on *Female* are now insignificant as females are more likely to sit on boards of larger firms. The coefficients on *NZ* are all positive and significant because *NZ* is negatively correlated with *AMV*. Therefore, after controlling for firm size, the relationship between place of residence and connectivity is more pronounced. Additionally, some of the larger firms in the sample are foreign firms that have more foreign director on boards, which are less connected to the New Zealand network. However, the relationship appears to be an inverted u-shape suggesting that being a New Zealander is better for connectivity for average connected directors as we find in the OLS estimation.

Table 5.9: Simultaneous Quantile Regressions of Social Capital on Human Capital

Panel A: Simultaneous quantile regressions for AGG on HCI controlling for Directorships (DIR)					
	q10 AGG	q25 AGG	q50 AGG	q75 AGG	q90 AGG
Constant	-2.250***	-2.493***	-1.874***	-1.652***	-1.598***
	(-32.43)	(-26.90)	(-43.52)	(-29.15)	(-12.23)
HCI	0.059***	0.090***	0.074***	0.046***	0.016***
	(16.33)	(21.40)	(21.58)	(15.19)	(3.24)
FEM	0.039*	0.139***	0.154***	0.109***	0.051
	(1.72)	(3.57)	(5.47)	(3.76)	(1.63)
NZ	-0.098***	-0.028	0.024	-0.092***	-0.126***
	(-5.94)	(-1.22)	(1.20)	(-5.21)	(-4.97)
DIR	0.761***	1.302***	1.531***	1.965***	2.658***
	(14.65)	(25.51)	(44.75)	(43.36)	(33.27)
Observations	12,211	12,211	12,211	12,211	12,211
Pseudo R2	0.090	0.157	0.233	0.353	0.451
Year dummies	Y	Y	Y	Y	Y

Panel B: Simultaneous Quantile Regressions for AGG on HCI controlling for firm size (AMV)					
	q10 AGG	q25 AGG	q50 AGG	q75 AGG	q90 AGG
Constant	-3.366***	-4.407***	-4.285***	-4.007***	-4.512***
	(-52.63)	(-79.10)	(-69.38)	(-62.54)	(-34.72)
HCI	0.007**	0.023***	0.003	-0.010***	-0.033***
	(2.40)	(6.13)	(0.74)	(-3.39)	(-7.82)
FEM	-0.043	-0.036	-0.005	0.007	-0.026
	(-1.38)	(-1.24)	(-0.18)	(0.34)	(-0.76)
NZ	0.174***	0.346***	0.284***	0.135***	0.090***
	(10.75)	(16.29)	(17.91)	(8.59)	(3.22)
DIR	0.725***	1.254***	1.526***	1.956***	2.550***
	(13.09)	(35.92)	(53.61)	(48.21)	(30.36)
AMV	0.122***	0.172***	0.194***	0.178***	0.223***
	(39.39)	(39.80)	(54.83)	(43.79)	(30.91)
Observations	12,211	12,211	12,211	12,211	12,211
Pseudo R2	0.208	0.267	0.327	0.426	0.519
Year dummies	Y	Y	Y	Y	Y

This table presents results for quantile regressions where each observation represents a director for a given year between 2000 and 2015. The dependent variable is the aggregate connectivity measure *AGG* at the Q^{th} quantile for director *i* in year *t*. Coefficients are estimated at the 10^{th}, 25^{th}, 50^{th}, 75^{th} and 90^{th} percentiles. The *t*-statistics are reported in parentheses below coefficients and are calculated from 500 bootstrap replications. Year dummies are included but not shown. ***, **, * indicates statistical significance at the 1%, 5% and 10% level, respectively. All variables are defined in Appendix A1.

Table 5.10 presents Wald tests of coefficient equality across different quantiles. The test results indicate that the quantile regressions are indeed significantly different from each other which supports the findings in Table 5.9.[37]

[37] We also perform a robustness test for the quantile regression. Parente-Santos Silva test for intra-cluster correlation (post QREG2 in Stata) demonstrates the intra-cluster correlation. Therefore, we run quantile regression with clustered standard errors and report the results in Appendix 5F. The coefficients are the same as those reported in Table 5.9. The significance of the coefficients reduces for a few variables, but the results generally support those in Table 5.9. The one exception would be the loss in significance for *Female*.

Table 5.10: Simultaneous Quantile Regression Post-Estimation Wald Tests

Test: coefficients in equation are 0		
	F(19, 12191)	Prob > F
test ([q10])	35.84	0.000
test ([q25])	123.36	0.000
test ([q50])	202.85	0.000
test ([q75])	162.21	0.000
test ([q90])	121.24	0.000
Quantile regression estimates are significantly different from zero		
	F(19, 12191)	Prob > F
test ([q10=q25])	17.36	0.000
test ([q10=q90])	51.16	0.000
test ([q25=q50])	8.21	0.000
test ([q25=q75])	16.99	0.000
test ([q50=q75])	11.34	0.000
test ([q75=q90])	14.18	0.000

This table reports Wald tests of coefficient differences from zero and coefficient equality across different quantiles. The Wald tests suggest that the coefficients are significantly different from zero and the relationship between aggregate connectivity and the independent variables is significantly different across quantiles. Dependent variables include *HCI*, *FEM*, *NZ*, *DIR* and Year dummies. All variables are defined in Appendix A1.

5.5.6. Robustness Tests

5.5.6.1. Multicollinearity

Correlations between the variables in Table 5.5 show correlation coefficients between independent variables below the generally accepted value of 0.80 (Midi, Sarkar, & Rana, 2010). We test for multicollinearity by running OLS regressions and generating variance inflation factors (VIF) and find none that exceed 2.03.[38] This value is well below 10, the maximum value generally accepted in econometric studies (Midi et al., 2010). We also ran the OLS and Logit models by systematically adding one independent variable at a time to see if additions changed the sign or significance level of the present variables. There are no erratic changes in the signs of the independent variables, which when combined with the VIF tests, indicates that multicollinearity is not an issue in our analysis. However, there are some changes in significance which are tabulated and discussed in the results section. We continue our analysis in the next section by isolating the most connected directors and investigating whether greater human capital increases a director's chances of being highly connected.

[38] See the VIF test statistics in Table 5.7.

5.5.6.2. Logit regression analysis

The Model

In this section, we test the robustness of our main results by using a different empirical approach. We estimate logit regressions to test whether greater levels of human capital increase the likelihood of a director being highly connected. Specifically, we investigate whether the likelihood of being in the 75th quantile of *Aggregate Connectivity*, compared to not being in the 75th quantile, is influenced by human capital. The following logit regression equation is estimated:

$$\ln\left(\frac{P\left(AGG_{it}^{Q75}=1\right)}{1-P\left(AGG_{it}^{Q75}=1\right)}\right) = \alpha + \beta_1 HCI_{it} + \beta_2 FEM_{it} + \beta_3 NZ_{it} + \sum_{y=1}^{Y} \theta_y Year_{yt} + \varepsilon_{it} \quad (5.4)$$

Where *P* is the probability of director *i* in year *t* being in the 75th quantile. The dependant variable is coded as one if director *i* in year *t* is in the top 25th percentile of *Aggregate Connectivity* and 0 otherwise; HCI_{it} represents the human capital index for Director *i* in year *t* and all other variables are consistent with Equation (5.1). Robust standard errors ε_{it} are clustered at the director level (Petersen, 2009).

Results and discussions

Table 5.11 reports the results of the logit model estimations for the relationship between human capital and highly connected directors.[39] Logit regression coefficients are typically reported in log-odds units which are cumbersome to interpret. We therefore report odds ratios which represent the change in the odds (or in other terms the likelihood) of being highly connected arising from a one-unit change in the director attribute. An odds ratio of 1 suggests no change, greater than one suggests an increase, while an odds ratio less than one suggests a decrease in the likelihood of being highly connected resulting from a one-unit change in the director attribute.

[39] We find similar results when the dependant variable is the probability of director *i* in year *t* being in the 90th quantile. Appendix 5G reports the logit regression estimates.

The overall evidence in Table 5.11 supports the main findings, predicting a relationship between human and social capital. Column 1 excludes *DIR* and we observe a statistically significant and positive relationship between AGG^{Q75} and *HCI*, *FEM* and *NZ*. The odds ratios are statistically significant at the 1% level. In particular, a director who increases their human capital by one level (such as obtaining an undergraduate degree) increases the odds of being highly connected by 1.42 times. Being female appears to be equally important for connectivity as living in New Zealand given the similar odds ratios.

In Column 2 we introduce *DIR* to the logit regression, which has a strong association with high connectivity. The inclusion of *DIR* reduces the significance of the other independent variables but they all remain significant. According to our analysis in Chapter 5, 15% of directors hold more than one public board seat. Increasing this to two, other factors held constant, increases the odds of being in the top 25^{th} percentile by 13.95 times. We observe a considerable increase in the pseudo r2 (176%) suggesting that *DIR* is a key variable for achieving high levels of connectivity. In Column 3 we find qualitatively similar results where we replace *DIR* with *AMV*. Column 4 shows the estimates including both controls in the logit regression. We find that the coefficient on *HCI* is insignificant, as we also find for the OLS estimates in Column 4 of Table 5.7. Overall, the findings support the main analysis, predicting a positive relationship between human capital and connectivity.

Table 5.11: Logit Regressions of Social Capital (Top 25%) on Human Capital

	1 AGG^{Q75} LOGIT	2 AGG^{Q75} LOGIT	3 AGG^{Q75} LOGIT	4 AGG^{Q75} LOGIT
Constant	0.022***	0.003***	0.000***	0.000***
	(-18.25)	(-21.12)	(-23.98)	(-26.59)
HCI	1.317***	1.155***	1.198***	1.003
	(14.08)	(6.89)	(8.74)	(0.14)
FEM	1.520***	1.369*	1.155	0.906
	(2.81)	(1.86)	(0.85)	(-0.50)
NZ	1.505***	0.745**	3.176***	1.769***
	(4.17)	(-2.53)	(9.27)	(3.83)
DIRs		13.945***		20.539***
		(14.58)		(16.11)
AMV			1.465***	1.629***
			(16.66)	(18.26)
Observations	12,211	12,211	12,025	12,025
Pseudo R2	0.104	0.286	0.181	0.383
Log	-6,155	-4,903	-5,488	-4,133
Wald Chi2	397.7	457.9	782.8	923.3
p(F)	0.000	0.000	0.000	0.000
Year fixed effects	Y	Y	Y	Y

This table presents results for logit regressions where each observation represents a director for a given year between 2000 and 2015. The dependent variable equals one if a director is in the top 25% quantile of *Aggregate Connectivity (AGG)* at time *t*, and zero otherwise. Odds ratios are reported representing the likelihood of a change in the dependent variable arising from a one-unit change in the independent variable. Z-statistics, displayed in parenthesis below each odds ratio estimate, are based upon robust standard errors clustered at the director level. Year dummies are included but not shown. ***, **, * indicates statistical significance at the 1%, 5% and 10% level, respectively. All variables are defined in Appendix A1.

5.5.6.3. Fixed effects

While we estimate first difference OLS regressions employing Equation (5.2), potentially mitigating a time-invariant omitted variable bias, an alternative method is to employ the fixed-effects estimation procedure. Consider the model: $AGG_{i,t} = \beta HCI_{it} + \eta_i + u_{it}$,

where η_i (1,….,*N*) represents the (un)observed time-invariant individual director fixed effect such as innate ability, $\eta_i + u_{it} = \varepsilon_{it}$ in which u_{it} then becomes the error term assumed to be I.I.D over directors and time. The overall intercept α becomes incorporated in the director fixed effect η_i. The fixed effects procedure removes the time-invariant factor η_i by time-de-meaning the variables in the model, i.e: $AGG_{it} - \overline{AGG_i}$; $HCI_{it} - \overline{HCI_i}$; $\eta_i - \eta_i$. This essentially captures all the temporally constant director-level effects such as innate ability (Verbeek, 2012).

The Hausman test

We employ the Hausman test to confirm whether the fixed effects model is superior to the random effects model. This test basically suggests whether the explanatory variables are correlated with the errors which indicates whether the unobserved heterogeneity is fixed (temporally constant) or random (individual effects follow a normal distribution). The Chi Square test statistic of 82.61 is significant at the 1% level which rejects the null hypothesis of no correlation between explanatory variables and errors. This suggests that the differences across directors are constant and not random. Therefore, based on the Hausman test, there is potentially an omitted variable which is time constant, thus the fixed effects specification is more appropriate for capturing this effect.

The results are reported in Table 5.12 and support our main findings. The results show the regression estimates for *AGG* on director characteristics and *HCI* while controlling for year and director fixed-effects. The coefficient on *HCI* is positive and significant for all models predicting a positive relationship between human and social capital.

Table 5.12: Fixed Effects Regressions of Social Capital on Human Capital

	1 AGG FE	2 AGG FE	3 AGG FE	4 AGG FE
Constant	-0.979**	-2.060***	-2.501***	-3.492***
	(-2.44)	(-7.91)	(-5.29)	(-10.94)
HCI	0.194***	0.056***	0.171***	0.035***
	(10.10)	(5.39)	(8.86)	(3.57)
FEM	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)
NZ	0.803	0.290	0.842	0.330
	(1.43)	(0.83)	(1.49)	(0.93)
DIR		1.652***		1.642***
		(21.68)		(21.37)
AMV			0.136***	0.129***
			(6.23)	(7.83)
Observations	12,211	12,211	12,025	12,025
R2 W	0.054	0.549	0.068	0.564
R2 Btw	0.086	0.276	0.198	0.427
R2 Ov	0.110	0.484	0.195	0.576
F Stat	14.85	48.27	16.03	50.45
p(f)	0.000	0.000	0.000	0.000
Year fixed effects	Y	Y	Y	Y

This table presents results for Fixed Effects regressions where each observation represents a director for a given year between 2000 and 2015. The dependent variable is the aggregate connectivity measure *AGG*. The *t*-statistics are reported in parentheses below coefficients and are based upon robust standard errors clustered at the director level. Year dummies are included but not shown. ***, **, * indicates statistical significance at the 1%, 5% and 10% level, respectively. All variables are defined in Appendix A1.

5.6. Conclusions

A recent trend of empirical studies investigates firm impacts related to board social connectivity. A review of this literature does not provide conclusive evidence on the influence of corporate social networks on firm outcomes. However, the literature does suggest that human capital and social capital are interlinked, which raises questions about the validity of prior studies. The literature indicates that the ambiguity related to board connectivity outcomes may in part be caused by the interlinked relationship between human capital and social capital. Moreover, it is not clear whether connectivity has any effect over and above human capital.

In this study, we attempt to disentangle these two important forms of board capital to see whether human capital and social capital are associated. To do so, we employ an index that represents how much human capital a director has by utilising measures of the most important attributes. We investigate an important social capital element, connectivity, which is constructed

by employing Social Network Analysis. We conduct a battery of tests to investigate the association between human capital and social connectivity and find positive and significant relationships. In particular, we find that human capital increases concurrent and future connectivity across the spectrum. We provide evidence to suggest that this relationship is uni-directional whereby connectivity does not predict changes in future human capital. Moreover, quantile regressions suggest that the positive impact of human capital on social capital increases for directors with low levels of connectivity, but becomes less important for directors with high social capital.

We conduct robustness tests to help mitigate multicollinearity and endogeneity issues and our findings remain the same. Our results suggest that the human capital of directors should be adequately controlled for in future empirical analyses. Therefore, future studies of board connectivity should consider this relationship in their research design.

Chapter 6

Social Capital and Board Appointments

6.1. Introduction

6.1.1. Context

A particular stream of corporate governance literature focuses on the behaviour and attributes of directors that influence their appointments to new boards. Directors with particular attributes develop reputations that attract more opportunities to sit on new boards (Fama, 1980; Fama & Jensen, 1983b). For example, CEO experience (Brickley, Linck, & Coles, 1999), better governance decisions (Coles & Hoi, 2003), expertise and prestige (Ferris et al., 2003), and professional expertise (White et al., 2014), are related to gaining additional board appointments. Directors with these factors are viewed as being "effective" in their duties, while directors who have performed poorly are found to receive less (Harford, 2003; Fich & Shivdasani, 2007; Ertimur, Ferri, & Stubben, 2010). The extant literature mainly concentrates on directors' human capital attributes, being the skills and knowledge acquired through past experiences, training and education (Becker, 1964, 1993). More recently, studies have begun to examine the value of the social capital that a director brings to a board (Johnson et al., 2013). However, this literature is still in its infancy.

In this study, we examine whether higher social capital results in additional board appointments. We employ this setting to infer the value that firms[40] and shareholders place on social capital. Specifically, if social capital makes a director more effective, then we would expect directors with higher social capital to be offered more board opportunities.[41] As noted earlier, directors' connections facilitate information flows between firms, providing access to skills, experiences and knowledge beyond the human capital the director brings as an individual (Pfeffer & Salancik, 1978). This suggests that the connectivity of a director could be a potential source of shareholder value by assisting the board with their monitoring and advising duties. Thus, we would expect that connectivity is attractive to firms such that well-connected directors receive additional board appointments.

Although the social capital literature suggests that connectivity is an important attribute for directors in terms of the access to resources the communication networks provide the board, the impact of connectivity on firms, thus shareholder value, has been mixed. Specifically, prior studies have investigated director connectivity at the board level, finding both positive associations between connectivity and firm outcomes (e.g. Horton et al., 2012; Larcker et al., 2013; Omer et al., 2014b; Akbas et al., 2016; Fracassi, 2017), and negative associations (e.g. Barnea & Guedj, 2007; Andres et al., 2013; Omer et al., 2013; Andersen & Gilbert, 2014). With respect to the present literature, the value of connectivity in social networks is yet to be fully understood. There are currently two particular issues in the literature. One issue is the mixed findings to date and this requires further research. The other issue is the endogenous link between social capital and human capital that we demonstrate in Chapter 6 of this thesis. We show that human capital in part explains social capital, and itself is a key attribute for attracting additional board seats. As a result, it is not clear whether connectivity has a marginal effect on director effectiveness, over and above being a

[40] More specifically, the incumbent board and chief executive officer as they typically select the new director.
[41] Additionally, although directors may be motivated to act in the best interests of shareholders and effectively monitor the firm because of reputational consequences, Hillman and Dalziel (2003) note that only the directors with the necessary social capital and human capital will be effective.

substitute for human capital. Therefore, human capital is an important aspect to control for when examining the importance of connectivity.

6.1.2. Approach

Our empirical setting addresses whether social capital is an effective director attribute. We begin at the director level by focusing our analysis on board appointments and whether director social connectivity matters in the labour market. We employ our connectivity factor *AGG*, based on the first principle component of Social Network Analysis' (SNA) centrality measures (Wasserman & Faust, 1994) to measure the aggregate connectivity of a director. We estimate several models for the relationship between the number of board appointments and director connectivity, human capital, and other director characteristics. First, we employ ordinary least square regression analysis to determine the average effect of director connectivity on new board appointments. We then perform logit regressions to determine the likelihood of connectivity increasing a director's chances of receiving an additional appointment. While the choice of director to nominate and appoint reflects the views of the firm as to the value of connectivity, it may not represent the views of the market. In addition, we measure the market reaction by employing an event study method to examine the abnormal returns around the appointment of a new director as this method is more attuned to assessing the market's views (MacKinlay, 1997). We control for firm-level characteristics that are likely to influence connectivity or influence the magnitude of abnormal returns.

6.1.3. Results and discussion

The results show a positive and significant relationship between director connectivity and the number of new appointments gained in the following year. This suggests that directors who are more connected, receive more appointments because of their social capital, after controlling for other factors likely to influence their appointment such as human capital. There are two main interpretations for this finding. The first one is that connectivity provides linkages to additional resources such as the experiences and practices of other firms assisting the board in their advisory

capacity and monitoring abilities. Thus, the director labour market rewards the value-contribution of highly connected directors. The second one is that director connectivity is related to board appointments because of the relationships that the social network facilitates. In other words, directors with connections may have a greater chance of being selected as a potential candidate, thanks to their connections making the appointment (Cai et al., 2017). If this is the case, there may be no value in being connected outside of the value that the intercorporate network provides directors personally. In support of this argument, there is evidence that shareholders have little say over the nomination process (Becher, Walkling, & Wilson, 2018) while some directors are found to be co-opted by management (Coles, Daniel, & Naveen, 2014), the people the board is expected to monitor,[42] and co-opted by the incumbent board (O'Higgins, 2002).[43] As a result, without adding material value to the firm, the social network of a director may facilitate her nomination to new boards. These two interpretations yield contradictory predictions regarding the contribution of highly-connected directors to shareholder value. This is what we investigate next.

When we examine the market's reaction to the appointment of a highly connected director, after controlling for human capital, we find no significant results. We consider both the absolute connectivity of the director and her connectivity relative to the average connectivity of the board she is appointed to, prior to the appointment. In both cases, we do not document any significant market reactions. These results support that director connectivity facilitates new board appointments without necessarily contributing to shareholder value, either because connections bias the candidate selection and nomination process, or because the benefits of being highly connected do not outweigh the costs (such as being overloaded with information (Omer et al.,

[42] Coles et al., (2014) define a co-opted director as one that is appointed to the board after the CEO takes office. They find that as co-option increases, board monitoring decreases, suggesting that co-opted directors, those that are not purely independent, are ineffective because of the reciprocity between the CEO and the director, which is at the shareholders expense.

[43] O'Higgins (2002) interviews non-executive directors and chairmen in Ireland. From the analysis, she summarizes that "people considered for directorships are almost always directly known to the chairman and / or other directors of the existing board. If not known personally, the individual is known by reputation, and easily approached through a go-between." (p. 23).

2014b))[44]. Yet the absence of a positive market reaction in the short-run does not preclude that social capital increases shareholder value in the long run. It may be that the contribution of director connectivity becomes material over time, and that the market underestimates its value-contribution in the short-run. Additionally, the market may not be able to quantify a directors connectivity at the time of the appointment because of its intangible nature, and therefore is unable to incorporate connectivity into stock prices (Edmans, 2011).

6.1.4. Contributions

Our study contributes to the literature in two main ways. First, we provide evidence on the importance of social capital and connectivity in director appointments, after controlling for human capital, and in a setting where the influence of connectivity should be material. Our findings specifically contribute to the finance and management literature assessing director effectiveness (e.g. Carpenter & Westphal, 2001; Coles & Hoi, 2003; Ferris et al., 2003; Fich, 2005; Fich & Shivdasani, 2007; Cashman et al., 2013; White et al., 2014; Cai et al., 2017). We present two possibilities; that information received faster, easier, and in larger quantities, assists directors with their monitoring and advising functions; or, the relationships with others in the network provide directors with more board opportunities (i.e. jobs for mates). In the latter case, there is evidence to suggest that the potential benefits gained from connectivity outweigh any potential costs of managerial entrenchment or poor decision-making on the basis of being appointed for who you know (Rosenstein & Wyatt, 1990).

Second, we disentangle social capital and human capital to present a clearer relationship between director connectivity and appointments. By doing so, we add to the social capital and human capital literature which examines the interlinkages between these sets of attributes (Coleman, 1988; Boxman et al., 1991; Shuller, 2001; Roberts & Lacey, 2008; Nyberg & Wright,

[44] The literature also suggests that networks facilitate the flow of information that can be either good or bad, such as one firm emulating the corporate practice of another firm (Haunschild, 1993; Chiu et al., 2013; Cai et al., 2014; Fracassi, 2017).

2015). We employ our human capital index to control for the human capital of directors in a more holistic and easier to interpret fashion than assessing one specific, or even a range of, human capital factors individually, such as CEO experience (Fahlenbrach et al., 2010). Thus, our index is a more robust human capital control variable for studies that investigate social capital.

6.1.5. Structure

The rest of the study is structured as follows: Section 2 presents the background and literature review, Section 3 develops our hypotheses, Section 4 presents a description of the data and variables, Section 5 presents the results, beginning with univariate analyses followed by regression analyses of board appointments, and the event study focusing on the market reaction to director appointments. Section 6 concludes the study.

6.2. Background and Literature Review

6.2.1. Board appointments

In this discussion, we focus on the literature that is related to the attributes of appointed directors. This review shows there are limited studies that demonstrate the value of director connectivity for board appointments. Fama and Jensen (1983a) argue that the director labour market seeks directors with particular attributes that help them to effectively monitor and advise management. As such, they argue that effective directors are rewarded by receiving additional board appointments. Empirical studies show support for this argument demonstrating a relationship between better governance decisions, prior firm performance, and new appointments. For instance, Brickley et al., (1999) find that retired CEOs who performed well in their prior CEO role received more subsequent board appointments. Coles and Hoi (2003) find that directors who sat on the board of a firm that rejected anti-takeover provisions gained additional board positions in the following three years. Ferris, Jagannathan and Pritchard (2003) find a positive relationship between the past performance of firms a director served and their subsequent number of directorships held. These are just a few studies that show the relationship between organisational

outcomes and board appointments to highlight that candidate directors are rewarded for demonstrating their ability to add value to the firm. The question is, what attributes does a sought-after director have?

Within this context, the literature identifies a range of human capital attributes associated with board appointments which suggest that directors with certain capital are deemed important to firms. A snippet of the literature includes the above study of Ferris et al., (2003) who indicate that directors demonstrating board expertise receive more board appointments. White, Woidtke, Black and Schweitzer (2014) find that academics from particular fields are more likely to gain a board seat, suggesting that professional expertise is attractive to firms. Johnson, Schnatterly, and Hill (2013) provide a survey of the management literature which identifies a range of attributes considered to be those of an effective director and thus add value to a firm. The attributes within this study include CEO experience, financial expertise, venture capital experience, acquisition experience, ties to other firms, affiliations, relationships and social status. These studies indicate that both social capital and human capital are collectively important attributes. Our study seeks to address whether social capital, more specifically connectivity, in addition to human capital, is also important.

Among the few studies investigating social capital and board appointments, there is no clear consensus on the importance of social capital. Cashman, Gillan, & Whitby (2013) indicate that directors with more social capital gain more board seats. Employing SNA, they find that a better-connected director is more likely to gain an additional board appointment. While Cashman et al, (2013) demonstrate that connectivity is valuable to firms, Ferris et al., (2003) find evidence to, at least partially, suggest that connectivity is not. They find a negative relationship between the number of directorships held and receiving an additional directorship the following year, suggesting that additional board seats make a director unlikely to gain, or accept, an additional seat due to time commitments. This is likely to be driven by the fact that directors with considerable demands on their time are likely to be less effective board members. However, Ferris

et al. (2003) also find a positive market reaction when firms appoint a "busy" director, one who holds more than two other board seats. This suggests that shareholders might value connectivity because busy directors are more connected to the network. As a result, we control for director busyness in our study to isolate the social capital derived from networks.

6.2.2. Shareholder reaction: Does the market care?

While there is some evidence that companies may value the social connections a connected director brings, it is not clear whether the market values social capital. Prior studies have shown that the market does react to the appointment of directors, in some cases indicating that directors create value, while in others that they destroy value. These studies, which typically examine cumulative abnormal returns over small event windows, have enabled credible connections to be made between director characteristics and firm value.

For instance, Yermack (2006) surveys the literature and provides evidence that shareholder reactions are sensitive to an appointed director's human capital attributes such as professional qualifications and occupational expertise. In particular, shareholders react positively to board appointments of outside directors (Rosenstein & Wyatt, 1990), those with previous CEO experience (Fich, 2005), and those who are CEOs of other boards (Fich & Shivdasani, 2006; Fahlenbrach et al., 2010). Shareholders also react positively to appointments of directors with greater director experience both in terms of the number of prior years' served as a director and the number of current directorships (Gray & Nowland, 2013). Masulis, Ruzzier, Xiao, and Zhao (2012) find positive shareholder reactions around the appointment announcement of an independent expert director and no significant reaction to a non-expert independent director. Karamanou and Vafeas (2005) show that shareholders value management forecasts more favourably when more financial experts are on the audit committee, and Defond, Hann and Hu (2005) find a positive reaction to the appointment of an accounting financial expert to the audit committee. This finding suggests that a director's financial expertise gives manager projections

more credibility. Shareholders also react favourably to a busy director who is resigning from a board (Fich & Shivdasani, 2006) providing evidence against the findings of Ferris et al., (2005).

6.2.3. Social capital and stock market reaction

Few studies examine shareholder reactions to well-connected directors and to our knowledge, no study employs an empirical investigation using SNA to investigate social capital and the market reaction. Studies that do provide evidence of the importance of social capital show it implicitly through other director characteristics. For instance, Perry and Peyer (2005) find shareholders value the appointment of an executive from another firm which has resources beneficial to the firm's performance. This suggests that connections provide the firm with reciprocity, other firms' experiences and ideas.

Connections may also cause financial contagion. For instance, Fich & Shivdasani (2007) study firms that underwent an alleged securities fraud lawsuit. They find negative shareholder reactions on the date at which the lawsuit is filed where the firm loses on average 3.25% of the share price. Meanwhile, the connected firms' share price loses on average 0.92% which indicates that news about misdemeanours of one firm spill over to others. This spill over may indicate that the market expects firms to replicate the misdemeanours of connected companies, or that the market expects the failure in monitoring to be replicated in the connected company. To our knowledge, there are no studies that investigate shareholder reactions to director connectivity which raises the question of whether social connectivity is valuable from a shareholder's perspective.

6.3. Hypotheses Development

It is not entirely clear in the literature whether social connectivity, specifically created through multiple directorships, is an important director attribute to firms or shareholders. Within the context of New Zealand, there are no studies which have specifically investigated this. Furthermore, at least one study suggests that social capital is more important than human capital

(Cashman et al., 2013). Thus, it is motivating to investigate whether there is a marginal effect of connectivity above that of human capital.

We use director-level data to ask the following research questions: First, do firms appoint directors with greater connectivity? Second, do shareholders value the appointment of directors with greater connectivity? To answer these research questions, we examine the social capital acquired from directors' connectivity and test two main hypotheses. The first hypothesis tests whether director connectivity is related to receiving additional board appointments. The literature is sparse and provides little evidence of a relationship. Resource dependence theory suggests that directors who sit on multiple boards gain access to broader corporate networks and act as conduits for information, resource sharing and capital. Directors are likely to use their knowledge and skills from experience on other boards to provide the organisation better advice and counsel (Carpenter & Westphal, 2001). Appointing a better-connected director is also likely to improve the network location of the appointing firm's board, enabling the board to tap into a wider pool of board resources, such as knowledge and experiences. We argue from a social network theory perspective (Borgatti & Foster, 2003) that the centrality of a director matters for board appointments. As such, we expect a positive relationship between connectivity and board appointments with the expectation that firm's aim to acquire more information capital. We also argue that board appointments may in part be awarded due to the relationships that networks facilitate between people. However, as discussed, the value of social capital could be a by-product of human capital as the literature has not fully considered the linkages between these attributes. Therefore, to identify the effect of social capital, we first need to control for human capital. Our first hypothesis is as follows:

H1: *Receiving a board appointment is positively related to social connectivity after controlling for human capital.*

We also investigate the value of connectivity from the shareholders' perspective who may view connectivity in several different ways. First, thanks to their network connections, perhaps directors appoint directors that they know. Or, as was suggested by Jensen and Meckling (1976), perhaps they are appointed to benefit managers, or co-opted by the existing directors, at the expense of shareholders (O'Higgins, 2002). In this case, we would find such directors to receive more appointments, but we would not expect a positive market reaction. Prior literature has also highlighted negative firm outcomes from connections such as the issue of contagion (Chiu et al., 2013) and poor monitoring (Barnea & Guedj, 2007). Thus, connectivity may be perceived by the market as a signal of an ineffective director.

Additionally, directors' connections may be important, but the market may not be able to fully price connectivity due to its intangible nature (Edmans, 2011). To demonstrate, a candidate director may only sit on one other board, but this board may be very central in the network. To distinguish the extent of the director's connectivity, one would be required to visually construct the network. Not all investors have the resources to piece together this kind of network information, as opposed to more sophisticated investors (Akbas et al., 2016). In this case, we would expect to find no market reaction due to the invisibility of connectivity.

On the other hand, director connectivity may matter to investors because of the informational advantages it brings to the firm (Wasserman & Faust, 1994). In this case we would expect to find a positive market reaction to connectivity, over and above human capital. As there are a number of likely outcomes, and a gap in the literature, we ask whether there is a market reaction to a well-connected appointed director. The alternative hypothesis is:

H2: *The market reaction to director appointments is related to social connectivity.*

6.4. Data and Variables

6.4.1. Sample and summary statistics

In this chapter, we employ the director-level information from the previous chapters. We start with the hand-collected sample of directors of New Zealand publicly listed firms between 2000 and 2015. The sample includes 279 unique firms, 2432 unique directors, and 12,211 director-year observations.[45] We identify 2,341 new board appointments for 2,227 unique directors at 271 firms between 2000 and 2015. Table 6.1 reports annual summary statistics for the board appointments. The average number of director appointments is 139 per year, which is 18% of the total number of directors. Table 6.1 shows that a higher percentage of new directors were appointed to boards over the period 2001 to 2004, driven by a high number of initial public offerings (IPOs) in 2000 and the push for greater board independence following changes in the early 2000's to the recommended corporate governance practices in New Zealand (Boyle & Ji, 2013). Another interesting point is the substantially lower percentage of new appointed directors in 2008 (a drop from 79% to 59%), the onset of the GFC. This indicates that boards may have preferred to appoint directors from other public boards with more experience during higher risk years, combined with a reduction in the number of available directorships (795 in 2007 drops to 765 in 2008).

[45] For a detailed description of the board appointment identification approach see Appendix 6A.

Table 6.1: Board Appointments from 2000 to 2015

Year	IPOs	N Firms	N Directors	N Appointed Directors	N Board Appointments	% New Appointed Directors
2000	21	132	702	185	200	41%
2001	4	144	733	173	188	75%
2002	5	142	729	171	183	74%
2003	6	144	711	129	137	71%
2004	15	166	811	157	166	73%
2005	6	169	811	134	139	62%
2006	7	161	784	114	118	65%
2007	10	167	795	138	142	79%
2008	3	163	765	124	125	59%
2009	1	158	766	106	110	69%
2010	2	155	785	129	134	73%
2011	4	152	751	114	123	72%
2012	2	154	764	155	161	71%
2013	6	153	762	152	161	68%
2014	12	155	769	116	119	66%
2015	4	158	773	130	135	67%
Average	7	155	763	139	146	68%
Total	108	2,473	12,211	2,227	2,341	1,501
Unique	108	279	2,432	1,743	271	1,501

This table presents annual summary statistics for the sample of 2,341 board appointments to New Zealand public companies from 2000 to 2015. The first column presents the number of initial public offerings by year, to show the relationship between appointments and newly public firms. Columns 2 and 3 reports the number of firms and directors in the sample each year, respectively. Column 4 reports the number of directors that were appointed by firms each year. Column 5 reports the number of board appointments per year while Column 6 reports the percentage of directors that received their first appointment to a firm in our sample for the respective year. The three bottom rows report averages, totals, and the number of unique events. For example, the 2,341 appointments were to 271 different boards.

6.4.2. Social capital and human capital measures

To investigate the importance of a director's social capital we employ SNA to measure directors' social connectivity (Wasserman & Faust, 1994).[46] We rely primarily on the PCA measure *AGG* for the analysis in this study. To measure human capital, we employ the human capital index (HCI) explained in Chapter 3. The human capital index *(HCI)* has a maximum possible value of 18.

[46] Please review Chapter 2 for the measurement of social capital.

6.4.3. Descriptive statistics

Panel A of Table 6.2 reports descriptive statistics of the sample and variables used in this study, while Panel B reports descriptive statistics of the full sample. In Panel A, we present the individual connectivity measures for the year prior to the appointment; *Degree*, *Closeness*, *Betweenness* and *Eigenvector*, and the aggregate measure (*AGG*). The average (median) *Degree* measure is 0.92% (0.78%) which suggests that the average director has 0.92% of the maximum possible degree centrality of the sample prior to being appointed. The average (median) closeness is 10.45% (12.90%) suggesting that the average director has 10.45% of the maximum possible closeness centrality prior to being appointed. The average (median) betweenness is 0.31% (0.00%) suggesting that the average director has 0.31% of the maximum possible betweenness centrality prior to being appointed. The average (median) eigenvector is 1.26% (0.01%) suggesting that the average director has 1.26% of the maximum possible eigenvector centrality prior to being appointed. We observe that the average director *HCI* score is 6.14 out of a possible 18. The minimum value is 0 while the maximum value is 15.2, indicating an extremely experienced director with a lot of highly desirable attributes. We observe that 8% of the directors are female, 72% of directors resided in New Zealand prior to the new appointment, held on average 1.24 directorships, with only 5% holding more than two. Looking at appointments, we observe that over 5% of the sample gained at least one new appointment and the greatest number gained in one year is three.

Table 6.2: Descriptive Statistics of Board Appointments

Panel A: Descriptive statistics								
Variable	Obs	Mean	Median	SD	Min	P25	P75	Max
Director Attributes - Prior Year								
DEG_{t-1}	9,620	0.92%	0.78%	0.54%	0.13%	0.62%	1.07%	6.70%
CLO_{t-1}	9,620	10.45%	12.90%	6.93%	0.13%	1.05%	15.73%	26.19%
BET_{t-1}	9,620	0.31%	0.00%	1.11%	0.00%	0.00%	0.00%	18.07%
EIG_{t-1}	9,620	1.26%	0.01%	4.96%	0.00%	0.00%	0.27%	52.92%
AGG_{t-1}	9,620	0.07	-0.24	1.57	-1.78	-0.83	0.31	17.70
HCI_{t-1}	9,620	6.14	6.20	2.67	0.00	4.20	8.00	15.20
FEM_{t-1} (0/1)	9,620	0.08	0.00	0.28	0.00	0.00	0.00	1.00
NZ_{-1} (0/1)	9,620	0.72	1.00	0.45	0.00	0.00	1.00	1.00
DIR_{t-1} (N)	9,620	1.24	1.00	0.61	1.00	1.00	1.00	6.00
$DIR+2_{t-1}$ (0/1)	9,620	0.05	0.00	0.22	0.00	0.00	0.00	1.00
Age_{t-1}	5,892	56.17	56.00	9.33	24.00	50.00	63.00	87.00
Appointments								
New Appt (0/1)	9,620	0.05	0.00	0.22	0.00	0.00	0.00	1.00
N Appts	9,620	0.06	0.00	0.26	0.00	0.00	0.00	3.00
Exec Appt (0/1)	9,620	0.00	0.00	0.05	0.00	0.00	0.00	1.00
N Exec Appts	9,620	0.00	0.00	0.05	0.00	0.00	0.00	1.00
Panel B: Full sample descriptive statistics								
	Obs	Mean	Median	SD	Min	P25	P75	Max
Director Attributes								
DEG	12,211	0.89%	0.78%	0.51%	0.00%	0.62%	1.05%	6.70%
CLO	12,211	10.15%	12.74%	6.96%	0.00%	0.99%	15.56%	26.19%
BET	12,211	0.26%	0.00%	1.01%	0.00%	0.00%	0.00%	18.07%
EIG	12,211	1.25%	0.01%	4.97%	0.00%	0.00%	0.25%	52.92%
AGG	12,211	0.00	-0.26	1.49	-1.94	-0.91	0.27	17.70
HCI	12,211	6.08	6.20	2.66	0.00	4.20	7.60	15.20
FEM (0/1)	12,211	0.09	0.00	0.28	0.00	0.00	0.00	1.00
NZ (0/1)	12,211	0.70	1.00	0.46	0.00	0.00	1.00	1.00
DIR (N)	12,211	1.21	1.00	0.57	1.00	1.00	1.00	6.00
DIR+2 (0/1)	12,211	0.04	0.00	0.20	0.00	0.00	0.00	1.00
Age	7,400	56.24	56.00	9.45	24.00	50.00	63.00	88.00
Appointments								
New Appt (0/1)	12,211	0.18	0.00	0.39	0.00	0.00	0.00	1.00
N Appts	12,211	0.19	0.00	0.42	0.00	0.00	0.00	4.00
Exec Appt (0/1)	12,211	0.03	0.00	0.16	0.00	0.00	0.00	1.00
N Exec Appts	12,211	0.03	0.00	0.16	0.00	0.00	0.00	2.00

Panel A presents descriptive statistics for the main variables employed in the ordinary least square and logit regression analysis to investigate the relationship between board appointments and director connectivity. Director attributes are measured at time t-1. All variables are defined in Appendix A1. We report age for descriptive purposes, however, we do not include age in the empirical analysis because the number of observations is only 5,892. However, we capture experience more specifically by the human capital index. Panel B presents descriptive statistics for the full sample, where the director attributes are measured at time t.

In Table 6.3, we tabulate the top five most frequently appointed directors to provide a closer look at their social and human capital. All five directors have *AGG* and *HCI* scores in the top 25th percentile. Frequently appointed directors also seem to be either accountants, general executives or professional directors who have held at least three public directorships at one time. Alistar Ryan, Eduard Van Arkel and Marko Bogoievski held as many as five at one time. However, these scores

are not as high as those in White et al., (2014). They report a director being appointed to nine different United States publicly traded firms between 1995 and 2007, and one holding as many as eight directorships at one time.

Table 6.3: Frequently Appointed Directors

No of Appts	First Name	Last Name	Residence	Primary Occupation	Max HCI	Max AGG	Year AGG	Max Public DShips
7	Alistair	Ryan	Auckland	Accountant/Financial	7.20	2.84	2013	5
7	Eduard	Van Arkel	Auckland	General Executive, Professional Director	10.40	7.47	2011	5
7	Elizabeth	Coutts	Auckland	Accountant/Financial, Professional Director	10.40	5.23	2001	3
7	Kimmitt	Ellis	Auckland	General Executive, Professional Director	10.40	5.32	2014	4
7	Susan	Sheldon	Christchurch	Accountant/Financial, Professional Director	10.60	4.66	2010	4
6	Marko	Bogoievski	Wellington	Accountant/Financial	10.40	8.19	2003	5

This table presents the top five most frequently appointed directors in our sample. In order from the left, the columns present the number of appointing boards, director name, place of residence, primary occupation, human capital index (*HCI*) score, *Aggregate Connectivity* (*AGG*) score, year of observed data, and the maximum number of other public directorships.

6.5. Results

6.5.1. Univariate analyses

6.5.1.1. Correlations

We begin our analysis by looking at the univariate relationship between social connectivity and subsequent board appointment. We first examine the Pearson pairwise correlations, presented in Table 6.4, which show that the relationship between New Appointments, *AGG*, *HCI* and the four centrality measures, is positive. This suggests that directors with more social and human capital receive more board appointments. The coefficients range between 0.07 and 0.12 which is fairly low and possibly the result of the small percentage of appointments (507) compared to the full sample (9,620).

Table 6.4: Pearson Pairwise Correlations

	DEG_{-1}	CLO_{-1}	BET_{-1}	EIG_{-1}	AGG_{-1}	HCI_{-1}	FRM_{-1}	NZ_{-1}	$DIR+2_{t-1}$	New Appt	N Appts	Exec Appt	N Exec Appts
DEG_{t-1}	1												
CLO_{t-1}	0.47	1											
BET_{t-1}	0.71	0.33	1										
EIG_{t-1}	0.44	0.27	0.22	1									
AGG_{t-1}	0.91	0.66	0.80	0.59	1								
HCI_{t-1}	0.33	0.22	0.26	0.07	0.31	1							
FEM_{t-1}	0.02	0.01	0.02	0.00	0.02	0.00	1						
NZ_{-1}	0.00	0.11	0.13	0.01	0.08	-0.16	-0.04	1					
$DIR+2_{t-1}$	0.61	0.23	0.66	0.16	0.59	0.22	0.02	0.11	1				
New Appt	0.12	0.09	0.10	0.05	0.12	0.08	0.03	0.07	0.11	1			
N Appts	0.12	0.09	0.10	0.05	0.12	0.07	0.02	0.07	0.11	0.97	1		
Exec Appt	-0.01	0.01	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.34	0.33	1	
N Exec Appts	-0.01	0.01	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.34	0.33	1.00	1

This table reports Pearson pairwise correlations for the variables employed in the empirical analyses. All variables are defined in Appendix A1.

6.5.1.2. Attributes of appointed directors versus non-appointed directors

Table 6.5 compares the attributes of directors who gained an additional board seat to those that did not. In Panel A, we find that newly appointed directors are on average more connected in all four individual centrality dimensions as well as for the aggregate measure. The positive differences are statistically significant at the 1% level and are the same whether we consider the lagged measure for the connectivity measures (reducing the sample size to 507), or the contemporaneous measure which includes the connections arising from the new appointment (un-tabulated). Looking at Panel B, newly appointed directors have more human capital (*HCI* difference = 0.9), are younger (by 1.2 years), more likely to be female (3% positive difference), live in New Zealand (14% positive difference), and sit on more boards, relative to those that do not receive a new board appointment. The results suggest that directors who gain additional appointments are both more connected and have higher human capital. This highlights the importance of controlling for human capital in evaluating the importance of social capital.

Table 6.5: Univariate analysis of Social Capital Differences between Appointed Directors and Non-appointed Directors

	Obs	New Appt = 1 (Mean)	Obs	New Appt = 0 (Mean)	Mean Difference		T/z stat
Panel A: Prior year director connectivity							
DEG_{t-1}	507	1.19%	9,113	0.90%	0.29%	***	(8.53)
CLO_{t-1}	507	13.10%	9,113	10.30%	2.80%	***	(8.99)
BET_{t-1}	507	0.77%	9,113	0.28%	0.48%	***	(6.74)
EIG_{t-1}	507	2.40%	9,113	1.20%	1.20%	***	(3.91)
AGG_{t-1}	507	0.90	9,113	0.03	0.872	***	(8.95)
Panel B: Director attributes							
HCI_{t-1}	507	6.99	9,113	6.09	0.903	***	(7.43)
FEM_{t-1}	507	0.11	9,113	0.08	0.03	**	(2.47)
Age_{t-1}	365	55.05	5,527	56.24	-1.19	**	(2.40)
NZ_{t-1}	507	0.86	9,113	0.72	14%	***	(7.05)
DIR_{t-1}	507	1.58	9,113	1.23	0.358	***	(8.82)
$DIR+2_{t-1}$	507	0.15	9,113	0.04	10%	***	(10.31)

This table reports the social capital, human capital and other attributes for the appointed directors versus directors who were not appointed. The second to last column of the table reports the average differences in the characteristics between the appointed directors versus directors who were not appointed, and the statistical significance based on a two-tailed two-sample t/z test with unequal variances. ***, ** indicates statistical significance at the 1% and 5% level, respectively. All variables are defined in Appendix A1.

Next, we formally test ***Hypothesis 1***, that social capital is important after controlling for human capital, following a similar approach to Cashman et al., (2013). We begin by employing OLS regressions to investigate the relationship between connectivity and the number of appointments a director receives. This will provide evidence on the labour market preferences for directors and the value of connectivity to firms. Following this, we examine the combined importance of connectivity and human capital for gaining new appointments to determine which of the two forms of capital, human or social, is more important than the other. To check the robustness of the results, we perform a logit analysis of the likelihood of a director being appointed based on their connectivity and human capital.

6.5.2. OLS regression analysis

To test ***Hypothesis 1,*** we examine the relationship between director appointments and connectivity while controlling for a director's human capital based on the human capital index we created. We estimate an ordinary least square regression using panel data. We employ the number of new appointments gained in a period of one year for the dependent variable and consider both the lagged level and lagged change (first difference) in connectivity and human capital for the independent variables. The level of connectivity proxies for the *amount* of social capital a director has prior to being appointed. A positive relationship suggests that better connected directors received more additional director appointments. Conversely, the change in connectivity proxies for a recent gain or loss in social capital prior to an appointment. A positive relationship suggests that directors with recently acquired connectivity are more likely to be appointed to additional boards. This could either be due to another board appointment in the prior year, or a change in the network structure of which they are connected to. Similarly, a positive relationship between the number of new appointments gained and human capital suggests that the amount of human capital matters to appointing firms. A positive relationship with the change in human capital suggests that a director who recently increased their human capital, by for example gaining experience in

additional industries, will be more attractive to appointing firms. Using this methodology also alleviates concerns about endogenous time invariant omitted variables that are correlated with either connectivity or human capital. We include multiple appointments of directors to the same firm as we are interested in the desirable attributes of the individual directors and not the characteristics of the firm itself.

6.5.2.1. The model

To conduct the analysis, we employ the following specification:

$$N\ Appts_{it} = \alpha + \beta_1 AGG_{it-1} + \beta_2 \Delta AGG_{it-1-(t-2)} + \beta_3 HCI_{it-1} + \beta_4 \Delta HCI_{it-1-(t-2)} + \beta_5 FEM_{it-1} + \beta_6 NZ_{it-1} + \beta_7 DIR + 2_{it-1} + \beta_8 N\ Exec\ Appts_{it} + \sum_{y=1}^{Y} \theta_y Year_{yt-1} + \varepsilon_{it} \quad (6.1)$$

where $N\ Appts_t$ is the number of new appointments for a director in year t. AGG_{it-1} is the *Aggregate Connectivity* measure for director *i* in year *t-1*, $\Delta AGG_{it-1-(t-2)}$ equals the one-year change in connectivity between year *t-1* and *t-2*, HCI_{it} represents the human capital index for director *i* in year *t-1*, $\Delta HCI_{i,t-1-(t-2)}$ equals the one-year change in human capital between year *t-1* and *t-2*, $FEM_{i,t-1}$is a dummy variable that equals one if the director is a female and zero if a male, NZ is a dummy variable that equals one if the director resides in New Zealand and zero otherwise, $DIR + 2_{it-1}$ is a dummy variable that equals one if the director holds three or more other directorships, $N\ Exec\ Appts_{it-1}$ is the number of executive appointments and $Year_t$ is a set of year dummies to control for time-series trends. Robust standard errors ε_{it} are clustered at the director level (Petersen, 2009) assumed to be I.I.D over directors and time.[47]

[47] We provide results for *Degree*, *Closeness*, *Betweenness* and *Eigenvector* as the independent variable in place of *AGG* in Appendix 6B. The results show that the relationship with the number of appointments is consistent for all centrality measures except for *Betweenness* after controlling for busyness. A director requires more than one directorship for Betweenness Centrality therefore, directors who sit on more than two boards would score higher in *Betweenness* so controlling for directorships of more than two reduces the significance of the relationship between *N Appts* and *Betweenness.*

6.5.2.2. Results and discussions

Column 1 of Table 6.6 shows the regression results for the number of new appointments. We find positive and significant coefficients on *AGG* and *HCI*. Specifically, a one standard deviation increase in connectivity is associated with a 35.40% increase in the average number of new appointments for a director,[48] while a one standard deviation increase in *HCI* is associated with a 32.47% increase in the average number of new appointments for a director.[49] This suggests that firms may appoint directors based on both how much connectivity and human capital they have. We also observe a positive coefficient on Δ*HCI*, suggesting that firms may appoint directors based on recently accumulated human capital. We find no significant relationship between Δ*AGG* and *N Appts.* This suggests that a recent gain or loss in connectivity has no effect on gaining additional appointments, even though directors with more connectivity achieve more appointments. These results remain consistent after controlling for the busyness of directors, and/or whether it is an executive appointment. Interestingly, despite the busyness hypothesis arguing that directors sitting on more boards are less able to add value due to time constraints, we find evidence to suggest that busy directors are in high demand, receiving more appointments. This finding supports Fama and Jensen (1983b) who explain that multiple directorships signal to the labour market expertise in board oversight, making them more attractive for future board positions. It also supports the finding of Ferris et al. (2003) that shareholders value the appointment of a busy director. The relationships with the other variables suggest that females and directors living in New Zealand are associated with a greater number of new appointments. Overall, the results support ***Hypothesis 1,*** that receiving a board appointment is positively related to director connectivity even after controlling for human capital.

[48] The percentage change in *N Appts* is calculated as (one standard deviation change in *AGG* × coefficient on *AGG* in Column 1)/Average N Appts for the sample = (1.57 × 0.013)/0.06 = 35.40%.
[49] The percentage change in *N Appts* is calculated as (one standard deviation change in HCI × coefficient on HCI in Column 1)/Average N Appts for the sample = (2.67 × 0.007)/0.06 = 32.47%.

Table 6.6: OLS Regressions for Number of Appointments on Social Capital

	1 N APPTS OLS	2 N APPTS OLS	3 N APPTS OLS	4 N APPTS OLS
Constant	-0.002	-0.002	0.000	0.000
	(-0.14)	(-0.15)	(0.02)	(0.01)
AGG_{-1}	0.013***	0.009***	0.014***	0.010***
	(5.62)	(3.37)	(5.90)	(3.67)
ΔAGG_{t-1}	0.000	0.000	-0.001	-0.001
	(0.05)	(0.05)	(-0.10)	(-0.09)
HCI_{-1}	0.007***	0.006***	0.006***	0.006***
	(5.61)	(5.49)	(5.37)	(5.22)
ΔHCI_{t-1}	0.010**	0.010**	0.008**	0.009**
	(2.32)	(2.40)	(1.98)	(2.06)
FEM_{t-1}	0.035**	0.034**	0.033**	0.032**
	(2.42)	(2.45)	(2.31)	(2.31)
NZ_{t-1}	0.049***	0.047***	0.046***	0.045***
	(8.67)	(8.44)	(8.47)	(8.22)
$DIR+2_{t-1}$		0.047*		0.047**
		(1.93)		(2.02)
N Exec Appts			1.112***	1.112***
			(11.38)	(11.55)
Observations	7,559	7,559	7,559	7,559
R2	0.031	0.0326	0.076	0.077
Adj R2	0.029	0.03	0.073	0.074
F Stat	8.42	8.86	13.19	13.56
p(F)	0.000	0.000	0.000	0.000
Year fixed effects	Y	Y	Y	Y

This table presents results for OLS regressions where each observation represents a director for a given year between 2000 and 2015. The dependent variable is the number of board appointments. The *t*-statistics are reported in parentheses below coefficients and are based upon robust standard errors clustered at the director level. Year dummies are included but not shown. ***, ** indicates statistical significance at the 1% and 5% level, respectively. All variables are defined in Appendix A1.

6.5.3. OLS regression for the relative importance of human capital and connectivity

The previous empirical analysis provides evidence that human and social capital are both positively related to the number of new appointments. However, Cashman et al., (2013) suggests that social capital is more important than human capital for board appointments. We employ a similar approach to Cashman et al., (2013) to determine whether social capital is more important than human capital for New Zealand boards. To conduct the analysis, we group directors into terciles in each year based on the rankings of their HCI_{t-1} and AGG_{t-1} variables. From these groups, we create four dummy variables to identify directors in the extreme groupings of human capital and social capital. $LowHCI_{t-1}\_LowAGG_{t-1}$ (Group 1,1), $LowHCI_{t-1}\_High\ AGG_{t-1}$ (Group 1,3), $HighHCI_{t-1}\_LowAGG_{t-1}$ (Group 3,1), and $HighHCI_{t-1}\_HighAGG_{t-1}$ (Group 3,3). In the regression analysis, we replace the standard human capital and connectivity measures in Equation (6.1) with

these dummy variables to investigate the number of new appointments a director gains based on their relative human and social capital.

The results presented in Table 6.7 suggest that human and social capital are both equally important attributes for gaining a board seat. The findings suggest that low human capital and low connectivity decreases the number of subsequent new appointments, while high human capital and high connectivity increases the number of subsequent new appointments. We observe that the coefficients on $LowHCI_{t-1}\_High\ AGG_{t-1}$ and $HighHCI_{t-1}\_LowAGG_{t-1}$ are insignificant. Put differently, a highly connected director with low human capital is no more likely to be appointed to a board than a director with high human capital and low connectivity. This finding contrasts with (Cashman et al., 2013) who finds that director connectivity is more important than human capital in a study of 21,211 United States directors. Additionally, female directors and directors who live in New Zealand are more likely to gain additional appointments. Overall, our findings in Table 6.7 provide additional evidence that both human capital and social capital are important attributes in the director labour market. We also find that having one type of capital rather than the other, does not make a director any more likely to be appointed.

Table 6.7: OLS Regressions for Number of Appointments on the Relative Importance of Social Capital and Human Capital

	1 N APPTS OLS	2 N APPTS OLS	3 N APPTS OLS	4 N APPTS OLS
Constant	0.043***	0.044***	0.040***	0.040***
	(3.69)	(3.69)	(3.45)	(3.46)
$LowHCI\_LowAGG_{t-1}$	-0.033***	-0.031***	-0.032***	-0.030***
	(-5.25)	(-4.91)	(-5.33)	(-4.97)
$LowHCI\_HighAGG_{t-1}$	-0.008	-0.008	-0.006	-0.006
	(-0.83)	(-0.83)	(-0.61)	(-0.61)
$HighHCI\_LowAGG_{t-1}$	-0.005	-0.005	-0.003	-0.003
	(-0.56)	(-0.55)	(-0.35)	(-0.34)
$HighHCI\_HighAGG_{t-1}$	0.045***	0.026***	0.046***	0.026***
	(4.89)	(2.70)	(5.11)	(2.84)
FEM_{t-1}	0.029**	0.027**	0.029**	0.027**
	(2.31)	(2.33)	(2.33)	(2.32)
NZ_{t-1}	0.047***	0.041***	0.046***	0.040***
	(8.77)	(8.00)	(8.95)	(8.15)
$DIR+2_{t-1}$		0.102***		0.103***
		(4.39)		(4.53)
N Exec Appts			1.108***	1.110***
			(16.02)	(16.24)
Observations	9,620	9,620	9,620	9,620
R2	0.020	0.026	0.076	0.083
F Stat	6.43	8.36	17.38	18.93
p(F)	0.000	0.000	0.000	0.000
AIC	931.58	869.04	365.32	297.08
Year fixed effects	Y	Y	Y	Y

This table presents results for OLS regressions estimating the relative importance of social connectivity and human capital, where each observation represents a director for a given year between 2000 and 2015. The dependent variable is the number of board appointments at time *t*. The *t*-statistics are reported in parentheses below coefficients and are based upon robust standard errors clustered at the director level. Year dummies are included but not shown. ***, ** indicates statistical significance at the 1% and 5% level, respectively. All variables are defined in Appendix A1.

6.5.4. Robustness test

6.5.4.1. Logit regression analysis

The model

In this section, we test the robustness of our main results for ***Hypothesis 1*** using a different empirical specification. We perform a logit regression to investigate whether directors' connectivity and human capital is associated with the likelihood of a director gaining an additional

board appointment. The dependent variable equals one if a director gains an additional board seat during the year and zero otherwise (Cashman et al., 2013). We estimate the following logit regression equation:

$$\ln\left(\frac{P\left(New_{Appt_{it}}\right)=1}{1-P\left(New_{Appt_{it}}=1\right)}\right) = \alpha \quad + \beta_1 AGG_{it-1} + \beta_2 \Delta AGG_{t-1-(t-2)} + \beta_3 HCI_{it-1} + \beta_4 \Delta HCI_{t-1-(t-2)} +$$
$$\beta_5 FEM_{it-1} + \beta_6 NZ_{it-1} + \beta_7 DIR + 2_{t-1} + \beta_8 Exec\ Appt_{t-1} \sum_{y=1}^{Y} \theta_y Year_{yt-1} + \varepsilon_{it} \qquad (6.2)$$

Where *P* is the probability that director *i* in year *t* is appointed. AGG_{it-1} is the *Aggregate Connectivity* measure for director *i* in year *t-1*, HCI_{it} represents the human capital index for Director *i* in year *t-1* and all other variables are consistent with Equation (6.1). Robust standard errors $\varepsilon_{i,t}$ are clustered at the director level (Petersen, 2009).

To interpret the results, we report odds ratios which represent the change in the odds (or in other terms the likelihood) of being appointed arising from a one-unit change in the director attribute. An odds ratio of one suggests no change, while greater than one suggests an increase in the likelihood of an appointment and an odds ratio less than one suggests a decrease in the likelihood of being appointed.[50]

Results and discussion

In Column 1 of Table 6.8 we report the results for *New Appt* on AGG_{t-1}, ΔAGG_{t-1}, HCI_{t-1}, ΔHCI_{t-1}, FEM_{t-1} and NZ_{t-1}. The odds ratio on the level of AGG_{t-1} is positive and statistically significant, indicating that a one-unit increase in AGG_{t-1} (above the mean value of 0.07) increases the likelihood of receiving a new appointment by 14.6%.[51] We observe no significant relationship between *New Appt* and ΔAGG_{t-1} further supporting the earlier findings that a recent gain or loss in

[50] Additionally, the magnitude of this effect and all others reported are non-linear as the variables are log-transformed for the logit regression analysis. The effects are only valid for one-unit changes from the sample mean.

connectivity has no bearing on gaining an additional board appointment. We also find that both the level of and changes to human capital are positively related to the likelihood of receiving a board seat. Females are 1.8 times more likely to receive a new board position than men and as expected, living in New Zealand increases the likelihood of being appointed 3.5 times. The results support the earlier findings in Table 6.6. Adding in a measure to control for director busyness, Column 2 of Table 6.8, does not change the likelihood ratios for *AGG* and *HCI*. Although, unlike the earlier results, being busy does not increase the likelihood of a director receiving an additional director appointment.[52]

The overall findings in Table 6.8 support ***Hypothesis 1,*** that receiving a board appointment is positively related to director connectivity after controlling for human capital. We find that New Zealand firms are more likely to appoint a local female, and directors with high human capital. This suggests that social capital increases a director's appeal and is an important director attribute.

[52] Due to only 29 out of 507 executive appointments and only 16 after losing some observations from including the changes in AGG_{t-1} and HCI_{t-1}, the logit specification drops the variable *Exec_Appt* from the estimation. Therefore, we ran the results excluding executive appointments from the sample which does not change our main results. Results are therefore un-tabulated.

Table 6.8: Logit Regressions for Number of Appointments on Director Connectivity

	1 NEW APPT LOGIT	2 NEW APPT LOGIT
Constant	0.005***	0.005***
	(-14.95)	(-14.95)
AGG_{t-1}	1.146***	1.115***
	(4.90)	(2.92)
ΔAGG_{t-1}	0.989	0.990
	(-0.22)	(-0.19)
HCI_{t-1}	1.153***	1.151***
	(6.12)	(5.97)
ΔHCI_{t-1}	1.154**	1.159**
	(2.11)	(2.17)
FEM_{t-1}	1.843***	1.843***
	(2.98)	(3.04)
NZ_{t-1}	3.487***	3.434***
	(6.89)	(6.79)
$DIR+2_{t-1}$		1.317
		(1.07)
Observations	7,559	7,559
Pseudo R2	0.075	0.075
Log	-1355.6	-1354.8
Wald Chi2	203.4	223.8
p(F)	0.000	0.000
Year fixed effects	Y	Y

This table presents results for logit regressions employing Equation (6.2) where each observation represents a director for a given year between 2000 and 2015. The dependent variable equals one if a director gained an additional appointment at time *t*, and zero otherwise. Odds ratios are reported representing the likelihood of a change in the dependent variable arising from a one-unit change in the independent variable. Z-statistics, displayed in parenthesis below each odds ratio estimate, are based upon robust standard errors clustered at the director level. Year dummies are included but not shown. ***, ** indicates statistical significance at the 1% and 5% level, respectively. All variables are defined in Appendix A1.

6.5.5. Event Study: Market reaction to appointments of connected directors

The previous section established that those selecting directors for appointment see value in the connections that a director brings to other companies. The next step is to evaluate whether shareholders also see value in the social capital that a director brings to the board. The director selection nomination process is vested upon the current board, or nomination committee (Withers et al., 2012). It is their duty to find the right skills for the board and subsequently, invite the director to join the board. If the director accepts, a market announcement is made. Event studies provide the opportunity to assess the markets evaluation of the director selected. By investigating the

market reaction to an appointed director, uncontaminated by any other news and controlling for other director attributes, we can observe the shareholders' perspective on director connectivity.

6.5.5.1. Event study sample

To conduct the event study, we start with the preliminary sample of 2,341 new appointments then remove observations where there is no measure of connectivity in the prior year, dropping to 507 appointments. We also exclude observations where there is missing firm-level financial or market data resulting in 387 appointments. We then searched for each director appointment individually in the NZX Company Announcement Database to identify the actual date of the earliest company announcement. We also ensure the announcements are not contaminated by other company news. We removed appointments that included multiple appointment announcements on the same day (158), where we could not confirm the announcement date on the NZX Company Announcement Database (16), and where material or price sensitive news was announced during the event window (77). These exclusions restrict our sample to interim appointments which reduces the likelihood of the market anticipating the news.[53] After outlier exclusions, our final sample for the event study is 130 appointment announcements. We obtain accounting and market data from Thomson Reuters Datastream and Thomson Reuters Eikon.

6.5.5.2. Methodology

To conduct the event study, we follow the standard methodology (Brown & Warner, 1985) to estimate abnormal security returns on the days around the announcement of a new director being appointed. For each stock *i* (appointing firm) on day *t* we calculate the daily stock returns and measure abnormal returns using market-adjusted returns as follows:

$$AR_{it} = R_{it} - R_{mt} \tag{6.3}$$

[53] Directors appointed at annual general meetings typically require the company to provide shareholders in advance of the meeting the list of candidates before the actual voting takes place.

where R_{it} and R_{mt} are the daily adjusted log returns of stock *i* and that of the market portfolio, respectively. We measure the market portfolio using the NZX All Index. We use the market adjusted return model to maximise the sample size as it does not require a pre-event estimation period as other factor models do, allowing the inclusion of director appointments in firms that have recently listed. To deal with possible information leakage, announcements after the market close, and slow market reactions, we estimate three windows; -1 to 1, -2 to 2 and -3 to 3 days around the announcement date. The model assumes that $\alpha_i=0$ and $\beta_i=1$ where β is the coefficient for stock *i* on the market portfolio. We average the daily abnormal returns across appointments as follows:

$$AAR_t = \frac{1}{n}\sum_{i=1}^{n} AR_{it} \tag{6.4}$$

To compute cumulative abnormal returns (*CAR*), we accumulate the abnormal returns for each appointment event over the three event windows mentioned above. Defining the event day as *T=0*, we test three different event windows: *t1,t2 = (-1,1), (-2,2), (-3,3)* whereby:

$$CAR_i(t1, t2) = \sum_{t=t1}^{t2} AR_{it} \tag{6.5}$$

CARs are winsorized at the 1st and 99th percentiles. Following this we average the CARs across the appointment events for the respective event window.

6.5.5.3. Control variables

We perform OLS regressions to control for other director and firm-level factors that may influence the market reaction. We regress the appointing firm's cumulative abnormal returns (CARs) around the announcement date of a director appointment on the *Aggregate Connectivity* measure in the previous year. The control variables include those in Equation (6.1) in addition to board size (*log Board Size*) as larger boards have more connections than smaller boards (Larcker et al., 2013), firm size (*Log Assets* or *Log MVE*) as smaller firms might receive larger abnormal reactions to an appointment of a director (Rosenstein & Wyatt, 1990), corporate governance (*Horwath CGI*), as a well-connected director might be valued lower in firms with weaker

governance (Cai et al., 2017), *Leverage*, *Firm Risk*, firm performance (*ROA*), and growth opportunities (*MTB*).[54] Board size equals the natural log of the number of directors on the board; firm size is measured using the log of total assets or log of market capitalisation. To control for the firm's corporate governance, we follow the approach from Ahmed and Ali (2017) to construct the Horwath Corporate Governance Index.[55] The Horwath index was developed in Australia to account for the corporate governance environment and rules in Australia. Given the close similarities with the rules and environment in New Zealand, this is an appropriate corporate governance metric for our sample. *Leverage* is calculated by dividing book value of total assets by book value of total liabilities; *Firm Risk* is the standard deviation of daily stock returns; firm performance is *ROA*, the earnings before interest, taxes, depreciation, interest and amortization divided by average total book assets.[56] We employ the follow model:

$$CAR_i(t1,t2) = \alpha + \beta_1 AGG_{it-1} + \beta_2 HCI_{it-1} + \beta_3 FEM_{it-1} + \beta_4 NZ_{it-1} + \beta_5 DIR + 2_{it-1} + \beta_6 Exec\ Appts_{it} + \sum_{k=1}^{\kappa} \gamma_k X_{kit} + \sum_{y=1}^{Y} \theta_k Year_{yt-1} + \varepsilon_{it} \quad (6.6)$$

where $CAR_i(t1,t2)$ is the appointing firm's cumulative abnormal return over the event window (-1,1), (-2,2), and (-3,3), AGG_{it-1} is the *Aggregate Connectivity* measure for the appointed director *i* in year *t-1*, HCI_{it} represents the human capital index for the appointed director *i* in year *t-1*, and X_{it} is a set of firm-level characteristics to control for observable factors. We compute robust standard errors ε_{it} (Petersen, 2009). All other variables are consistent with Equation (6.1).

6.5.5.4. Results and discussion

Table 6.9 provides descriptive statistics for the variables employed in this study. In Panel A we provide the CARs for event windows (-1,1), (-2,2), (-3,3). As shown, the CARs range from -

[54] We winsorized all financial and market data variables at the 1st and 99th percentiles to mitigate the effects of the observed outliers on our results.

[55] See Appendix 6C for the description of the Horwath Index. For a detailed description of the firm-level control variables, please see Appendix A1.

[56] Pearson pairwise correlation estimates for the even study variables in Equation 6.6 are reported in Appendix 6D.

16.7% to 29.5%. We observe significantly positive CARs for all three windows, increasing from 0.54% for (-1,1) to 1.69% for (-3,3).

Panel B reports the firm-level control variables for the appointing firms. We observe that the average board size is 6.10 and the average firms' leverage ratio is 44% indicating these companies are on average predominantly equity financed. Average ROA is 8.25% with a median of 10.52% and ranges from -61% to 42%. The average (median) appointing firm has a market to book ratio of 0.95 (0.58) indicating that the book value of equity is greater than market value of equity. This is quite a low ratio which suggests that many of these firms are undervalued. The average firm is 32 years old, while the youngest is 1,[57] and the oldest is 187 years old. We observe that more than half of the appointing firms have corporate governance scores above the average of 9.78 and scores range from 0 to 17, which is the lowest and maximum score possible.

Table 6.9: Descriptive Statistics of Event Study Variables

Panel A: Cumulative abnormal returns

Variable	Obs	Mean	Median	SD	Min	P25	P75	Max
CAR(-1,1)	130	0.53%	0.18%	3.96%	-16.90%	-1.07%	1.40%	22.53%
CAR(-2,2)	130	0.91%	0.52%	5.11%	-18.04%	-1.46%	2.81%	18.84%
CAR(-3,3)	130	1.66%	0.45%	6.99%	-19.09%	-1.61%	3.02%	31.38%

Panel B: Control variables

Variable	Obs	Mean	Median	SD	Min	P25	P75	Max
DIR+2$_{t-1}$ (0/1)	130	0.20	0.00	0.40	0.00	0.00	0.00	1.00
Board Size	130	6.50	6.00	2.10	3.00	5.00	7.00	18.00
Log Board Size	130	1.83	1.79	0.30	1.10	1.61	1.95	2.89
Horwath CGI	130	9.78	10.00	4.26	0.00	7.00	13.00	17.00
Assets - NZm	130	$3,230	$218	$15,700	$3	$56	$1,043	$122,000
Log Assets	130	12.37	12.29	2.14	8.16	10.94	13.86	18.62
MVE - NZm	130	$1,100	$129	$3,432	$2	$46	$694	$22,700
Log MVE	130	12.05	11.77	1.95	7.77	10.73	13.45	16.94
Leverage	130	0.44	0.45	0.25	0.00	0.30	0.62	0.98
Firm Risk	130	0.02	0.02	0.02	0.01	0.01	0.02	0.09
ROA	130	8.25%	10.52%	17.74%	-60.91%	3.54%	18.16%	42.00%
MTB	130	0.95	0.58	1.78	0.01	0.27	0.90	16.85
Firm Age	130	31.78	20.00	34.21	1.00	9.00	39.00	187.00
Log Firm Age	130	2.95	3.00	1.06	0.00	2.20	3.66	5.23

This table presents descriptive statistics for the main variables used in the event study. The analysis investigates the relationship between director connectivity and cumulative abnormal returns around the announcement of a director appointment. All variables are defined in Appendix A1. CARs methodology is defined at Section 5.5.5.2. Methodology.

[57] Firm age is the number of years counted from the date of its foundation, or incorporation when the establishment date is not available. Thus, we include the years in operation prior to its IPO.

Table 6.10 presents the average CARs for the three event windows, (-1,1), (-2,2) (-3,3). Panel A shows that the CARs are positive and significant across all windows providing evidence that the average market reaction is positive and significant for director appointments. In Panel B, we separate the director appointees into terciles based on their connectivity measure where Tercile 1 is the least connected directors. We observe that the average CARs for the (-3,3) event window is positive and significant for Terciles 1 and 2. This suggests that the market reacts favourably to a director being appointed who has low connectivity, albeit we observe a delayed reaction. We find no significant market reaction to the appointment of a highly connected director, nor do we see a significant difference in the CARs between the least and most connected directors. This suggests that, at least in a univariate setting, the market does not value connectivity, cannot accurately observe it, or it may be that the market may see well connected directors as being too over loaded.

In Panel C we separate the director appointees into terciles based on their human capital index measure where Tercile 1 is again the low human capital group. As we have already established that human and social capital are positively related, the results are unsurprisingly similar to Panel B with no significant difference between a high human capital director and a low human capital director being appointed. We observe positive and significant CARs for Terciles 1 and 3 for the (-3,3) event window. Tercile 1 has an average CAR of 2.70%, which is 1.5% higher than Tercile 3. This again suggests that the market reacts more favourably to a director with low human capital, however there is no significant difference in the CARs between Tercile 1 and 3.

A possible explanation for the lack of market reaction to the appointment of a more connected director is that it may depend on the relationship between the director's level of social capital and the level of social capital of the board. For instance, a highly connected director may be appointed to a board that is already well connected, which may result in a different market reaction compared to an appointment to a board with low levels of social capital. In Panel D, we test this idea and separate the sample into two subsamples based on whether the appointed director is more connected than the appointing firm's board. To do so, we average the *Aggregate Connectivity* of

the current directors on the board and compare the board's connectivity to the new director's connectivity prior to the appointment. We find a statistically significant market reaction to an appointed director who has a greater level of connectivity than the board, over the event window (-3,3). This provides some evidence that the market may value a connected director when they bring additional connectivity to the board. However, we find positive and significant reactions for both positive and negative differences in connectivity with no significant difference between the two CARs. This undermines the argument that the market values social capital as the market reacts favourable irrespective of whether the director increases or decreases the boards connectivity.

Table 6.10: Average Cumulative Returns for Event Windows (-1,1), (-2,2) (-3,3)

Panel A: Cumulative returns

Returns	Obs	(-1,1)	(-2,2)	(-3,3)
Raw	130	0.70% **	1.00% **	1.80% ***
		(2.26)	(2.32)	(3.17)
Abnormal	130	0.50% *	0.90% **	1.70% ***
		(1.79)	(2.07)	(2.83)

Panel B: Aggregate Connectivity terciles

Tercile	Obs	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
1	44	0.80%	1.20%	1.60% *
		(1.44)	(1.53)	(1.93)
2	43	0.70%	1.40%	2.60% *
		(1.22)	(1.48)	(1.88)
3	43	0.10%	0.20%	0.80%
		(0.27)	(0.33)	(1.07)
High(3) - Low(1)	87	-0.70%	-1.00%	-0.80%
		(0.98)	(1.04)	(0.75)

Panel C: Human Capital Index terciles

Tercile	Obs	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
1	50	0.30%	1.20%	2.70% **
		(0.51)	(1.26)	(2.35)
2	39	0.70%	0.80%	0.90%
		(1.45)	(1.10)	(0.81)
3	41	0.70%	0.80%	1.20% *
		(1.65)	(1.43)	(1.73)
High(3) - Low(1)	91	0.40%	-0.40%	-1.50%
		(0.51)	(-0.37)	(-1.17)

Panel D: Market reaction to a director being appointed who is more connected than the average director on the appointing firm's board.

Difference	Obs	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
1	58	0.60%	0.90%	1.80% *
		(1.27)	(1.33)	(1.70)
0	72	0.50%	1.00%	1.60% **
		(1.26)	(1.58)	(2.43)
Difference	130	0.10%	-0.10%	0.20%
		(0.19)	(-0.11)	(0.21)

This table presents average cumulative abnormal returns for event windows (-1,1), (-2,2), -(3,3) around the announcement of a director appointment. Abnormal returns are measured using standard event study methodology: market adjusted returns. Panel A reports cumulative raw returns and abnormal returns for the sample of 130 director appointment announcements. Panel B reports average CARs for terciles formed on *Aggregate Connectivity (AGG)* where Tercile 1 is the lowest connected group and Tercile 3 is the highest connected group. Panel C reports average CARs for terciles formed on the human capital index *(HCI)* where Tercile 1 is the low *HCI* group and Tercile 3 is the high *HCI* group. Panel D reports average CARs for the market reaction to director appointments based on whether she is more or less connected than the average director on the appointing firm's board. The dummy variable equals one if director *i's* AGG_{t-1} relative to the appointment year is greater than the AGG_{t-1} of firm *j's* board relative to the appointment year. *Group 1* equals directors who are more connected and *Group 0* equals directors who are less connected than the appointing firm's board. Panels B, C, and D report the difference in the average CARs for the high versus low connected, high versus low human capital, and positive versus negative difference between director and board connectivity, respectively.

Differences in means are tested for significance using the two-tailed two sample t test assuming unequal variances. *t*-statistics are displayed in parentheses below the CARs. ***, **, * indicates statistical significance at the 1%, 5% and 10% level, respectively. CARs are defined at Appendix A1. CARs methodology is defined at Section 6.5.5.2. Methodology.

Table 6.11 presents OLS regressions for CARs (-1,1) on connectivity, human capital and control variables.[58] Columns 1 and 2 report estimates excluding year and industry fixed effects, Columns 3 and 4 include year and industry fixed effects, while Column 5 includes a dummy variable that measures if the director's connectivity is greater than the appointing firms' connectivity. For the first four columns we find that *AGG* is negative and insignificant except for Column 1, suggesting that the market does not consider a director's social capital as adding value to the firm. In contrast, the coefficient on *HCI* is positive and significant. After controlling for other factors, including connectivity, the abnormal return is on average, greater for a director with more human capital. The coefficient on *HCI* suggests that shareholders react 0.3% to 0.4% higher for a director with an HCI score that is one unit higher than the average HCI director.

In Column 5, where we include a dummy that equals one if the appointee directors' connectivity is greater than the appointing firms' board connectivity ($AGG_{t-1,D}$-$AGG_{t-1,F}$), the coefficient for *AGG* becomes negative and significant, suggesting the market views it as a negative attribute. The dummy variable's coefficient is insignificant. We find no relationship between female appointments and CARs, or to a director appointed from overseas and appointments of executives of the appointing firm. We find that firm size measured by market value of equity, is negatively related to CARs, suggesting that smaller firms receive a greater market reaction to a director appointment.

[58] While we report results for the (-1,1) event window CARs, we also conduct the same tests for (-2,2) and (-3,3) event windows. The results are un-tabulated as we find no significant relationship for director appointment announcements between *AGG* and the CARs over these event windows.

Table 6.11: OLS Regressions of Cumulative Abnormal Returns on Director Connectivity

	CAR(-1,1) OLS	CAR(-1,1) OLS	CAR(-1,1) OLS	CAR(-1,1) OLS	CAR(-1,1) OLS
Constant	2.726	4.517	6.294	7.980*	7.541
	(0.69)	(1.26)	(1.35)	(1.77)	(1.53)
AGG_{t-1}	-0.276*	-0.239	-0.234	-0.210	-0.392*
	(-1.72)	(-1.45)	(-1.24)	(-1.10)	(-1.71)
HCI_{t-1}	0.266**	0.277**	0.339***	0.363***	0.298**
	(2.22)	(2.26)	(2.70)	(2.86)	(2.17)
FEM_{t-1}	-0.489	-0.363	-0.877	-0.790	-0.902
	(-0.73)	(-0.53)	(-1.25)	(-1.07)	(-1.17)
NZ_{t-1}	-1.922	-1.977	-2.173	-2.077	-2.375*
	(-1.34)	(-1.40)	(-1.59)	(-1.55)	(-1.76)
$DIR+2_{t-1}$	0.533	0.332	-0.571	-0.684	-0.600
	(0.61)	(0.37)	(-0.51)	(-0.60)	(-0.54)
Exec Appt	6.457	6.700	6.053	6.471	5.960
	(1.61)	(1.61)	(1.40)	(1.43)	(1.34)
Log Board Size	-0.109	0.271	-0.147	0.139	0.571
	(-0.09)	(0.22)	(-0.09)	(0.09)	(0.39)
Log Assets	-0.241		-0.274		
	(-0.85)		(-0.95)		
Log MVE		-0.467*		-0.511*	-0.519*
		(-1.68)		(-1.85)	(-1.86)
Horwath CGI	0.070	0.096	0.002	0.026	0.011
	(0.87)	(1.20)	(0.02)	(0.27)	(0.11)
Leverage	-0.215	-0.330	0.535	0.373	0.334
	(-0.12)	(-0.18)	(0.29)	(0.21)	(0.19)
Firm Risk	19.110	9.423	26.925	15.283	9.663
	(0.41)	(0.22)	(0.61)	(0.37)	(0.24)
ROA (Wins)	-1.081	-0.687	0.310	0.446	0.135
	(-0.42)	(-0.29)	(0.11)	(0.17)	(0.05)
MTB	-0.097	0.010	-0.091	0.042	-0.024
	(-0.43)	(0.05)	(-0.37)	(0.18)	(-0.10)
$AGG_{t-1,D}$-$AGG_{t-1,F}$					0.011
					(1.26)
Observations	130	130	130	130	130
R2	0.217	0.237	0.400	0.417	0.426
Adj R2	0.129	0.152	0.168	0.192	0.195
F Stat	1.49	1.82	2.05	1.95	2.09
p(F)	0.132	0.047	0.003	0.006	0.002
Industry fixed effects	N	N	Y	Y	Y
Year fixed effects	N	N	Y	Y	Y

This table reports the results for OLS regressions of the average market reaction to an appointed director on Aggregated Connectivity (*AGG*) measured at *t-1* relative to the appointment, and director, board and firm characteristics. CARs represent the abnormal returns measured using the market-adjusted returns model over the (-1,1) event window. The *t*-statistics are reported in parentheses below coefficients and are based upon robust standard errors. Year and industry dummies are included but not shown. ***, **, * indicates statistical significance at the 1%, 5% and 10% level, respectively. All variables are defined in Appendix A1. CARs methodology is defined at Section 5.5.5.2. Methodology.

The results overall indicate that shareholders either do not value, or cannot measure, the social capital of a new director that has been appointed. This result is found after controlling for both human capital and directors who are identified by the literature as "busy". Therefore, we can reject our second hypothesis; the market reaction to director appointments is related to director

connectivity. This result is not completely surprising because the process of identifying the extent of a director's connections using social network analysis is complex. However, the market could have some idea of how connected a director is by evaluating how many and which boards they sit on and how connected and central those boards are.[59]

6.6. Conclusions

This study provides new empirical evidence on the attributes of directors. More specifically, we find that after controlling for human capital, the number of subsequent additional new appointments a director gains, and the likelihood of being appointed to a board, is positively related to their social connectivity. This finding suggests that firms may appoint directors for their network connections and that social capital is thus perhaps an effective board attribute in terms of providing additional informational resources for the board to use in carrying out their role. However, we also find considerable evidence that boards also look to appoint directors with greater human capital, suggesting that both human and social capital are valuable.

A director's network may also increase their chances of being selected for other boards as candidates for director selection typically come from the incumbent board or CEO (Withers et al., 2012). In this case, we also examine the market reaction to the appointment of a high-connected vs low-connected director, to investigate whether shareholders see value in connectivity. We find insignificant differences in CARs in three windows around the announcement, suggesting that investors do not value the appointment of well-connected directors. Two possible explanations can be made for this finding. First, the market may see connectivity as imposing costs that equal the value that a connected director brings. Second, it could be that the market cannot clearly identify the connectivity of a director, especially based on indirect centrality measures such as Closeness.

[59] As a final test of the importance of the market reaction to the appointment of connected directors, we look at the individual connectivity measures and regress them against the CARs (-1,1). The results are reported in Appendix 6E which shows similar findings as Table 11 for *AGG*. The coefficients on the separate connectivity measures are negative and insignificant except for *EIG* which is positive and significant. Therefore, we conclude that the market does not value a director's social capital.

Therefore, the market is unable to accurately price connectivity at the announcement of an appointment (Edmans, 2011). We however find that the market reacts significantly and positively to an appointment of a director with higher human capital. This suggests that shareholders value a director's human capital and the market generally views effective directors to have a mix of the important skills, knowledge and education for their board functions.

Chapter 7

Social Capital and Firm Performance

7.1. Introduction

7.1.1. Context

Social networks facilitate communication flows between firms (Wasserman & Faust, 1994) which may be beneficial or costly for firms and thus shareholder value. In this chapter, we investigate whether board level social capital acquired via the network formed by directors of publicly listed companies is beneficial for a firm's performance. In the previous chapters we find that social capital and human capital are closely related, and that director level social capital explains directors gaining additional appointments even after controlling for directors' human capital. However, we also find that the market does not react to the appointment of a better-connected director, suggesting that while it may be a valuable attribute for attaining appointments, it may not be viewed as valuable by investors. In this chapter, we investigate whether social capital increases firm performance.

The social capital literature argues that connectivity allows firms to access additional resources and information (Burt, 1992). However, the literature on the impact of connectivity on

firm performance, thus shareholder value, has found mixed results. Specifically, prior studies find both positive relationships between connectivity and firm outcomes (e.g. Horton et al., 2012; Larcker et al., 2013; Omer et al., 2014b; Akbas et al., 2016; Fracassi, 2017), and negative relationships (e.g. Barnea & Guedj, 2007; Andres et al., 2013; Omer et al., 2013; Andersen & Gilbert, 2014). In addition to the mixed findings, another confounding issue that may explain part of the ambiguous findings is the endogenous link between social capital and human capital.[60] To date, few studies have controlled for the impact of human capital and those that have, do so in a limited fashion. In this study, we build on the previous two chapters and investigate the social capital of the board of directors after controlling for human capital and the range of skills on the board that may have influenced the previous findings. In addition, prior network studies largely focus on micro-level relationships (for example, Berger et al., 2013), or simple one-step connections between firms (e.g. Zona, Gomez-Mejia, & Withers, 2018). We employ Social Network Analysis (SNA) and investigate the impact of connectivity in a wider sense on firm performance.

7.1.2. Approach

In this chapter, we aggregate the director level measures of social capital[61] and human capital[62] to the board level for the sample of New Zealand listed firms between 2000 and 2015. We focus on the aggregate social capital factor based on PCA analysis aggregated to the board level. We explore a number of questions in this chapter. First, we investigate whether board connectivity influences firm performance for New Zealand firms after controlling for the board's human capital. Second, we question whether this relationship is non-linear. Previous studies suggest that while some levels of connectivity may be effective, at some point a board may become too connected (Non & Franses, 2007; Jiraporn et al., 2008; Santos et al., 2009). Third, we

[60] See Chapter 5 for the discussion on the relationship between social capital and human capital.
[61] See Chapter 2 for a detailed explanation of the social connectivity measures employed.
[62] See Chapter 4 and 5 for a detailed discussion of the human capital measures and the Index (HCI), respectively.

investigate whether social connectivity may be more valuable for certain types of firms, such as those where the board is not highly educated, skilled, or experienced (low human capital).

7.1.3. Results and discussions

The main results show that board connectivity is positively related to future firm performance measured by return on assets, return on equity and total stock returns. We perform robustness tests to address endogeneity concerns including employing instrumental variables and a dynamic model controlling for past performance. The results support our main findings and collectively suggest that higher board connectivity improves future firm performance. We also find that the relationship between connectivity and performance is non-linear such that high levels of board connectivity reduce firm performance. Specifically, firms with connectivity above the 92nd percentile see a decline in the accounting-based performance measures. As we control for board busyness, the evidence leads to the likely conclusion that the negative implication of connectivity is induced by information overload (O'Reilly, 1980; Jackson & Farzaneh, 2012; Omer et al., 2014b).

We further examine whether the positive relationship depends on the firms need for advice. We find that board connectivity has a greater impact on return on assets for high growth firms, low human capital boards, and when CEOs have low connectivity. These situations suggest that the firm may lack resources that it needs. For instance, growth firms typically benefit from additional advice given that fewer decisions are business as usual, and the decisions involve uncertain outcomes (Larcker et al., 2013). Within these contexts, boards need to be more involved with advising the firm making their connections more useful. A prime example is when boards do not have a lot of human capital, they could rely more on their social capital to support their monitoring and advisory roles. Likewise, a CEO with low social connectivity would be expected to obtain more value from the board, especially a better-connected board.

7.1.4. Contributions

As noted above, the primary contribution of this chapter is to extend prior literature on the relationship between firm performance and board connectivity controlling more extensively for human capital. Few studies have adequately controlled for human capital, raising the prospect that the prior findings are biased. We find evidence consistent with board connectivity improving firm performance even after controlling for board level human capital and skill set. Second, we add to the currently sparse literature on the non-linearity of the relationship between board connectivity and firm performance. We empirically explore this relationship by allowing the effect to be quadratic. Finally, we contribute substantial new knowledge to the New Zealand literature which is very narrow in the empirical examination of the board of directors. We provide novel data on the network characteristics of both directors and firms over a long-time period and show that social capital contributes to firm performance in a social context, such as New Zealand, and where networking is an important contribution to a director's career.

7.1.5. Structure

The rest of the chapter is structured as follows. Section 7.2 provides a background of the related literature while Section 7.3 develops the hypotheses. Section 7.4 provides a description of the data and variables used in this study. Section 7.5 presents the results, beginning with the univariate analysis in Section 7.5.1. to investigate the relationship between the board's human capital and connectivity, and between firm performance and connectivity. Section 7.5.2 presents the main multivariate results, examining the relationship between board connectivity and firm performance, controlling for common firm-level factors and a range of human capital attributes. Section 5.3. provides various robustness tests including tests for endogeneity. Sections 7.5.4. to 7.5.6. present results for the non-linear and sub-sample analyses. Section 7.6 concludes the study.

7.2. Background and Literature Review

7.2.1 1nformation flows

The social capital in connections can provide firms with a range of valuable information and business-related advantages. As discussed in Chapter 2, earlier studies show that connections to other firms provide strategic ideas (Carpenter & Westphal, 2001), key learning experiences, including positive acquisition strategies (Haunschild, 1993), and anti-takeover practices (Davis, 1991). These studies demonstrate that board connections impact the decisions and actions of managers. Networks are also found to allow the spread of poor practices such as backdating stock options (Bizjak et al., 2009) and the replication of mistakes (Mizruchi, 1996).

7.2.2. Board connectivity and firm performance

Prior to the use of SNA within the board context, studies only focused on board interlocks to examine the impact of connectivity on firm performance. These connections are somewhat similar to the *Degree* measure, the direct connections between boards. The literature however, shows mixed impacts from a firm's direct connections. Non and Santos (2007), who examined the Netherlands, and Santos, Da Silveira, and Barros (2009), who examined Brazilian companies, both found greater interlocks resulted in reducing firm performance, predominantly due to boards being too busy to effectively monitor firms. On the other hand, Boyd (1990) and Masulis and Mobbs (2011), who examine the United States, and Lu, Wang, and Dong (2013), who examine Chinese firms, find a positive impact on firm performance measures such as return on assets and return on equity. Of note however, Masulis and Mobbs (2011) and Lu et al. (2013) both suggest that it is not a linear relationship, suggesting that too much connectivity may be a bad thing.

Currently, limited empirical evidence exists on the impact of board connectivity on firm performance based on SNA measures, which measure connectivity more completely. Horton et al., (2012) examines the implications of social networks on firm performance for companies listed on the London Stock Exchange. They find that connectivity is positively associated with a firms'

future performance measured by return on assets and the market to book ratio. The more recent study of Larcker et al. (2013) looks at board connectivity in United States firms and finds that better connected firms earn higher characteristic-adjusted returns and higher growth in return on assets. They argue that the benefits of connectivity outweigh the costs, particularly because of the resource benefits that social networks facilitate. Fogel, Ma and Morck (2015) find that board connectivity is positively related to Tobin's Q and show that better connected boards have better corporate practices.

However, the evidence is not uniformly positive. Lee, Choi and Kim (2012) use a sample of Korean publicly listed firms and measure connectivity using *Betweenness* and *Closeness*. They find that better connected outside directors negatively impact firm performance and value. Omer et al. (2013) looks at US firms using director-level connectivity measures aggregated at the firm level, and find the results vary for the different connectivity measures. In their study, degree shows a positive relationship with firm performance, measured by Tobin's Q and Return on Assets (ROA), while Closeness and Eigenvector have a negative relationship. However, in contrast to Larcker et al., (2013) who find a positive overall relationship for US firms, Omer et al., (2013) find a negative association with firm performance. In their later paper, Omer et al., (2014b) find that the firm's market value is positively impacted by connectivity using an aggregated measure of Degree, Closeness, Betweenness and Eigenvector. Andres et al., (2013) use German data and find a negative association between Degree and Eigenvector and firm performance. They argue that the negative relationship is driven by the fact that well-connected boards adversely impact the monitoring role of the board and cause directors to be over-committed. Finally, Andersen and Gilbert (2014) study Australian firms, employing the four standard measures of connectivity and a connectivity factor of the four individual measures. They report that better connected firms have lower firm performance.

7.3. Hypotheses Development

The existing literature is not clear on whether social capital impact's firm performance positively. However, we discussed in Chapter 5, that the literature to date has not dealt with the issue of human capital well and this may explain the contradictory findings. In this chapter, we examine the impact that board connectivity has on firm performance based on a variety of firm performance measures and controlling for human capital. Additionally, no prior New Zealand study that we are aware of has investigated the impact of connectivity on firm performance, employing SNA. Given the small size of the New Zealand market and a perceived limited supply of quality directors (Financial Markets Authority, 2014), connectivity could play an important role in helping directors meet their increasing range of board responsibilities. The small number of companies also means that the network is relatively more condensed making the flow of information and resources easier. To answer the research question, we state the following hypothesis:

Hypothesis 1: *Board connectivity is associated with firm performance.*

Evidence to date on the impact of connections suggests both positive and negative effects on firm outcomes. Indeed, it would be reasonable to hypothesise that there could be a nonlinear relationship between board connectivity and firm performance. More specifically, board connections may be beneficial up to a certain point where the benefit begins to diminish as the level of connectivity increases. Several studies examining the impact of board connections on firm performance have indicated a non-linear relationship (Fich & Shivdasani, 2006; Non & Franses, 2007; Santos et al., 2009). For instance, Non and Franses (2009) include a quadratic measure of interlocks in their analysis and find evidence supporting a non-linear relationship between the number of interlocks and firm performance. Santos et al., (2009) estimate regressions using quadratic specifications of interlocking variables on firm performance and find a negative and significant quadratic relationship. They find that interlocks increase return on assets but only up

to five interlocks. After this point, the effect becomes negative. It appears that some connectivity is good for firms thus we further explore this relationship in our study.

There are two main reasons why a high level of connectivity might be detrimental to the firm's performance. Directors may become so connected that they are too busy maintaining their network relationships and other board responsibilities to adequately perform their role. Or, it may be a case of information overload resulting in firms unable to make timely beneficial decisions due to having too much information (O'Reilly, 1980; Chewning & Harrell, 1990; Jackson & Farzaneh, 2012). We control for the potential impact of busy boards by including a measure based on the percentage of busy directors (Horton et al., 2012) to test the latter reason as to why too much board connectivity might be detrimental to firms.[63] The potential for non-linear relationships in corporate governance has also been underlined as a substantial factor for researchers to consider (Adams et al., 2010). While it is important to establish whether there is a significant relationship, determining the point of equilibrium for connectivity will help firms to determine whether their board may be too well connected. We explore the presence of nonlinearity in the relationship and attempt to find the point where the marginal impact of board connectivity on firm performance changes. Thus, our hypothesis 2 states:

Hypothesis 2: *The relationship between board connectivity and firm performance is non-linear.*

The literature on the resource role of the board suggests that the value of the board's social capital may also depend on how much the firm has need for outside skills, expertise and knowledge (Pfeffer, 1976; Carpenter & Westphal, 2001; Hillman & Dalziel, 2003; Hillman et al., 2009; Zona

[63] The literature suggests both a 'network' effect and a 'busyness' effect of board connectivity and that these effects are not mutually exclusive. We acknowledge that including a closely related control variable such as board busyness reduces the influence of board connectivity on firm performance. However, this study is not concerned with the number of multiple directorships and the influence on firms (see Jahan (2018) for a study and review of multiple directorships in New Zealand and Cashman et al., (2012) for a study and review of board busyness). We are interested in the impact of social networks on the board's ability to extract information, ideas and experiences from its connections and add value to the firm.

et al., 2018). For example, firms may earn greater benefits from connections when there is a greater need for the board's advice (Pfeffer, 1972; Carpenter & Westphal, 2001; Coles et al., 2008; Redor, 2015), such as with younger firms (Field et al., 2013), and with less experienced or connected CEOs (Linck, 2008). This suggests that the relative importance of board connectivity may depend on the firms need for external resources. For instance, Linck (2008) finds that complex firms require larger and more independent boards to gain more informational resources. To provide further evidence to support Hypothesis 1, we look at three different scenarios where firms would be more reliant on the board's connectivity; low board human capital, high growth firms and low CEO connectivity. These situations represent instances where there is a greater need for the board's advice. Boards with low human capital may lack skills and knowledge for directors to effectively advise management. Firms in a growth stage are typically in need of stronger board input as they navigate through challenging situations and make risky decisions. Likewise, CEOs with low board connectivity personally, would rely more on the board and their connections, to access relevant information and ideas from other firms (Klein, 1998; Coles et al., 2008; Linck et al., 2008). Our third hypothesis is therefore:

Hypothesis 3: *Board connectivity has a greater association with firm performance in firms that have a greater need for informational resources.*

7.4. Data and Variables

7.4.1. The sample

In this chapter, we employ the director-level information from the previous chapters and collect firm-level information for the boards that the directors were on. These boards include New Zealand firms listed on the New Zealand stock exchange (NZSX) between 2000 and 2015. We obtain accounting and market data from Thomson Reuters Datastream and Thomson Reuters Eikon from 2000 to 2015. Market data is collected for the main ordinary equity security listed. We obtain missing financial information from annual reports and financial profiles provided by the

NZX Company Research database. Corporate governance information was hand collected from annual reports and committee member information was cross-checked with the data available at Morningstar Direct. We use the SIRCA corporate governance database for firms also listed on the Australian Stock Exchange (ASX). Director-level attributes are aggregated to the board level for this study, which is explained in the following sections.

We construct the director networks and obtain information on the firms and their directors. We exclude unit trusts and cooperatives from the sample due to the different ownership and governance structures and security trading regimes. We exclude firm-year observations for the regression analyses where the required financial data is missing. We keep observations for firms that do not provide enough corporate governance (CG) information for the CG Index as we view them as portraying low CG by omission. Following this, we winsorize all financial, continuous data at the 1st and 99th percentiles to reduce the effect of extreme outliers. We also employ quantile (at the median) regressions to check the robustness of the main results for the impact of outliers in the data (Koenker & Bassett, 1978; Buchinsky, 1994).

7.4.2. Board connectivity

In this section, we describe the social capital measures used in this study and take a closer look at board connectivity. Table 7.1 reports the fraction of firms by the number of interlocks. An interlock is formed when two firms have one director in common during the same year. On average, 78.37% of firms are directly connected to at least one other firm. This suggests that New Zealand boards are quite frequently interlocked.

Table 7.1: Firms by Number of Interlocks

	Valued Interlocks		Binary Interlocks	
Interlocks	**N Firms**	**% of Firms**	**N Firms**	**% of Firms**
0	535	21.63%	535	21.63%
1	418	16.90%	483	19.53%
2	381	15.41%	431	17.43%
3	298	12.05%	301	12.17%
4	263	10.63%	263	10.63%
5	174	7.04%	178	7.20%
6	124	5.01%	111	4.49%
7	101	4.08%	87	3.52%
8	58	2.35%	38	1.54%
9	39	1.58%	23	0.93%
10	35	1.42%	12	0.49%
11	22	0.89%	6	0.24%
12	18	0.73%	5	0.20%
13	3	0.12%	0	0.00%
14	0	0.00%	0	0.00%
15	1	0.04%	0	0.00%
16	3	0.12%	0	0.00%
Total	2473	100%	2473	100%

This table presents the number and percentage of firms that are interlocked, classified by the number of interlocking boards. The first column 'Valued Interlocks' classifies the number of interlocks by counting every unique linkage to all other firms whereas the third column recognises a connection as binary (0/1) before counting every linkage to all other firm. For example, Firm 1 and 2 have two directors in common. Therefore, the valued number of interlocks is two and the binary number is one.

7.4.2.1. Social capital measures

The boards' social capital is measured by aggregating each of the four individual director centrality scores to the board level, following prior studies (Horton et al., 2012; Omer et al., 2014b). Specifically, we take the average measure of *Degree*, *Closeness*, *Betweenness*, and *Eigenvector* across all the directors serving on a firm's board in each sample year. To investigate the overall effect of board connectivity on firm performance, we take the first principal component of the average measures of *Degree*, *Closeness*, *Betweenness*, and *Eigenvector*, and construct an aggregate social capital measure, board connectivity (*AGG*).

Table 7.2 provides the PCA output for *AGG* which begins with Pearson (Spearman rank) correlation coefficients in Panel A for the four centrality measures. The Pearson coefficients are all positive and range between 0.302 and 0.740. We observe strong correlations above 0.67 for *DEG*, *CLO*, and *BET*. However, the relationships with *EIG* are much weaker. This relationship suggests that boards with directors connected to other well-connected directors are not necessarily

centrally placed in the network. The first component, which has an eigenvalue of 2.6 and captures most of the variation in the measures (67%), extracts the most important information and similarity in the data (Abdi & Williams, 2010). We use this component as our social capital measure, which we label as *AGG*. Components 2 to 4 have eigenvalues under 1, suggesting that the loss of information is low by excluding these vectors. Additionally, the Cronbach's Alpha for the connectivity factor shows a test scale of 0.82, which is within the acceptable range of 0.70 to 0.95 (Bland & Altman, 1997; Tavakol & Dennick, 2011). Panel D reports correlations between *AGG* and the centrality measures. We observe coefficients all above 0.50, suggesting that the first component has a strong relationship with the four variables and thus represents the measures well.

Table 7.2: Principal Component Analysis for Board Connectivity

Panel A: Pearson (Spearman rank) pairwise correlations above (below) diagonal				
	DEG	CLO	BET	EIG
DEG	1.000	0.845	0.797	0.722
CLO	0.740	1.000	0.903	0.868
BET	0.699	0.672	1.000	0.820
EIG	0.462	0.302	0.276	1.000
Panel B: Principal Components Analysis				
	Component 1	Component 2	Component 3	Component 4
DEG	0.565	-0.016	-0.160	-0.809
CLO	0.536	-0.267	-0.624	0.503
BET	0.522	-0.315	0.761	0.221
EIG	0.348	0.911	0.078	0.209
Eigenvalue	2.631	0.808	0.331	0.230
Variance Explained %	65.78	20.20	8.27	5.75
Cumulative %	65.78	85.98	94.25	100.00
Panel C: Cronbach's Alpha Validity Test				
	Item-test correlation	Item-rest correlation	Average inter-item correlation	Alpha
DEG	0.904	0.811	0.417	0.682
CLO	0.846	0.707	0.479	0.734
BET	0.825	0.672	0.501	0.751
EIG	0.636	0.387	0.704	0.877
Test scale = mean (standardized items)			0.5253	0.8157
Observations				2473
Panel D: Correlations for Aggregate Connectivity and Centrality Measures				
	DEG	CLO	BET	EIG
AGG (Pearson pairwise)	0.917	0.869	0.847	0.564
AGG (Spearman Rank pairwise)	0.923	0.954	0.944	0.872

This table presents the sample statistics of the principal component analysis (PCA) for the board-level social capital measures employed in this chapter. Panel A reports correlations for the four centrality measures used to measure social capital: *Degree (DEG), Closeness (CLO), Degree (DEG)* and *Eigenvector (EIG).* Panel B reports the principal component analysis output for the four centrality measures to create the aggregate connectivity factor, *AGG*. Panel C reports the Cronbach's Alpha test statistics for the validity of the first PCA factor, *AGG*. Panel D reports correlation coefficients for *AGG* and the social network centrality measures. All variables are defined in Appendix A1.

7.4.2.2. Board connectivity sample statistics

Table 7.4 presents average annual social network statistics which shows that connectivity generally declines over time, albeit with considerable fluctuations[64]. This suggests that on average, firms are becoming less connected to networks which is similar to the trend observed for Australian listed firms (Andersen & Gilbert, 2014). Given the increasing emphasis on independent directors and board diversity, a decrease in connectivity is to be expected as the director pool expands.

[64] As the New Zealand market is small with few listed firms, firms dropping in and out of the sample have a large impact on the network.

However, we observe that *AGG* in 2015 is at a similar level to *AGG* in 2001. From 2000 to 2001 we observe a large drop in connections mainly due to a lot of firms delisting between 2000 and 2001. Additionally, highly connected directors resigning from boards have a significant impact on the connectedness of the network.[65] We observe a big drop in *AGG* following the global financial crisis in 2008-2009, which is largely due to a loss of well-connected directors (*EIG*). However, *AGG* increases again in 2011. Looking at NZX50 firms compared to non-NZX50 firms, we observe that larger, more publicly exposed firms have higher connectivity. This would be the result of larger boards and a desire for high quality directors resulting in these companies sharing a higher proportion of directors. We notice that non-NZX50 firms have a stronger downward trend in connectivity than NZX50 firms. This suggests that the loss in connectivity is mostly due to the smaller firms losing connectivity, likely due to smaller firms having smaller boards and less connected directors.

We observe that on average, 66% of New Zealand listed firms are connected to the largest network. This figure is larger than that found in Wood's (2010) figure of 42% for a sample of 230 New Zealand firms. This is likely a result of smaller companies being unconnected to the main network. However, New Zealand listed firms are relatively well connected considering that these firms are much smaller, with smaller boards, than United States or Australia (Larcker et al., 2013; Andersen & Gilbert, 2014; Omer et al., 2014b). Additionally, the New Zealand network is more concentrated, as shown by the average geodesic distance being 5.4 directors. In essence, this means that on average it would take 5.4 steps for one director to reach any other director in the main network. This is shorter than that shown in Omer et al., (Omer et al., 2014b) for the United States where the distance was 6.5 directors.

[65] For example, Craig Leonard Heatley resigned from two out of three boards in 2000. Mr Heatley's connectivity measure *AGG* dropped from 6.344 to -0.275 while he remained on Eventures New Zealand Ltd's board until it delisted in 2002 after going into liquidation. Meanwhile, his departure from the boards of Sky Network Television Ltd and Independent Newspapers Ltd took 62% and 40% of their connectivity, respectively.

Table 7.4: Annual Sample Statistics of Social Capital and Social Network Measures

Year	DEG	CLO	BET	EIG	AGG	AGG - NZX50	AGG - Non NZX50	% Largest Component	Avg Geodesic Distance
2000	1.14%	12.15%	0.70%	1.82%	0.501	1.110	0.245	68	4.90
2001	1.02%	9.22%	0.45%	0.96%	-0.122	0.721	-0.447	60	5.18
2002	1.05%	11.30%	0.62%	1.36%	0.223	1.069	-0.098	68	5.12
2003	1.09%	11.38%	0.59%	1.30%	0.260	1.098	-0.243	68	4.98
2004	0.99%	11.91%	0.52%	1.26%	0.114	1.062	-0.318	69	4.79
2005	0.96%	12.79%	0.67%	0.85%	0.209	1.153	-0.259	75	5.27
2006	0.94%	10.77%	0.62%	0.89%	0.007	0.932	-0.410	71	5.58
2007	0.88%	10.33%	0.64%	0.67%	-0.118	0.888	-0.560	70	5.80
2008	0.92%	10.30%	0.65%	1.18%	-0.016	1.088	-0.519	70	5.75
2009	0.92%	10.30%	0.67%	1.01%	-0.014	1.190	-0.571	69	5.72
2010	0.90%	7.93%	0.49%	1.17%	-0.327	0.770	-0.865	59	5.87
2011	0.96%	10.22%	0.68%	1.23%	0.056	1.394	-0.639	65	5.58
2012	0.91%	9.28%	0.51%	1.24%	-0.195	0.870	-0.771	62	5.42
2013	0.94%	8.23%	0.50%	1.37%	-0.228	0.699	-0.677	60	5.81
2014	0.95%	9.33%	0.47%	1.30%	-0.157	0.829	-0.613	64	5.40
2015	0.97%	9.81%	0.47%	1.24%	-0.107	0.805	-0.528	65	5.16
Average	0.97%	10.33%	0.58%	1.17%	0.000	0.980	-0.455	66	5.40

This table presents annual statistics for the sample of firms employed in this study. *% Largest Component* represents the percentage of firms that are connected to the largest network in the sample for a given year. *Avg Geodesic Distance* represents the average number of steps for one director to reach another director by taking the shortest (geodesic) path. All other variable are defined in Appendix A1.

7.4.3. Firm performance measures

To estimate firm performance, we employ three measures: operating return on assets (*ROA*), return on equity (*ROE*), and total stock returns (*TSR*). ROA is a general measure for accounting performance that considers the real earnings generated from a firm's assets. We use earnings before interest, taxes, depreciation and amortization (EBITDA) scaled by average total assets. Using EBITDA rather than net profit reduces the effect of firm taxation, capital structure and accounting decisions (Anderson & Reeb, 2003; Andres & Vallelado, 2008). ROE is another common accounting-based measure employed in corporate finance studies. ROE equals earnings before interest, taxes, depreciation and amortization (EBITDA) scaled by the book value assets minus the book value of liabilities. Following Core et al., (1999) total stock return (*TSR*) is measured using the adjusted closing price of the firm's security at the end of December and incorporates gross dividends with the assumption that dividends are reinvested at the closing price of the security on the ex-dividend date.

7.4.4. Control variables

7.4.4.1. Board-level controls

The findings in Chapter 5 provide evidence of the positive relationship between directors' social capital and human capital. To control for the board's human capital throughout the analysis, we employ two measures. The first measure is the average human capital index measure (*HCI* explained in Chapter 5) across the board of directors. The second measure is constructed using a board skills matrix approach. We identify 20 director skills that prior literature (Adams et al., 2017) and industry practitioners (Ernst & Young, 2015; Equilar, 2016; Effective Governance, n.d.) deem important. We examine each director in turn and match their attributes to these skills using their human capital measures, current/prior positions, and their biographies. For each board we estimate the board skills index (*BSI*) which we measure as how many of the 20 skills are covered by at least one of the directors in a given year.[66]

We also control for other potential explanations for the performance of firms. We control for gender, measured as the percentage of female directors on the board *(Female*) (Adams & Ferreira, 2009). We also control for the firms internal corporate governance structure by measuring a simplified Horwath Index (*Horwath CGI*) based on Ahmed and Ali (2017).[67] The Horwath Index was developed to measure corporate governance within the Australian context, which applies a similar set of principles to NZ. We also separately control for *Board Size* (Jensen, 1993; Yermack, 1996), and board busyness (Cashman et al., 2012) as busy boards may have overcommitted directors (Fich & Shivdasani, 2006; Andres et al., 2013). *BUSY* is measured as the percentage of the board with three or more public directorships.

[66] See Appendix 7A for a description of the Board Skills Index and descriptive statistics for each skill.
[67] See Appendix 6C for the description of the Horwath Index.

7.4.4.2. Firm-level controls

To control for other firm factors, we include a range of variables which have been proven by the prior literature to impact a firm's performance. We control for firm size (*Assets)* using total book assets (Banz, 1981),[68] *Firm Age* based on the number of years the firm has been operating (Frijns, Dodd, & Cimerova, 2016), complexity *(Segments)* using the number of business segments the firm reports on (Hermalin & Weisbach, 1988; Coles et al., 2008), leverage *(LEV)* measured as the ratio of total book liabilities to total book assets (Baker, 1973), and firm risk *(RISK)* defined as the firm's 5-year monthly beta (Coles et al., 2008). We expect firm size, firm age and complexity to be positively related to board connectivity as larger, older, more complex firms typically have larger boards (Coles et al., 2008), which by extension should be more connected.

7.4.5. Descriptive statistics

Table 7.5 provides descriptive statistics for the variables employed in this study. In Panel A we provide the firm-level social capital measure *AGG* which is of the complete network before removing any observations due to missing information and different firm characteristics. Panel B of Table 7.5 reports the descriptive statistics of the board-level measures. The average board size of 6.1 is consistent with other New Zealand studies (Koerniadi & Tourani-Rad, 2012). The average board has an HCI score of 6.4, out of a maximum of 18, and 12 different skills, out of a maximum of 20. On average women make up 8.5% of directors, meaning that on average 1 in 2 companies have a female director. Compared to the Australian study by Ali, Liu, & Su (2016) which reports an average CGQ (Horwath) score of 8.5, our sample has a slightly higher average (median) score of 9.3 (9), but a lower minimum score of 0.

Panel C of Table 7.5 reports descriptive statistics of the firm-level measures. The mean (median) ROA is 5.2% (9.6%) with a range from -96.5% to 48.5%. The mean (median) ROE is 18.5% (19.3%) with a range from -176.8% to 216.3%. The accounting measures indicate that the

[68] Market Value is used to replace total book assets in the robustness tests. The results are consistent with the results using total book assets.

average New Zealand firm generates positive returns from utilising both assets and equity funds, above the risk-free rate. The ranges are wider than other New Zealand studies (Koerniadi & Tourani-Rad, 2012; Koerniadi, Krishnamurti, & Tourani-Rad, 2014), however, our sample covers a wider range of firms and a longer time period. The average total stock return (TSR) is 9.0% with a median of 5.4% and a range from -83.32% to 220.7%. We log-transform *Assets*, *Firm Age*,[69] and *Segments* to smooth out the distributions.

Table 7.5: Sample Descriptive Statistics

Panel A: Board connectivity								
	Obs	Mean	Median	SD	Min	P25	P75	Max
AGG	2473	0.00	-0.17	1.62	-2.56	-1.45	0.94	5.95
Panel B: Board-level measures								
	Obs	Mean	Median	SD	Min	P25	P75	Max
HCI	2167	6.37	6.25	1.79	0.60	5.05	7.67	11.38
BSI	2167	12.20	12.00	2.52	4.00	10.00	14.00	20.00
NZ	2167	77.28%	88.89%	29.60%	0.00%	60.00%	100.00%	100.00%
FEM	2167	8.50%	0.00%	13.12%	0.00%	0.00%	16.67%	66.67%
BUSY	2167	12.7%	0.0%	17.9%	0.0%	0.0%	20.0%	100.0%
Board Size	2167	6.07	6.00	1.97	3.00	5.00	7.00	18.00
Horwarth CGI	2167	9.25	9.00	4.27	0.00	6.00	12.00	17.00
Panel C: Firm-level measures								
	Obs	Mean	Median	SD	Min	P25	P75	Max
Firm Performance								
ROA	2167	5.92%	9.61%	22.02%	-96.51%	1.58%	17.00%	48.46%
ROE	2141	18.51%	19.28%	53.65%	-176.83%	2.19%	37.77%	216.27%
TSR	2110	9.13%	5.40%	48.15%	-83.32%	-19.88%	31.04%	220.70%
Firm Characteristics								
Assets (NZD $000)	2167	6,244,433	137,019	35,900,000	1,007	27,471	631,621	299,000,000
MVE (NZD $000)	2167	1,841,433	96,343	8,291,896	1,027	23,850	466,782	65,100,000
Firm Age	2167	31.25	19.00	36.22	0.00	10.00	32.00	198.00
Segments	2167	2.48	2.00	1.67	1.00	1.00	4.00	9.00
LEV	2167	0.45	0.44	0.27	0.00	0.26	0.62	1.29
RISK	1773	0.78	0.77	0.65	-1.32	0.41	1.14	2.71
Years listed	2167	13.64	9.00	14.46	0.00	4.00	18.00	111.00

This table presents descriptive statistics for the board-level social connectivity measure *AGG*, board-level controls, firm performance measures (dependent variables), and firm-level controls that are employed in the analyses. *Years listed* is the number of years the firm is listed on the New Zealand stock exchange which is shown for reference only and is not included in the empirical models. All variables are defined in Appendix A1.

[69] The oldest firm in the sample is Westpac Banking Corporation which was originally established as the Bank of New South Wales in 1817. It was subsequently renamed Westpac Banking Corporation when it acquired the Commercial Bank of Australia in 1982.

7.5. Results

7.5.1. Univariate Analysis

7.5.1.1. Correlations

To begin investigating the relationship between board connectivity and firm performance, we estimate Pearson pairwise correlations. The results are reported in Table 7.6 which suggest that board connectivity is positively related to firm performance. The correlations show that *AGG* is positively related to *ROA* (corr = 0.25), ROE (corr = 0.16) and TSR (corr = 0.07). We observe positive relationships between the social capital and human capital measures suggesting that human capital is important to control for in regression analysis.

Table 7.6: Pearson Pairwise Correlations

		1	2	3	4	5	6	7	8	9	10
1	ROA	1									
2	ROE	0.57	1								
3	TSR	0.20	0.14	1							
4	DEG	0.26	0.18	0.08	1						
5	CLO	0.24	0.15	0.08	0.73	1					
6	BET	0.17	0.12	0.02	0.70	0.67	1				
7	EIG	0.12	0.06	0.03	0.46	0.30	0.28	1			
8	AGG	0.25	0.16	0.07	0.91	0.87	0.85	0.56	1		
9	HCI	0.19	0.14	0.05	0.47	0.40	0.39	0.14	0.45	1	
10	BSI	0.14	0.11	0.01	0.47	0.38	0.26	0.11	0.40	0.55	1

This table reports Pearson pairwise correlations for the firm performance, social capital and human capital variables employed in the empirical analyses. All variables are defined in Appendix A1.

7.5.5.2. Aggregate connectivity quantiles

Next, we sort firms based on their *AGG* connectivity scores into four quartile groups ranging from low to high connectivity. We then estimate the mean values of the firm performance measures for each quartile and report the results in Table 7.7. The results show that *ROA* and *ROE* monotonically increases, while *TSR* increases until Quartile 3. *TSR* is highest at 14.5% for Quartile 3 then drops to 11.6% for the highest connected quartile. These results provide preliminary evidence that the relationship between social capital and firm performance is a linear function for *ROA* and *ROE* and maybe non-linear for *TSR*. Tests of differences between the High and Low

quartiles are all highly significant, indicating a significant difference between the firm performance of highly versus poorly connected firms.

Table 7.7: Univariate Test of the Firm Performance and Board Connectivity Relationship

Quartile	Obs	ROA_{t+1}		ROE_{t+1}		TSR_{t+1}	
Low	534	-2.92%		6.44%		1.49%	
2	544	7.25%		19.27%		13.15%	
3	542	8.59%		21.27%		14.46%	
High	547	12.17%		29.81%		11.62%	
Total	2,167	6.50%		19.56%		10.39%	
Difference (High - Low)		15.09%	***	23.37%	***	10.13%	***
T Stat (High - Low)		10.38		6.20		3.30	

This table reports quartiles of firms sorted by the board's *AGG* measure, ranging from low to high connectivity. For each quartile, we present the mean values for three firm performance measures. The statistical significance of the difference between the high and low *AGG* quartiles is based on a two-tailed two-sample t test with unequal variances. *** indicates statistical significance at the 1% level. All variables are defined in Appendix A1.

7.5.2. Ordinary least square estimation

7.5.2.1. The model

In this section we begin our multivariate analysis to test our first hypothesis***:*** *that there is a relationship between firm performance and board connectivity*. To empirically test Hypothesis 1, we begin by employing ordinary least squares regression analysis using a panel data methodology estimating the following equation:

$$FP_{it+1} = \alpha + \beta_1 AGG_{it} + \sum_{k=1}^{K} \gamma_k X_{kit} + \sum_{y=1}^{Y} \theta_y Year_{yt} + \sum_{h=1}^{H} \delta_H Industry_{hi} + \varepsilon_{it}, \qquad (7.1)$$

where FP_{it+1} represents one of the proxies for firm performance, measured in the following year *t+1*,[70] AGG_{it} is the aggregate connectivity measure, X_{it} is a set of other board and firm-level characteristics to control for observable factors including human capital, board skills, board diversity (gender), board busyness, board size, corporate governance, firm size, firm age, complexity, leverage, and risk. $Year_t$ and $Industry_i$ are a set of year and industry dummies

[70] As the most recent measure of FP_{it+1} is measured in 2015, we exclude 2015 firm-year connectivity from the regression.

respectively to control for time and industry fixed effects. We use robust standard errors ε_{it} (Wooldridge, 2002; Petersen, 2009). [71]

7.5.2.2. Results and discussion

Table 7.8 provides the results for the regression of future firm performance (*ROA, ROE, TSR*) as the dependant variable[72] on current year aggregate connectivity (*AGG*). Column 1 of Table 7.8 reports the results for *ROA* on *AGG* which suggests there is a significant and positive relationship. Specifically, a 1-point increase in *AGG* will increase ROA next year by 2.8%. This result supports the univariate results in the prior section. Column 2 adds in controls for the human capital and board skills mix of the firm. In Column 2, We find that the coefficient on *AGG* is still positive and significant at the 1% level, albeit slightly smaller in magnitude. This suggests that even after controlling for human capital, greater board connectivity appears to be positive for firm performance for NZX firms. However, the coefficient on *AGG* reduces by 25% to 0.021 in Column 2. This suggests that the effect of connectivity would have been overstated if we gave no consideration to the influence of human capital on ROA. In economic terms, before controlling for human capital, we could expect a one standard deviation increase in board connectivity (σ = *1.62*) to increase average ROA 76.67%.[73] However, after controlling for human capital the expected increase is only 57.50%[74] overstating a change in ROA of 19.17%. The overstatement is equivalent to a difference in earnings before interest, taxes, depreciation and amortization of

[71] Equation (7.1) is also estimated using median regression (least absolute deviation) as the medians of the firm performance measures are quite different to the means (see Table 7.5). Median regression provides robustness to skewed data (Badshah et al., 2016; Liu et al., 2017). Median regression is also less sensitive to outliers by minimising the sum of the absolute residuals when computing the standard errors (Koenker & Bassett, 1978). We employ the median regression model with bootstrapped standard errors (Koenker, 2005) using 500 replications of the conditional variances. The results support the findings of Table 8.

[72] The regression analysis using Equation (7.1) is also conducted with future firm performance FP_{it+2} to see whether the influence of connectivity extends for longer than one year. The results are similar to those presented here, further supporting Hypothesis 1. This finding also indicates that board connectivity may provide resources that benefit firms' capital projects and other long-term activities.

[73] The percentage change calculation is: (Column 1 coefficient estimate on AGG * one standard deviation change in AGG) / sample average ROA = (0.028*1.62)/0.0592

[74] The percentage change calculation is: (Column 2 coefficient estimate on AGG * one standard deviation change in AGG) / sample average ROA = (0.021*1.62)/0.0592

NZ$65,363,640, ceteris paribus.[75] In Column 3, we add in controls for other board and firm characteristics. We find that connectivity is still significantly and positively associated to firm performance, indicating that a one standard deviation increase in *AGG* increases *ROA* by 3.08%, which is a 51.99% change from the average.[76] This result provides evidence to support that connectivity is beneficial for accounting performance. After controlling for other factors however, the human capital of the board is no longer significant. The results in Column 3 suggest that larger, older firms with better corporate governance and firms that are less risky, achieve greater operating returns from assets.

Columns 4 to 6 in Table 7.8 report the results for *ROE* as the dependent variable and repeats the same sequence of regressions as with *ROA*, finding similar results. We find a significant and positive relation between board connectivity and *ROE,* after controlling for all other board, firm and human capital characteristics. A one standard deviation increase in board connectivity increases *ROE* by 27.13% relative to the sample mean of 18.51% for ROE.[77] However, while the relationship with connectivity and human capital is unchanged, the control variables do show considerable differences. *Assets, CGI* and *Firm Age* and are no longer significant, while more female directors increase *ROE* next year and more busy directors reduces *ROE*. Additionally, increased use of leverage increases the *ROE*.

Columns 7 to 9 in Table 7.8 report the results for *TSR* as the dependent variable. The results are broadly in line with those for accounting performance, albeit with less significance. Column 7 shows that *AGG* is positive and significant at the 5% level. After controlling for all other factors, the relationship remains positive, but significance reduces to 10%. Given the finding that ROA and ROE increase with better connected boards, it appears that shareholders see connected

[75] This figure is calculated by the sample average EBITDA of $341,035,100 * 19.17%.

[76] The increase in ROA is calculated by: Column 3 coefficient estimate on AGG * one standard deviation change in AGG = 0.019*1.62 = 0.0308 and the percentage change is: 0.0308/0.0592 = 0.5199.

[77] The percentage change calculation is: (Column 6 coefficient estimate on AGG * one standard deviation change in AGG) / sample average ROE (0.031*1.62/0.1851)

directors as adding value over and above their inherent quality (Ferris, Javakhadze, & Rajkovic, 2017). Leverage is negative and significant, suggesting that firms with more debt have lower shareholder returns. This makes sense as firms with more debt pay greater interest premiums and therefore, reduce shareholder returns. *FEM* remains positive and significant, while *CGI* reduces the shareholder returns next year, potentially indicating better governed firms are less risky. Overall, the results in Table 7.8 support our ***Hypothesis 1*** predicting a relationship between firm performance and connectivity. Irrespective of the measure of firm performance, we find positive and significant relationships.[78]

Table 7.8: OLS Regressions of Subsequent Firm Performance on Board Connectivity

	1	2	3	4	5	6	7	8	9
	ROA_{t+1}	ROA_{t+1}	ROA_{t+1}	ROE_{t+1}	ROE_{t+1}	ROE_{t+1}	TSR_{t+1}	TSR_{t+1}	TSR_{t+1}
AGG	0.028***	0.021***	0.019***	0.042***	0.028***	0.031***	0.016**	0.014*	0.018*
	(9.14)	(6.21)	(4.58)	(5.26)	(3.15)	(2.78)	(2.54)	(1.79)	(1.78)
HCI		0.016***	-0.002		0.031***	0.006		0.012	0.006
		(4.47)	(-0.51)		(3.26)	(0.49)		(1.55)	(0.55)
BSI		-0.002	-0.002		-0.004	0.001		-0.006	-0.009
		(-1.06)	(-0.70)		(-0.64)	(0.15)		(-1.11)	(-1.35)
FEM			0.047			0.281***			0.213*
			(1.05)			(2.73)			(1.96)
BUSY			0.002			-0.135*			-0.108
			(0.06)			(-1.74)			(-1.33)
Log Board Size			0.005			0.081			0.033
			(0.18)			(1.13)			(0.47)
Log Assets			0.011**			0.017			0.005
			(2.43)			(1.28)			(0.49)
Horwath CGI			0.004**			-0.003			-0.007*
			(2.08)			(-0.59)			(-1.68)
Log Firm Age			0.016***			-0.025			0.000
			(2.69)			(-1.45)			(0.03)
Log Segments			-0.010			-0.028			0.020
			(-1.10)			(-1.13)			(0.87)
LEV			-0.009			0.312***			-0.108*
			(-0.38)			(3.69)			(-1.93)
RISK			-0.026***			-0.085***			0.000
			(-2.68)			(-3.04)			(0.01)
Observations	1,884	1,884	1,547	1,864	1,864	1,530	1,879	1,879	1,542
R2	0.126	0.136	0.176	0.074	0.080	0.114	0.139	0.140	0.144
Adj R2	0.115	0.124	0.157	0.061	0.067	0.093	0.128	0.128	0.124
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

[78] In addition to the regression estimates reported for firm performance on *AGG*, we also regress firm performance on the separate social network centrality measures, *DEG*, *CLO*, *BET* and *EIG*. We also replace *AGG* with the maximum *AGG* measure of the board instead of the average *AGG* measure of the board. Firms with larger boards tend to have an inherently positive association between board size and measures of board connectivity (Larcker et al., 2013). Therefore, we also orthogonalize *AGG* to board size to attempt to purge the effect of board size from board connectivity. The results are reported in Appendix 7B. Overall the results support the main findings. Of note is the insignificant relationship between firm performance and *BET* regardless of the measure of firm performance. This suggests that boards with greater information control do not perform any better than boards with less information control.

Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table reports results for OLS regressions of firm performance measured at *t+1* on *Aggregate Connectivity* employing Equation (7.1). T-statistics are displayed in parentheses below each coefficient estimate and are based upon robust standard errors. Significance levels are denoted by *, **, and *** for 10%, 5%, and 1% confidence levels, respectively. All variables are defined in Appendix A1.

7.5.3. Robustness Tests

7.5.3.1. Multicollinearity

We check whether there is any cause for concern regarding multicollinearity by generating variance inflation factors and find none that exceed 3. This value is well below 10, the maximum acceptable value in econometric studies (Midi, Sarkar, & Rana, 2010). We also ran the models reported in Table 7.8 by systematically adding one independent variable at a time to see whether each addition changes the sign or significance level of the present variables. There are no erratic changes in the signs of the independent variables, which combined with the VIF tests, we conclude that multicollinearity is not an issue in our analysis.

7.5.3.2. Endogeneity

One potential concern of the findings is the possibility of simultaneity, whereby firm performance may impact the selection of directors for the board. For instance, poorly performing firms might appoint directors who have better access to pertinent information, experiences and knowledge to help the CEO improve firm performance (Schmidt, 2015). Conversely, firms that are performing well may be attractive to high quality, reputable directors (Fama & Jensen, 1983b), which are typically in high demand, sit on multiple boards and therefore are more highly connected. This is especially the case in New Zealand where there is a small pool of 'qualified' directors (Financial Markets Authority, 2014). As a result, a small group of the same directors are appointed to multiple boards which makes them better connected. This suggests a two-way relationship between board connectivity and firm performance, which raises a causality issue. The second issue is the possibility of an omitted variable that is correlated with board connectivity and firm performance that is driving the results. In this section, we explore endogeneity issues in more

detail by controlling for past performance (Adams & Ferreira, 2009; Horton et al., 2012) and employing instrumental variables (Omer et al., 2014b).[79]

Controlling for past influences

While we partially consider simultaneity in the relationship by analysing subsequent performance in Table 7.8, most firm performance measures are persistent, meaning that past performance predicts current and future performance. To check the robustness of the results, we include a lag of the specific firm performance measure being tested (Adams & Ferreira, 2009; Horton et al., 2012). The use of a lagged dependent variable (LDV) proxies for any unobserved past and persistent factors, including firm performance (Wooldridge, 2009), and is commonly used to deal with endogeneity issues. This enables us to control for the board's selection process and director preferences, and also eases concerns regarding the existence of an omitted variable. Columns 1 to 3 of Table 6.9 report the results of the regressions including the LDV. The findings are consistent with the main results in Table 6.8. The coefficients on *AGG* are positive and remain significant for *ROA* and *ROE*, although *TSR* is no longer significant. The LDV is both significant and positive for *ROA* and *ROE* indicating strong persistence in these performance measures. The inclusion of the LDV increases the *r*-square markedly for the *ROA* and *ROE*, yet only marginally

79 In unreported tests, we also perform firm fixed effects (Frijns et al., 2016) and changes on changes (Wintoki et al., 2012) regressions. The fixed-effects model removes the effect of variables that are constant over time within firms. This makes the model more appropriate for research which concerns analysing the impact of independent variables that change over time. Each firm has its individual, time-constant characteristics, which may or may not have an impact on firm performance. One example is the business practices of a firm. The fixed effects estimator removes the effect of business practices that are time-constant, enabling the researcher to observe the net effect of the independent variables and solve an omitted variable problem. However, to employ the fixed effects model we are to assume that the time-invariant firm characteristics are unique to each firm and constant over time (i.e. α_i). Therefore, business practices of one firm should not be correlated with the business practices of another firm. Employing the fixed effects model, we find no significant relationship between firm performance and connectivity. However, a loss in significance is often found in board characteristic studies (Masulis, Wang, et al., 2012; Frijns et al., 2016) which is a consequence of firm fixed effects having low detectability for slow within-firm board-level changes across time (Zhou, 2001). We also employ OLS changes on changes regressions. To create some variation in the board-level measures, we follow the approach of Wintoki (2012) and drop observations from every second year. Then we regress the change in FP_{t+1-t}, on changes in the independent variables. The results do not provide any significant inferences to suggest that a change in connectivity predicts a change in firm performance. We do reiterate however, that a loss in significance is often found in board characteristic studies when analysing changes in measures and the loss in the number of observations in a small sample such as ours would also have an impact.

for *TSR*. This is expected as TSR_{t-1} is insignificant, and we do not expect stock returns to be serially correlated.

Table 7.9: Subsequent Firm Performance on Board Connectivity – Dynamic Model (LDV)

	1 ROA_{t+1}	2 ROE_{t+1}	3 TSR_{t+1}
AGG	0.012***	0.028**	0.014
	(3.13)	(2.55)	(1.32)
HCI	-0.001	-0.007	0.004
	(-0.32)	(-0.65)	(0.33)
BSI	-0.002	0.004	-0.006
	(-0.93)	(0.54)	(-0.90)
FEM	0.029	0.178*	0.213*
	(0.69)	(1.81)	(1.88)
BUSY	0.001	-0.165**	-0.083
	(0.03)	(-2.09)	(-1.00)
Log Board Size	0.009	0.005	0.028
	(0.41)	(0.07)	(0.40)
Log Assets	0.000	-0.007	-0.007*
	(0.05)	(-1.57)	(-1.70)
Horwath CGI	0.003	0.024**	0.008
	(0.87)	(2.04)	(0.78)
Log Firm Age	0.010*	-0.020	0.002
	(1.81)	(-1.12)	(0.15)
Log Segments	-0.009	-0.014	0.019
	(-1.06)	(-0.61)	(0.79)
LEV	0.038	0.242***	-0.091
	(1.58)	(2.70)	(-1.60)
RISK	-0.011	-0.072**	-0.005
	(-1.32)	(-2.48)	(-0.22)
ROA_{t-1}	0.426***		
	(9.49)		
ROE_{t-1}		0.291***	
		(5.93)	
TSR_{t-1}			0.019
			(0.61)
Log TSR_{t-1}			
Observations	1,434	1,403	1,431
R2	0.345	0.201	0.151
Adj R2	0.328	0.181	0.129
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes

This table reports results for OLS regressions of firm performance measured at *t+1* on *Aggregate Connectivity* (*AGG*) employing Equation (7.1) and including a control for past performance - lagged dependent variable (LDV). T-statistics are displayed in parentheses below each coefficient estimate and are based upon robust standard errors. Significance levels are denoted by *, **, and *** for 10%, 5%, and 1% confidence levels, respectively. All variables are defined in Appendix A1.

Instrumental variable estimation method

We also employ an instrumental variable (IV) estimation to correct potential endogeneity issues. One issue is the omission of an important time-varying variable missing from the model

that is correlated with *AGG.* An omitted variable is an issue as its variation will remain in the residuals of the regression model. If the omitted variable and *AGG* are correlated, it will produce a biased and inconsistent estimator of *AGG*. This may result in drawing incorrect conclusions for the relationship between connectivity and firm performance (Wooldridge, 2009).

The IV approach recognises the possible presence of an omitted variable. The IV solution is to isolate the variation in connectivity which is unrelated to the omitted variable. To do so, we need additional information by way of a new variable that meets certain conditions, to proxy for connectivity. The conditions require relevance, an instrument that is correlated with the potentially endogenous connectivity variable, *AGG,* but is exogenous, so that it isn't directly correlated with the dependent variable, firm performance. The latter condition is to ensure that the new variable isn't a partial predictor of firm performance, an omitted variable itself. It should also be uncorrelated with the omitted variable which cannot be formally tested so must be assumed that it is randomly assigned (Wooldridge, 2009).

Another source of endogeneity is the possibility that current levels of social capital is a function of past performance (Wintoki et al., 2012). For instance, a firm underperforming may select a well-connected director because of the value they might bring to the firm to increase firm performance. Alternatively, a well performing firm may attract a well-connected director because the director is concerned about his reputation as a director. These instances can obscure the relationship between firm performance and connectivity. Even though we examine the relationship between current connectivity and future firm performance, while also controlling for past performance with an LVD, the instrumental variable estimation allows us to infer causality.

To conduct the analysis, we identified two different instruments determined to meet these conditions. We follow Omer et al., (2014b) for the first IV which is the industry average *Aggregate Connectivity (AGG Ind).* The motivation for selecting this instrument is that it is likely to be highly correlated with the connectivity of the firm and uncorrelated with the error term in the first stage

regression, after controlling for other effects. We expect that the average connectedness of the industry is a random variable due to the dynamic and variable nature of the network. We argue that average industry connectivity may determine a firm's connectivity. Firms in the same industry are more likely to have similar levels of connectivity than firms in other industries because they tend to compete against each other, requiring similar resources, including the human and social capital attributes for their board. Conversely, we do not expect the average connectedness of an industry to impact the performance of individual firms. The second instrument we employ is a dummy variable that equals one for firms in the largest connected component[80] (*LC Dummy)*. We expect that firms connected to the largest component will be more connected than unconnected firms because of the compounding effect of large networks on the number of connections. Thus, connectivity in the largest component will positively impact the connectivity of firms that are connected to this component. On the other hand, the largest component is not expected to directly impact an individual firm's performance because it is the board of directors' who ultimately controls the information flow to the firm, not the network.

The results for the instrumental variable regressions, which are estimated by two-stage least squares (2SL), are reported in Panel A of Table 7.10. The first stage regression of *AGG* is in Column 1 showing positive coefficients on the two IVs *AGG Ind* and *LC Dummy*. These relationships are in the expected direction and are significant at the 1% level. The average connectedness of a firm's industry is associated with the connectivity of the individual firm and firms connected to the largest component are better connected. The coefficient on *HCI* is significant and positive, further supporting the findings in Chapter 5, that connectivity and human capital are positively related. However, we find that *BSI* is negative and significant which is the opposite to the positive correlation between *AGG* and *BSI* in Table 7.6. This suggests that after controlling for board size[81] and other firm characteristics, it appears that better connected boards

[80] The largest component is the largest group of directors/firms that are connected to each other both directly and indirectly.
[81] Un-tabulated correlation estimate between *BSI* and *Log Board Size* is 0.511.

are more homogenous in terms of their skill sets. Therefore, better connected boards have less board skills or skills concentrated in a few areas. *Busy***,** *Log Board Size* and *LEV* are positive and significant, while *Log Assets* is negative and significant. This suggests that firms with a greater number of directors with three or more directorships, firms with more debt compared to assets and with larger boards, tend to have better connected boards. The positive relationship between *AGG* and *Assets* reverses when we control for other firm factors.

In Columns 2 to 4 we report the results of the second stage regressions for *ROA*, *ROE* and *TSR*, respectively. We observe positive and significant coefficients on *AGG* in all three regressions. Additionally, we can interpret the IV regressions causally, meaning that our results show that higher connectivity drives improved firm performance. This provides strong evidence for the value of board connectivity. Taken together, these results provide further support for our earlier findings regarding ***Hypothesis 1***, that there is a positive relationship between board connectivity and firm performance.

Additional Tests

Panel B of Table 7.10 reports standard tests to assess the strength of our IV and the presence of endogeneity. First, we compute the F-statistic of the instrument. Staiger and Stock (1997) argue that estimators are not weak if the partial F-statistic is greater than 10. Panel B shows that the F-statistics range from 380.6 to 384.8[82] which greatly exceed this threshold. The partial R^2 statistic estimates the correlation between the endogenous explanatory variable and the additional instruments, after controlling for other factors (Shea, 1997). Shea's (1997) partial R^2 of the instrument is 0.36 which means that *AGG Ind* and *LC Dummy* explain 36% of the variation in *AGG*, which cannot be explained by the exogenous factors. This adds about 47% to the r-square in the first stage regression. Taken together, these tests suggest that our instrument is not weak.

[82] The number of observations vary in each 2 SLS firm performance model due to differences in the data available for each firm performance measure. Thus, each 2 SLS procedure generates different test statistics.

We also perform endogeneity tests for *AGG* employing the Durban (1954) and Wu-Hausman (1978) tests for endogeneity. The null hypothesis is that *AGG* can be treated as exogenous. Panel B of Table 10 provides the test results where both tests show that there is a significant difference between the OLS estimates and the IV estimates for the *ROA*, *ROE* and *TSR* models. This indicates that we can reject the null hypothesis, that the OLS estimates are consistent and endogeneity is not a concern. Therefore, the IV approach provides further support for the findings as the endogeneity tests suggest that there is endogeneity present in the OLS model.

Table 7.10: Endogeneity Test: Instrumental Variable Regressions

	1st Stage LS	2nd Stage LS		
	AGG	ROA_{t+1}	ROE_{t+1}	TSR_{t+1}
AGG		0.044***	0.062***	0.043**
		(5.59)	(2.71)	(2.18)
AGG (industry med)	0.154**			
	(1.98)			
LC Dummy	1.566***			
	(30.51)			
HCI	0.173***	-0.008*	-0.002	0.000
	(10.31)	(-1.94)	(-0.20)	(0.02)
BSI	-0.025**	-0.003	0.001	-0.010
	(-2.18)	(-0.94)	(0.07)	(-1.48)
FEM	0.026	0.057	0.292***	0.223**
	(0.13)	(1.28)	(2.91)	(2.11)
BUSY	3.575***	-0.126***	-0.294**	-0.234**
	(14.76)	(-2.67)	(-2.40)	(-2.05)
Log Board Size	1.539***	-0.042	0.023	-0.013
	(12.56)	(-1.51)	(0.30)	(-0.17)
Horwath CGI	0.009	0.003*	-0.003	-0.008*
	(1.35)	(1.84)	(-0.73)	(-1.85)
Log Assets	-0.053***	0.012***	0.019	0.006
	(-3.64)	(2.84)	(1.46)	(0.65)
Log Firm Age	0	0.018***	-0.023	0.002
	(0.01)	(3.04)	(-1.34)	(0.15)
Log Segments	0.032	-0.011	-0.029	0.018
	(0.98)	(-1.30)	(-1.23)	(0.82)
LEV	0.374***	-0.018	0.300***	-0.116**
	(5.44)	(-0.77)	(3.68)	(-2.13)
RISK	-0.029	-0.024**	-0.083***	0.002
	(-1.14)	(-2.55)	(-3.03)	(0.10)
Observations	1,773	1,547	1,530	1,542
R2	0.759	0.157	0.110	0.142
Adj R2	0.754	0.138	0.089	0.122
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Panel B: Instrumental variable tests				
Weak IV test				
Robust F		384.8	380.6	382.1
p		0.000	0.000	0.000
Shea's partial r-square		0.360	0.357	0.359
Endogeneity Tests				
Durbin (score) chi2(1)		19.52	3.66	2.73
p		0.000	0.056	0.098
Wu-Hausman		19.30	3.58	2.67
p		0.000	0.059	0.102

Panel A of this table reports the results for the instrumental variables regression estimation. Column 1 reports the first stage of the 2SLS regression estimates with Aggregate Connectivity (*AGG*) as the dependant variable. Columns 2,3 and 4 report the second stage regression estimates for *ROA*, *ROE* and *TSR*, respectively, measured at *t-1*. T-statistics are displayed in parentheses below each coefficient estimate and are based upon robust standard errors. Significance levels are denoted by *, **, and *** for 10%, 5%, and 1% confidence levels, respectively. All variables are defined in Appendix A1. Panel B reports the results for weak instrumental variable tests and endogeneity tests.

7.5.4. Non-linear analysis to test the information overload hypothesis

While the results in Table 7.8 suggest a positive relationship between board connectivity and firm performance, the relationship may be more complex than a simple linear relationship.

Specifically, while our results suggest greater connectivity improves firm performance, it could also be that too much connectivity has negative implications as per the findings in Santos et al., (2009). Put more formally, the marginal benefits of connectivity may be taken over by the marginal costs of connectivity. To test ***Hypothesis 2***: *the relationship between board connectivity and firm performance is non-linear*, we estimate OLS regressions of firm performance on board connectivity while including a quadratic specification of aggregate connectivity (*AGG*). The conditional expectation is that $E(y|x_1, x_1^2) = \alpha + \beta_1 x_1 + \beta_2 x_1^2$;

$$FP_{it+1} = \alpha + \beta_1 AGG_{it} + \beta_2 AGG_{it}^2 + \sum_{k=1}^{K} \gamma_k X_{kit} + \sum_{y=1}^{Y} \theta_y Year_{yt} + \sum_{h=1}^{H} \delta_H Industry_{hi} + \varepsilon_{it}, \quad (7.2)$$

where AGG_{it}^2 is a quadratic term of *AGG*. All other variables are defined as per Equation (7.1). To find the point of equilibrium, where the relationship between the level of connectivity (*x*) and firm performance (*y*) changes direction, we calculate x and y using standard parabola equations, where:

$$X = -\frac{b}{2a}, \text{ and } y = ax^2 + bx + c. \quad (7.3)$$

Therefore, the point of equilibrium is:

$$x = AGG = -\frac{\beta_1}{2\beta_2}, \quad (7.4)$$

and,

$$y = FP_{it+1} = \alpha + \beta_1 AGG_{it} + \beta_2 AGG_{it}^2 + \sum_{k=1}^{K} \gamma_k X_{kit} + \sum_{y=1}^{Y} \theta_y Year_{yt} + \sum_{h=1}^{H} \delta_H Industry_{hi} + \varepsilon_{it} \quad (7.5)$$

Other board composition studies have also tested for non-linear relationships in the same manner. For instance, Coles et al., (2008) find a U-shaped relation between Tobin's Q and board size, driven by firm complexity, and McConnell and Servaes (1990) find an inverted U-shaped relation between Tobin's Q and ownership.

Table 7.11 presents the results for the non-linear analysis, regressing subsequent firm performance measured using ROA_{t+1}, ROE_{t+1} and TSR_{t+1}, on connectivity (*AGG)* and a quadratic

specification of connectivity (AGG^2). We first observe that the results support our main findings which is of a positive association between board connectivity and firm performance. Secondly, the results also suggest that at a certain level, connectivity has negative implications for firms when considering *ROA* and *ROE*. Specifically, we observe positive and significant coefficients on *AGG* across Columns 1 to 3, while observing significantly negative coefficients on AGG^2 for *ROA* and *ROE*.[83]

Table 7.11: Subsequent Firm Performance on Board Connectivity – Non-linearities

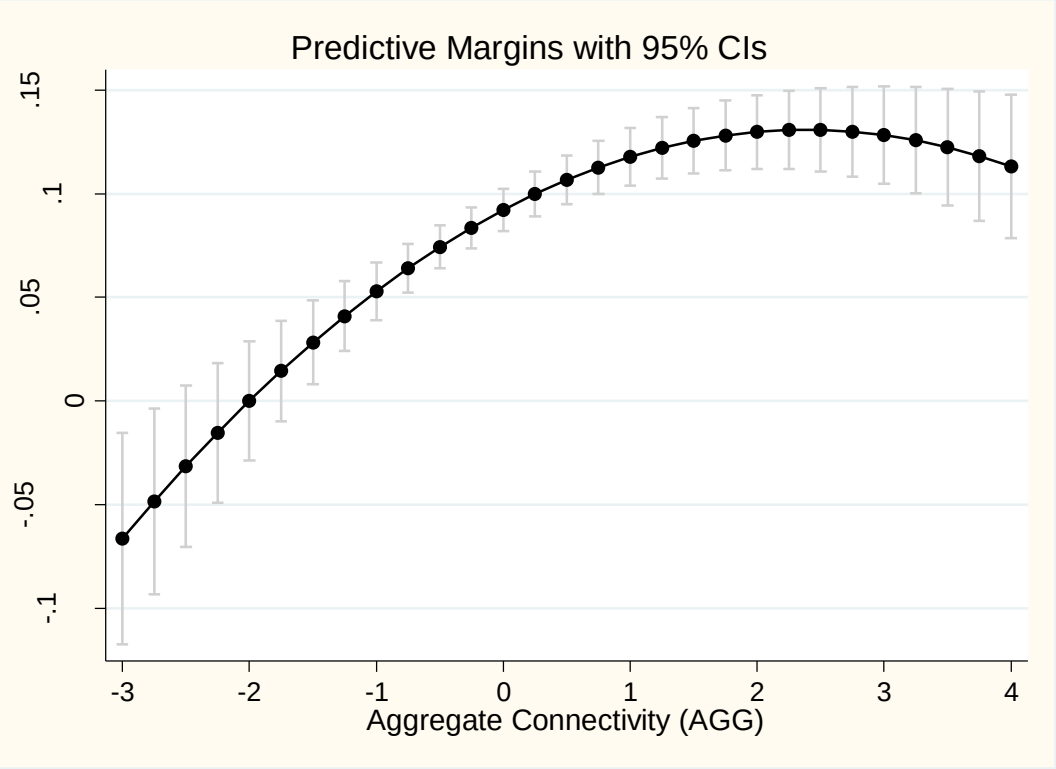
	1 ROA_{t+1}	2 ROE_{t+1}	3 TSR_{t+1}
AGG	0.032***	0.049***	0.028**
	(5.99)	(3.22)	(2.06)
AGG^2	-0.007***	-0.009**	-0.005
	(-4.39)	(-2.18)	(-1.30)
HCI	-0.002	0.006	0.007
	(-0.45)	(0.52)	(0.57)
BSI	-0.004	-0.001	-0.010
	(-1.42)	(-0.15)	(-1.56)
FEM	0.066	0.306***	0.227**
	(1.48)	(2.98)	(2.10)
BUSY	-0.019	-0.164**	-0.124
	(-0.57)	(-2.09)	(-1.50)
Log Board Size	0.005	0.081	0.033
	(0.18)	(1.14)	(0.47)
Horwath CGI	0.003*	-0.004	-0.007*
	(1.75)	(-0.75)	(-1.79)
Log Assets	0.008*	0.014	0.003
	(1.92)	(1.04)	(0.33)
Log Firm Age	0.017***	-0.024	0.001
	(2.92)	(-1.35)	(0.09)
Log Segments	-0.009	-0.027	0.020
	(-1.05)	(-1.08)	(0.89)
LEV	0.005	0.332***	-0.097*
	(0.20)	(3.86)	(-1.73)
RISK	-0.024**	-0.083***	0.002
	(-2.51)	(-2.95)	(0.08)
Observations	1,547	1,530	1,542
R2	0.189	0.117	0.145
Adj R2	0.169	0.095	0.125
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Wald Joint F Test of B1 B2	18.09	5.21	2.13
Prob F	0.000	0.006	0.119

This table reports results for OLS regressions of firm performance measured at *t+1* on *Aggregate Connectivity* employing Equation (7.2). T-statistics are displayed in parentheses below each coefficient estimate and are based upon robust standard errors. Significance levels are denoted by *, **, and *** for 10%, 5%, and 1% confidence levels, respectively. All variables are defined in Appendix A1.

[83] The non-linear analysis employing Equation (7.2) was also repeated including a lag dependent variable (LDV) to control for persistence in firm performance (Adams & Ferreira, 2009; Horton et al., 2012). The results are not tabulated as the relationships between the variables of interest are the same as those reported here, except a loss in significance for AGG^2 in the ROE model.

To investigate this relationship further, we calculate the point of equilibrium for ROA_{t+1} above which additional connectivity reduces firm performance. Based on Equation (7.4) the equilibrium point for *AGG* is 2.286.[84] Figure 7.1 shows the predicted *ROA* as a function of connectivity, based on Equation (7.2). The relationship is an inverted U-shape, suggesting that firms with connectivity above 2.289 experience a decline in firm performance as their connectivity increases. In our sample, *AGG* is above this threshold for 8.4 percent of the firms. Thus, for a vast majority of New Zealand firms, increasing connectivity is a positive. These findings provide support for ***Hypothesis 2.*** Specifically, the conditional mean relationship between accounting returns and connectivity, is non-linear. One likely reason for this non-linearity is that too much information and resources overload the firm, undermining the board's ability to effectively advise management (O'Reilly, 1980; Swain & Haka, 2000).

Figure 7.1: Predicted Return on Assets



This figure presents the predicted *ROA* as a function of aggregate connectivity (*AGG*), based on Equation (2).

[84] Specifically, we apply the parabola equation to *AGG* and AGG^2, such that $x = AGG$ = -(0.032/(2*-0.007)) = 2.286.

7.5.5. Sub-sample analysis for firms with greater needs for the board's advice

In this section, we test ***Hypothesis 3*** by examining whether firm performance increases in board connectivity for high growth firms, low human capital firms, and firms with CEOs that have low connectivity. We examine these possibilities because the positive benefit of board connectivity may be stronger for firms that have a greater need for board resources (Coles et al., 2008). Specifically, in each year we create terciles of firms based on their measure of Tobin's Q (growth opportunities), HCI (human capital index), and the CEO's connectivity. We expect that firms with greater growth opportunities, boards with low human capital, or firms with CEOs with low or no board connectivity, will achieve a greater benefit from connectivity for firm performance. To do so, we run OLS regressions of firm performance on *AGG* employing Equation (7.1) on the separate tercile samples. Then we compare the differences in the coefficients on *AGG* for the three firm performance measures and test for statistical significance of the differences in the coefficients between the top and bottom tercile samples for each measure.

Table 7.12 reports the results for the multivariate sub-sample analysis, estimating Equation (7.1) using *ROA* as the firm performance measure. We observe that the coefficients on *AGG* are positive across all sub-groups. However, the magnitude of the coefficient on *AGG* is higher for high growth firms, low HCI firms and low CEO connected firms and are also statistically significant at the 1% or 5% level. The positive differences between the high and low terciles are significantly different for the high growth and low HCI firms, suggesting that firms with greater growth potential and firms with boards that have weaker human capital experience greater impacts from connectivity because their current circumstances call for a greater need for the informational and relational resources that network connections provide. However, when we use *ROE* and *TSR* as the firm performance measure, the differences between the tercile groups are positive but not

statistically significant. Overall these findings provide some evidence for the firm advisory need literature whereby firms with greater growth potential and firms with low human capital boards have significantly greater return on assets from being well connected.

Table 7.12: OLS Regressions: Sub-sample Analysis

Tercile	High growth	Low Growth	Low HCI	High HCI	Low or No CEO AGG	High CEO AGG
Panel A: ROA_{t+1}						
AGG	0.028**	0.006	0.042***	0.014**	0.020***	0.011
	(2.51)	(1.03)	(3.13)	(2.49)	(3.59)	(1.55)
Observations	474	524	458	570	1078	469
R2	0.410	0.147	0.274	0.256	0.188	0.215
Adj R2	0.363	0.086	0.214	0.207	0.161	0.152
Coefficient Difference	0.022**		0.028**		0.009	
P-value	0.048		0.047		0.272	
Panel B: ROE_{t+1}						
AGG	0.038	0.016	0.048	0.037**	0.028*	0.015
	(1.18)	(0.97)	(1.22)	(1.99)	(1.80)	(0.62)
Observations	464	522	453	564	1066	464
R2	0.254	0.086	0.123	0.217	0.086	0.219
Adj R2	0.193	0.021	0.050	0.165	0.055	0.155
Coefficient Difference	0.022		0.011		0.013	
P-value	0.498		0.763		0.632	
Panel C: TSR_{t+1}						
AGG	0.015	0.003	0.018	0.020	0.019	0.030
	(0.56)	(0.18)	(0.49)	(1.25)	(1.37)	(1.32)
Observations	474	520	453	570	1073	469
R2	0.217	0.152	0.140	0.219	0.136	0.250
Adj R2	0.155	0.090	0.068	0.168	0.107	0.189
Coefficient Difference	0.012		-0.002		-0.011	
P-value	0.687		0.959		0.651	
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

This table reports results for OLS regressions of *ROA*, *ROE* and *TSR* measured at *t+1* on *Aggregate Connectivity* employing Equation (7.1). The regressions are estimated on sub-samples. Specifically, in each year we create terciles of firms based on their measure of Tobin's Q (growth opportunities), HCI (human capital index), and the CEO's connectivity. Differences in the coefficients between the top and bottom tercile samples are tested for statistical significance. T-statistics are displayed in parentheses below each coefficient estimate and are based upon robust standard errors. Significance levels are denoted by *, **, and *** for 10%, 5%, and 1% confidence levels, respectively. All variables are defined in Appendix A1.

7.6. Conclusions

The social capital of connections play an important role in helping boards to obtain additional informational resources for their advisory role (Hillman & Dalziel, 2003). As show in Chapter 6, firms appear to value directors that are well connected, by appointing them to their board, but it is not certain whether investors do due to the absence of an average market reaction to the

appointment of a well-connected director. So, it could be that the value of connectivity is not easily priced or observed by stock market investors. Meanwhile, of the board connectivity studies conducted to date, there is no consistent finding for the impact of board connectivity on firm performance. There is also a need to deal with human capital better when investigating board connectivity. This study questions whether board connectivity is a beneficial board attribute that improves future firm performance, after controlling for the board's human capital. We find strong, supporting evidence for this research question: a positive and significant relationship between board connectivity and firm performance. This holds after applying endogeneity tests using lagged dependent variables and an instrumental variable. This study also finds that the likelihood that connectivity is beneficial only up to a certain point and that the relationship is indeed non-linear. We provide the optimal level of social capital for firm performance. Specifically, for *ROA*, a measure of the connectivity index above 2.286 results in a reduction in firm performance as connectivity increases. As we control for negative impacts a busy board has on monitoring (Horton et al., 2012), the obvious conclusion is that too much connectivity is an overload of information from external network connections (O'Reilly, 1980; Jackson & Farzaneh, 2012; Omer et al., 2014b). We also examine whether the benefits of social capital depend on the firms need for advice and find that board connectivity has a greater impact on return on assets for high growth firms, low human capital boards, and when CEOs have low connectivity. Within these contexts, management has a greater need for the external knowledge and experience that board connections can bring.

This study primarily helps resolve the ambiguity of board connectivity's impact on firm performance by conducting our analysis in a different market, while controlling for the board's human capital. We show that information received faster, easier, and in larger quantities, assists directors with their monitoring and advising functions and so improves firm performance. Importantly, we provide an estimate of the 'optimal level' of board connectivity. Finally, we provide the New Zealand literature novel data on the characteristics of boards over a long-time

period and provide evidence of an important attribute to both directors and firms. Social capital is a useful contribution to firm performance and a director's career, by supplementing a "relatively small pool of qualified and experienced directors" (Financial Markets Authority, 2014 p. 13).

Chapter 8

Conclusions

The board of directors plays a crucial role in the governance framework of a firm (Fama & Jensen, 1983b; Adams et al., 2010). The board also acts as the sounding board for management's strategic ideas and forthcoming operational plans (Hillman & Dalziel, 2003; Hillman et al., 2009). The board therefore is a key source for creating value for shareholders and as a result, has been the subject of many studies across a wide range of disciplines. An attribute of recent interest is social capital, which is the value that can be extracted from social relationships between entities. This attribute is of particular importance as it can provide directors with the ability to meet the wide range of responsibilities and resources that their role demands. Yet the importance of social capital in corporate governance has received little attention by the literature and has not been clearly addressed in the empirical frameworks. This thesis aims to fill this gap in academia and investigate the effectiveness of a director's social capital.

To conduct this study, we employ Social Network Analysis (Wasserman & Faust, 1994) to measure the social capital of directors that is generated by the interlocking board network. Specifically, we measure the connectivity of a director by considering the multi-dimensional context of social networks. In doing so, we provide a more inclusive measure of social capital by considering the direct and indirect channels of information and resource sharing between directors. We also control for the human capital of the board to isolate the effects of social capital, a

limitation in many prior studies. The data for this thesis is based on a hand-collected dataset of comprehensive information about directors. Specifically, we carry out our study within the New Zealand context where we have created a rich dataset of in-depth information about directors and firms. Social capital is also of relevance to the New Zealand context because of its geographical setting and cultural environment, which makes it an important attribute for a director's career in New Zealand.

The main findings of the empirical chapters provide several key contributions to the literature that have important implications. First, we document a positive and significant relationship between human capital and social capital. This suggests that human capital is an important aspect to be considered. This relationship should be addressed when examining the contribution of social capital for board effectiveness which has not been fully considered by previous work.

Second, we provide evidence that social capital is important in the director labour market. Specifically, we document that directors with more social connectivity achieve more board appointments. This finding is robust after controlling for human capital. Two interpretations result from this finding that have important implications. (1) Firms may value social connectivity because of its contribution to board effectiveness; (2) Well-connected directors may have an advantage over less-connected directors in gaining additional board appointments thanks to their network. We continue the analysis to seek evidence for (1) as the results so far suggest that the value contribution of connectivity should exist if firms appoint well-connected directors. However, we further document no significant market reaction to a well-connected director being appointed to the board. This finding leads to the conclusion that greater connectivity allows directors to access new board appointments, despite not adding any value for shareholders. The lack of market reaction calls for further analysis by looking at connectivity's value contribution over a longer time period. Perhaps due to its intangible nature, social connectivity is unobserved by shareholders and therefore not reflected in stock prices.

The third and final analysis collectively suggests that the connectivity of the board improves firm performance, over and above the board's human capital. Therefore, social capital appears to provide directors with the ability to add value for shareholders in the long run. Further tests find that this positive contribution has its limitations whereby high levels of board connectivity reduces firm performance. However, poorly performing firms achieve greater benefits from connectivity compared to well performing firms. Moreover, firms that require greater input from the board achieve greater positive impacts from social connectivity. Our findings contribute to the efficacy of the capital markets in New Zealand by providing information to stakeholders about the social capital of the board of directors.

Limitations are a natural outcome upon the completion of an academic study and typically result from data limitations, sample selection or information overload. Nevertheless, they should be outlined for providing leads to future work, especially if the research field is in its infancy. Our study specifically focuses on boardroom network connections formed by, yet extending beyond, interlocking directorates. To extend our work, we suggest taking a primary research focus and investigating the use of social capital by directors. For instance, a research design that includes director interviews would provide perspectives, opinions and confirmations to gain a better understanding of how directors use their connections.

Future work might consider including private company, governmental and not-for-profit directorships in the network. Unfortunately, aside from requiring a substantial collection of data, the restriction is that private company financial information is not made publicly available. There will also be a theoretical issue as the corporate governance of public companies is remotely different to, for example, private companies. However, we are confident that boardroom connections are the most likely ones to facilitate information flows, or the passing of behaviour, that are relevant for board effectiveness in a corporate setting (Mizruchi, 1996; Larcker et al., 2013).

References

Abdi, H., & Williams, L. J. (2010). Principal component analysis. *Wiley interdisciplinary reviews: computational statistics, 2*(4), 433-459.

Adams, R., Akyol, A., & Verwijmeren, P. (2017). Director skill sets. *Working Paper*.

Adams, R., & Ferreira, D. (2009). Women in the boardroom and their impact on governance and performance. *Journal of Financial Economics, 94*(2), 291-309.

Adams, R. B., Hermalin, B. E., & Weisbach, M. S. (2010). The role of boards of directors in corporate governance: A conceptual framework and survey. *Journal of Economic Literature, 48*(1), 58-107. https://doi.org/10.2307/40651578

Adams, S. M., & Flynn, P. M. (2005). Local Knowledge Advances Women's Access to Corporate Boards. *Corporate Governance: An International Review, 13*(6), 836-846. https://doi.org/10.1111/j.1467-8683.2005.00474.x

Ahmed, A., & Ali, S. (2017). Boardroom gender diversity and stock liquidity: Evidence from Australia. *Journal of Contemporary Accounting & Economics, 13*(2), 148-165. https://doi.org/https://doi.org/10.1016/j.jcae.2017.06.001

Ahn, S., Jiraporn, P., & Kim, Y. S. (2010). Multiple directorships and acquirer returns. *Journal of Banking & Finance, 34*(9), 2011-2026. https://doi.org/http://dx.doi.org/10.1016/j.jbankfin.2010.01.009

Akbas, F., Meschke, F., & Wintoki, M. B. (2016). Director networks and informed traders. *Journal of Accounting and Economics, 62*(1), 1-23. https://doi.org/http://dx.doi.org/10.1016/j.jacceco.2016.03.003

Alexander, M., Murray, G., & Houghton, J. (1994). Business power in Australia: The concentration of company directorship holding among the top 250 corporates. *Australian Journal of Political Science, 29*(1), 40-61. https://doi.org/10.1080/00323269408402279

Ali, S., Liu, B., & Su, J. J. (2016). What determines stock liquidity in Australia? *Applied Economics, 48*(35), 3329-3344. https://doi.org/10.1080/00036846.2015.1137552

Allio, R. J. (2004). What's the board's role in strategy development?: Why you need to redesign your board of directors – an interview with Jay Lorsch. *Strategy and Leadership, 32*(5), 34/37. Retrieved from https://doi.org/10.1108/10878570410557642

Andersen, A., & Gilbert, A. (2014). *Help or hinderance? Board network connectivity and firm performance*. Unpublished Manuscript. (Available from the Auckland University of Technology, Auckland, New Zealand)

Anderson, R. C., & Reeb, D. M. (2003). Founding-family ownership and firm performance: evidence from the S&P 500. *The Journal of Finance, 58*(3), 1301-1327.

Anderson, R. C., Reeb, D. M., Upadhyay, A., & Zhao, W. (2011). The economics of director heterogeneity. *Financial Management, 40*(1), 5-38.

Andres, C., Bongard, I., & Lehmann, M. (2013). Is busy really busy? Board governance revisited. *Journal of Business Finance & Accounting, 40*(9-10), 1221-1246.

Andres, P. d., & Vallelado, E. (2008). Corporate governance in banking: The role of the board of directors. *Journal of Banking & Finance, 32*(12), 2570-2580.

Anthony, J. (2018, October 11). Dame Jenny Shipley gives evidence in Mainzeal High Court trial. *Stuff Limited*. Retrieved from https://www.stuff.co.nz/business/industries/107619078/dame-jenny-shipley-prepares-to-give-evidence-in-mainzeal-high-court-trial

Armstrong, C. S., Blouin, J. L., Jagolinzer, A. D., & Larcker, D. F. (2015). Corporate governance, incentives, and tax avoidance. *Journal of Accounting and Economics, 60*(1), 1-17. https://doi.org/https://doi.org/10.1016/j.jacceco.2015.02.003

Armstrong, C. S., & Larcker, D. F. (2009). Discussion of "The impact of the options backdating scandal on shareholders" and "Taxes and the backdating of stock option exercise dates". *Journal of Accounting and Economics, 47*(1), 50-58. https://doi.org/https://doi.org/10.1016/j.jacceco.2008.11.005

Badshah, I., Frijns, B., Knif, J., & Tourani-Rad, A. (2016). Asymmetries of the intraday return-volatility relation. *International Review of Financial Analysis, 48*(Supplement C), 182-192. https://doi.org/https://doi.org/10.1016/j.irfa.2016.09.016

Baker, S. H. (1973). Risk, leverage and profitability: an industry analysis. *The Review of Economics and Statistics, 55*(4), 503-507.

Banz, R. W. (1981). The relationship between return and market value of common stocks. *Journal of Financial Economics, 9*(1), 3-18.

Barnea, A., & Guedj, I. (2007). Sympathetic boards: Director networks and firm governance. *Unpublished Manuscript, University of Texas–Austin*.

Becher, D. A., Walkling, R. A., & Wilson, J. I. (2018). *Board changes and the director labour market: The case of mergers*. ECGI Working Paper Series in Finance.

Becker, G. S. (1964). *Human Capital*. Chicago, NL: University of Chicago Press.

Becker, G. S. (1993). *Human capital*: Chicago: University of Chicago Press.

Becker, G. S. (1994). Human capital revisited. In *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education (3rd Edition)* (pp. 15-28): The University of Chicago Press. Retrieved from http://www.nber.org/chapters/c11229.pdf

Berger, A. N., Kick, T., Koetter, M., & Schaeck, K. (2013). Does it pay to have friends? Social ties and executive appointments in banking. *Journal of Banking & Finance, 37*(6), 2087-2105. https://doi.org/https://doi.org/10.1016/j.jbankfin.2013.01.040

Berle, A. A., & Means, G. C. (1932). *The modern corporation and private property*. New York: The MacMillan Company.

Bhagat, S., & Black, B. (1999). The Uncertain Relationship Between Board Composition and Firm Performance. *The Business Lawyer, 54*(3), 921-963. https://doi.org/10.2307/40687871

Bilimoria, D., & Piderit, S. K. (1994). Qualifications of corporate board committee members. *Group & Organization Management, 19*(3), 334-362. https://doi.org/10.1177/1059601194193007

Bizjak, J., Lemmon, M., & Whitby, R. (2009). Option backdating and board interlocks. *Review of Financial Studies, 22*(11), 4821-4847.

Bland, J. M., & Altman, D. G. (1997). Statistics notes: Cronbach's alpha. *Bmj, 314*(7080), 572.

Bonacich, P. (1972). Factoring and weighting approaches to status scores and clique identification. *Journal of Mathematical Sociology, 2*(1), 113-120. https://doi.org/10.1080/0022250X.1972.9989806

Bonacich, P. (1987). Power and Centrality: A Family of Measures. *American journal of sociology, 92*(5), 1170-1182. https://doi.org/10.2307/2780000

Booth, J. R., & Deli, D. N. (1999). On executives of financial institutions as outside directors. *Journal of Corporate Finance, 5*(3), 227-250. https://doi.org/https://doi.org/10.1016/S0929-1199(99)00004-8

Borgatti, S. P. (2005). Centrality and network flow. *Social networks, 27*(1), 55-71.

Borgatti, S. P., Everett, M. G., & Freeman, L. C. (2002). Ucinet for Windows: Software for Social Network Analysis. Harvard, MA: Analytic Technologies.

Borgatti, S. P., & Foster, P. C. (2003). The Network Paradigm in Organizational Research: A Review and Typology. *Journal of Management, 29*(6), 991-1013. https://doi.org/10.1016/s0149-2063_03_00087-4

Bourdieu, P. (1986). The forms of capital. In J. G. Richardson, *Handbook of theory and research for the sociology of education* (pp. 241-258). New York: Greenwood Press.

Bowley, G. (2010, August 1). The Academic-Industrial complex. *The New York Times*. Retrieved from https://www.nytimes.com/2010/08/01/business/01prez.html

Boxman, E. A., De Graaf, P. M., & Flap, H. D. (1991). The impact of social and human capital on the income attainment of Dutch managers. *Social networks, 13*(1), 51-73. https://doi.org/https://doi.org/10.1016/0378-8733(91)90013-J

Boyd, B. (1990). Corporate linkages and organizational environment: A test of the resource dependence model. *Strategic Management Journal, 11*(6), 419-430. https://doi.org/10.1002/smj.4250110602

Boyle, G., & Ji, X. (2013). New Zealand corporate boards in transition: Composition, activity and incentives between 1995 and 2010. *Pacific Accounting Review, 25*(3), 235-258. https://doi.org/10.1108/PAR-06-2012-0027

Brickley, J. A., Linck, J. S., & Coles, J. L. (1999). What happens to CEOs after they retire? New evidence on career concerns, horizon problems, and CEO incentives. *Journal of Financial Economics, 52*(3), 341-377.

Brown, S. J., & Warner, J. B. (1985). Using daily stock returns: The case of event studies. *Journal of Financial Economics, 14*(1), 3-31. https://doi.org/https://doi.org/10.1016/0304-405X(85)90042-X

Buchinsky, M. (1994). Changes in the U.S. wage structure 1963-1987: Application of quantile regression. *Econometrica, 62*(2), 405-458. https://doi.org/10.2307/2951618

Burke, R. J. (2000). Company size, board size and numbers of women corporate directors. In R. Burke & M. Mattis (Eds.), *Women on corporate boards of directors* (pp. 118-125). Dordrecht, The Netherlands: Kluwer.

Burt, R. (1980). Cooptive Corporate Actor Networks: A Reconsideration of Interlocking Directorates Involving American Manufacturing. *Administrative science quarterly, 25*(4), 557-582. https://doi.org/10.2307/2392281

Burt, R. (1992). Structural holes. Cambridge: Harvard University Press.

Byrd, J. W., & Hickman, K. A. (1992). Do outside directors monitor managers?: Evidence from tender offer bids. *Journal of Financial Economics, 32*(2), 195-221. https://doi.org/http://dx.doi.org/10.1016/0304-405X(92)90018-S

Cai, J., Nguyen, T., & Walkling, R. A. (2017). Director appointments – it is who you know. *Working Paper, Drexel University*. https://doi.org/http://dx.doi.org/10.2139/ssrn.2934434

Cai, Y., Dhaliwal, D. S., Kim, Y., & Pan, C. (2014). Board interlocks and the diffusion of disclosure policy. *Review of Accounting Studies, 19*(3), 1086-1119. https://doi.org/https://doi.org/10.1007/s11142-014-9280-0

Cai, Y., & Sevilir, M. (2012). Board connections and M&A transactions. *Journal of Financial Economics, 103*(2), 327-349. https://doi.org/http://dx.doi.org/10.1016/j.jfineco.2011.05.017

Carpenter, M. A., & Westphal, J. D. (2001). The strategic context of external network ties: Examining the impact of director appointments on board involvement in strategic decision making. *Academy of Management Journal, 44*(4), 639-660. https://doi.org/10.2307/3069408

Carter, D. A., Simkins, B. J., & Simpson, W. G. (2003). Corporate Governance, Board Diversity, and Firm Value. *Financial Review, 38*(1), 33-53. https://doi.org/10.1111/1540-6288.00034

Cashman, G. D., Gillan, S., & Whitby, R. J. (2010). *Expertise, connections, and the labor market for corporate directors*: Working paper.

Cashman, G. D., Gillan, S., & Whitby, R. J. (2013). Human and social capital in the labor market for directors. *Advances in Financial Economics, 16, 2013*. https://doi.org/10.1108/S1569-3732(2013)0000016005

Cashman, G. D., Gillan, S. L., & Jun, C. (2012). Going overboard? On busy directors and firm value. *Journal of Banking & Finance, 36*(12), 3248-3259. https://doi.org/http://dx.doi.org/10.1016/j.jbankfin.2012.07.003

Chapman Tripp. (2017). *Corporate governance in New Zealand: trends and insights*. Retrieved from https://www.chapmantripp.com/publications

Chewning, E. G. J. r., & Harrell, A. M. (1990). The effect of information load on decision makers' cue utilization levels and decision quality in a financial distress decision task. *Accounting, Organizations and Society, 15*(6), 527-542.
Chi, J., McWha, M., & Young, M. (2010). The performance and the survivorship of New Zealand IPOs. *International Review of Financial Analysis, 19*(3), 172-180.
Chiu, P.-C., Teoh, S. H., & Tian, F. (2012). Board interlocks and earnings management contagion. *The Accounting Review, 88*(3), 915-944.
Chiu, P.-C., Teoh, S. H., & Tian, F. (2013). Board interlocks and earnings management contagion. *The Accounting Review, 88*(3), 915-944. https://doi.org/10.2307/23526309
Cohen, L., Frazzini, A., & Malloy, C. (2008). The small world of investing: Board connections and mutual fund returns. *Journal of Political Economy, 116*(5), 951-979. https://doi.org/https://doi.org/10.1086/592415
Cohen, L., Frazzini, A., & Malloy, C. (2010). Sell-Side School Ties. *The Journal of Finance, 65*(4), 1409-1437. https://doi.org/10.2307/40864915
Coleman, J. S. (1988). Social capital in the creation of human capital. *American journal of sociology, 94*, S95-S120.
Coleman, J. S. (1990). *Foundations of social theory*. Cambridge: Belknap Press of Harvard University Press.
Coles, J. L., Daniel, N. D., & Naveen, L. (2008). Boards: Does one size fit all? *Journal of Financial Economics, 87*(2), 329-356. https://doi.org/http://dx.doi.org/10.1016/j.jfineco.2006.08.008
Coles, J. L., Daniel, N. D., & Naveen, L. (2014). Co-opted boards. *The Review of Financial Studies, 27*(6), 1751-1796. https://doi.org/https://doi.org/10.1093/rfs/hhu011
Coles, J. L., & Hoi, C. K. (2003). New evidence on the market for directors: Board membership and Pennsylvania Senate Bill 1310. *The Journal of Finance, 58*(1), 197-230. https://doi.org/https://doi.org/10.1111/1540-6261.00522
Core, J. E., Holthausen, R. W., & Larcker, D. F. (1999). Corporate governance, chief executive officer compensation, and firm performance. *Journal of Financial Economics, 51*(3), 371-406.
Corrales, M., & Lee Hsien, Y. (2015, April 24). How corporate boards can make a difference/Interviewer: Michael Useem. *Knowledge@Wharton*. Retrieved from https://knowledge.wharton.upenn.edu/article/how-corporate-boards-can-make-a-difference/
Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*(297). https://doi.org/https://doi.org/10.1007/BF02310555
Dalziel, T., Gentry, R. J., & Bowerman, M. (2011). An integrated agency–resource dependence view of the influence of directors' human and relational capital on firms' R&D spending. *Journal of Management Studies, 48*(6), 1217-1242. https://doi.org/ 10.1111/j.1467-6486.2010.01003.x
Darmadi, S. (2013). Board members' education and firm performance: evidence from a developing economy. *International Journal of Commerce & Management, 23*(2), 113-135. https://doi.org/http://dx.doi.org/10.1108/10569211311324911
Dass, N., Kini, O., Nanda, V., Onal, B., & Wang, J. (2014). Board expertise: Do directors from related industries help bridge the information gap? *Review of Financial Studies, 27*(5), 1533-1592.
Davis, G. F. (1991). Agents without Principles? The Spread of the Poison Pill through the Intercorporate Network. *Administrative science quarterly, 36*(4), 583-613. https://doi.org/10.2307/2393275
Davis, G. F. (1996). The significance of board interlocks for corporate governance. *Corporate Governance: An International Review, 4*(3), 154-159.

DeFond, M. L., Hann, R. N., & Hu, X. (2005). Does the market value financial expertise on audit committees of boards of directors? *Journal of Accounting Research, 43*(2), 153-193. https://doi.org/10.1111/j.1475-679x.2005.00166.x

Donatiello, N. E., Larcker, D. F., & Tayan, B. (2017). CEO talent: A dime a dozen, or worth its weight in gold? *European Financial Management*, n/a-n/a. https://doi.org/10.1111/eufm.12158

Drago, C., Ricciuti, R., & Santella, P. (2015). An attempt to disperse the italian interlocking directorship network: Analyzing the effects of the 2011 reform. *Department of Economics, University of Verona (Working Paper)*. https://doi.org/http://dx.doi.org/10.2139/ssrn.2580700

Durbin, J. (1954). Errors in variables. *Review of the International Statistic Institute*(22), 23-32.

Edmans, A. (2011). Does the stock market fully value intangibles? Employee satisfaction and equity prices. *Journal of Financial Economics, 101*(3), 621-640. https://doi.org/http://dx.doi.org/10.1016/j.jfineco.2011.03.021

Effective Governance. (n.d.). *Sample of director skills/competency assessment report*. Retrieved December 20, 2017, from https://www.effectivegovernance.com.au/services/director-skills-competency-assessment/

El-Khatib, R., Fogel, K., & Jandik, T. (2015). CEO network centrality and merger performance. *Journal of Financial Economics, 116*(2), 349-382. https://doi.org/http://dx.doi.org/10.1016/j.jfineco.2015.01.001

Engelberg, J., Gao, P., & Parsons, C. A. (2012). Friends with money. *Journal of Financial Economics, 103*(1), 169-188. https://doi.org/https://doi.org/10.1016/j.jfineco.2011.08.003

Equilar. (2016). *The top 20 board skills in the S&P 500*. Retrieved December 20, 2017, from http://www.equilar.com/blogs/bi/12-07-2016-the-top-20-board-skills-in-the-s&p-500.html

Ernst & Young. (2015). *Board operations: Is your skills matrix driving performance and effectiveness?* Retrieved from http://www.ey.com/Publication/vwLUAssets/EY-board-operations/$FILE/EY-board-operations.pdf

Ertimur, Y., Ferri, F., & Stubben, S. R. (2010). Board of directors' responsiveness to shareholders: Evidence from shareholder proposals. *Journal of Corporate Finance, 16*(1), 53-72. https://doi.org/https://doi.org/10.1016/j.jcorpfin.2009.07.005

Faccio, M., Masulis, R. W., & McConnell, J. (2006). Political connections and corporate bailouts. *The Journal of Finance, 61*(6), 2597-2635.

Fahlenbrach, R., Low, A., & Stulz, R. M. (2010). Why do firms appoint CEOs as outside directors? *Journal of Financial Economics, 97*(1), 12-32. https://doi.org/http://dx.doi.org/10.1016/j.jfineco.2010.01.003

Fama, E. F. (1980). Agency Problems and the Theory of the Firm. *The Journal of Political Economy, 88*(2), 288-307.

Fama, E. F., & Jensen, M. C. (1983a). Agency problems and residual claims. *Journal of law and economics*, 327-349.

Fama, E. F., & Jensen, M. C. (1983b). Separation of ownership and control. *Journal of law and economics, 26*(2), 301-325.

Ferris, S. P., Jagannathan, M., & Pritchard, A. C. (2003). Too busy to mind the business? Monitoring by directors with multiple board appointments. *The Journal of Finance, 58*(3), 1087-1111. https://doi.org/10.2307/3094573

Ferris, S. P., Javakhadze, D., & Rajkovic, T. (2017). The international effect of managerial social capital on the cost of equity. *Journal of Banking & Finance, 74*, 69-84. https://doi.org/https://doi.org/10.1016/j.jbankfin.2016.10.001

Fich, E. M. (2005). Are Some Outside Directors Better than Others? Evidence from Director Appointments by Fortune 1000 Firms. *The Journal of Business, 78*(5), 1943-1972. https://doi.org/10.1086/431448

Fich, E. M., & Shivdasani, A. (2006). Are busy boards effective monitors? *The Journal of Finance, 61*(2), 689-724. https://doi.org/10.1111/j.1540-6261.2006.00852.x
Fich, E. M., & Shivdasani, A. (2007). Financial fraud, director reputation, and shareholder wealth. *Journal of Financial Economics, 86*(2), 306-336. https://doi.org/http://dx.doi.org/10.1016/j.jfineco.2006.05.012
Fich, E. M., & White, L. J. (2003). CEO compensation and turnover: the effects of mutually interlocked boards. *Wake Forest Law Review, 38*(3), 935-960.
Field, L., Lowry, M., & Mkrtchyan, A. (2013). Are busy boards detrimental? *Journal of Financial Economics, 109*(1), 63-82. https://doi.org/http://dx.doi.org/10.1016/j.jfineco.2013.02.004
Financial Markets Authority. (2014). *Corporate governance in New Zealand: Principles and guidelines*: Financial Markets Authority,. Retrieved from http://fma.govt.nz/assets/Reports/141201-FMA-Corporate-Governance-Handbook-Principles-and-Guidelines2014.pdf
Firth, M. (1987). Multiple directorships and corporate interlocks in New Zealand firms. *Journal of Sociology, 23*(2), 274-281.
Fischer, H. M., & Pollock, T. G. (2004). Effects of social capital and power on surviving transformational change: The case of initial public offerings. *Academy of Management Journal, 47*(4), 463-481.
Fogel, K., Ma, L., & Morck, R. (2015). *Powerful independent directors*: European Corporate Governance Institute (ECGI) - Finance Working Paper No. 404/2014. Retrieved from http://ssrn.com/abstract=2377106 https://doi.org/http://dx.doi.org/10.2139/ssrn.2377106
Fogelberg, G., & Laurent, C. (1973). Interlocking directorates: a study of large companies in New Zealand. *Journal of Business Policy, 3*(2), 16-21.
Fondas, N., & Sassalos, S. (2000). A different voice in the boardroom: How the presence of women directors affects board influence over management. *Global focus, 12*(2), 13-22.
Fonseka, M. M., Farooque, O. A., Rajapakse, R. L. T. N., & Tian, G.-L. (2018). Political and interlocking connections in the boardroom on private equity placements. *Emerging Markets Finance & Trade, 54*(9), 2053-2077. https://doi.org/10.1080/1540496X.2017.1355300
Fox, M. A., & Walker, G. R. (2001). Multiple directorships and interlocks among New Zealand Stock Exchange companies, 1996 to 2001. *Company and Securities Law Journal,, 19*, 467-471.
Fracassi, C. (2017). Corporate finance policies and social networks. *Management Science, 63*(8), 2397-2771. https://doi.org/https://doi.org/10.1287/mnsc.2016.2433
Fracassi, C., & Tate, G. (2012). External Networking and Internal Firm Governance. *The Journal of Finance, 67*(1), 153-194. https://doi.org/10.2307/41419674
Freeman, L. C. (1977). A set of measures of centrality based on betweenness. *Sociometry*, 35-41.
Freeman, L. C. (1979). Centrality in social networks conceptual clarification. *Social networks, 1*(3), 215-239.
Freeman, L. C. (2004). *The development of social network analysis: A Study in the Sociology of Science*. Vancouver, B. C.: Empirical Press.
Frijns, B., Dodd, O., & Cimerova, H. (2016). The impact of cultural diversity in corporate boards on firm performance. *Journal of Corporate Finance, 41*(Supplement C), 521-541. https://doi.org/https://doi.org/10.1016/j.jcorpfin.2016.07.014
Gao, L., & Kling, G. (2008). Corporate governance and tunneling: Empirical evidence from China. *Pacific-Basin Finance Journal, 16*(5), 591-605. https://doi.org/https://doi.org/10.1016/j.pacfin.2007.09.001
Glaeser, E. L. (2001). The formation of social capital. *Canadian Journal of Policy Research, 2*(1), 34-40. Retrieved from https://search.oecd.org/edu/innovation-education/1824983.pdf
Glaeser, E. L., Laibson, D. I., Scheinkman, J. A., & Soutter, C. L. (2000). Measuring trust. *The Quarterly Journal of Economics, 115*(3), 811-846. https://doi.org/https://doi.org/10.1162/003355300554926

Granovetter, M. (1985). Economic Action and Social Structure: The Problem of Embeddedness. *American journal of sociology, 91*(3), 481-510. https://doi.org/10.2307/2780199
Granovetter, M. S. (1973). The strength of weak ties. *American journal of sociology*, 1360-1380.
Grant, D. (2010). Stock market - First stock exchanges *Te Ara - the Encyclopedia of New Zealand*.
Gray, S., & Nowland, J. (2013). Is prior director experience valuable? *Accounting & Finance, 53*(3), 643-666. https://doi.org/10.1111/j.1467-629X.2012.00481.x
Gray, S., & Nowland, J. (2015). The diversity of expertise on corporate boards in Australia. *Accounting & Finance*. https://doi.org/10.1111/acfi.12146
Güner, A. B., Malmendier, U., & Tate, G. (2008). Financial expertise of directors. *Journal of Financial Economics, 88*(2), 323-354. https://doi.org/https://doi.org/10.1016/j.jfineco.2007.05.009
Hambrick, D. C., & Mason, P. A. (1984). Upper echelons: The organization as a reflection of its top managers. *Academy of Management Review, 9*(2), 193-206.
Hamori, M., & Koyuncu, B. (2015). Experience matters? The impact of prior CEO experience on firm performance. *Human Resource Management, 54*(1), 23-44. https://doi.org/ https://doi.org/10.1002/hrm.21617
Hanifan, L. J. (1916). The Rural School Community Center. *Annals of the American Academy of Political and Social Science, 67*, 130-138. https://doi.org/10.2307/1013498
Hanifan, L. J. (1920). *The community center*. Boston: Silver, Burdett & Co.
Hao, L., & Naiman, D. Q. (2007). *Quantile regression*. Thousand Oaks, CA: Sage.
Hararay, F. (1969). *Graph Theory*. New York: Addison-Wesley.
Harford, J. (2003). Takeover bids and target directors' incentives: The impact of a bid on directors' wealth and board seats. *Journal of Financial Economics, 69*(1), 51-83. https://doi.org/https://doi.org/10.1016/S0304-405X(03)00108-9
Haunschild, P. R. (1993). Interorganizational imitation: The impact of interlocks on corporate acquisition activity. *Administrative science quarterly, 38*(4), 564-592.
Hawarden, R., & Stablein, R. E. (2008). New Zealand women directors: Many aspire but few succeed. In S. Vinnicombe, V. Singh, R. J. Burke, D. Bilimoria, & M. Huse (Eds.), *Women on corporate boards of directors: International research and practice* (pp. 57-66). Cornwall, Great Britain: Edward Elgar Publishing Limited. https://doi.org/10.4337/9781848445192.00014
Henry, D. (2008). Corporate governance structure and the valuation of Australian firms: is there value in ticking the boxes? *Journal of Business Finance & Accounting, 35*(7-8), 912-942. https://doi.org/10.1111/j.1468-5957.2008.02100.x
Hermalin, B. E., & Weisbach, M. S. (1988). The determinants of board composition. *RAND Journal of Economics (RAND Journal of Economics), 19*(4), 589-606.
Herrmann, P., & Datta, D. K. (2005). Relationships between Top Management Team Characteristics and International Diversification: an Empirical Investigation. *British Journal of Management, 16*(1), 69-78. https://doi.org/10.1111/j.1467-8551.2005.00429.x
Hillman, A. J., Cannella Jr, A. A., & Harris, I. C. (2002). Women and racial minorities in the boardroom: How do directors differ? *Journal of Management, 28*(6), 747-763. https://doi.org/http://dx.doi.org/10.1016/S0149-2063(02)00192-7
Hillman, A. J., & Dalziel, T. (2003). Boards of directors and firm performance: Integrating agency and resource dependence perspectives. *Academy of Management Review, 28*(3), 383-396. https://doi.org/10.5465/AMR.2003.10196729
Hillman, A. J., Withers, M. C., & Collins, B. J. (2009). Resource dependence theory: A review. *Journal of Management*. https://doi.org/10.1177/0149206309343469
Hochberg, Y. V., Ljungqvist, A., & Lu, Y. (2007). Whom you know matters: Venture capital networks and investment performance. *The Journal of Finance, 62*(1), 251-301.
Horton, J., Millo, Y., & Serafeim, G. (2012). Resources or power? Implications of social networks on compensation and firm performance. *Journal of Business Finance & Accounting, 39*(3-4), 399-426. https://doi.org/10.1111/j.1468-5957.2011.02276.x

Hossain, M., Prevost, A. K., & Rao, R. P. (2001). Corporate governance in New Zealand: The effect of the 1993 Companies Act on the relation between board composition and firm performance. *Pacific-Basin Finance Journal*, *9*(2), 119-145. https://doi.org/http://dx.doi.org/10.1016/S0927-538X(01)00003-8

Houston, J. F., Jiang, L., Lin, C., & Ma, Y. (2014). Political Connections and the Cost of Bank Loans. *Journal of Accounting Research*, *52*(1), 193-243.

Hsiang-Lan, C. (2014). Independent Directors Human Capital and Firm Internationalization. *Asian Economic and Financial Review*, *4*(10), 1378-1388.

Hunter, T. (2018, June 14). Sir Ralph Norris retires from Contact board. *The National Business Review*. Retrieved from https://www.nbr.co.nz/article/sir-ralph-norris-retires-contact-board-th-216345

Huse, M., & Grethe Solberg, A. (2006). Gender-related boardroom dynamics: How Scandinavian women make and can make contributions on corporate boards. *Women in Management Review*, *21*(2), 113-130. https://doi.org/doi:10.1108/09649420610650693

Hwang, B.-H., & Kim, S. (2009). It pays to have friends. *Journal of Financial Economics*, *93*(1), 138-158. https://doi.org/doi:10.1016/j.jfineco.2008.07.005

Jackson, T. W., & Farzaneh, P. (2012). Theory-based model of factors affecting information overload. *International Journal of Information Management*, *32*(6), 523-532. https://doi.org/https://doi.org/10.1016/j.ijinfomgt.2012.04.006

Jacobs, J. (1961). *The death and life of great americal cities*. New York: Random House Publishing Group.

Jahan, M. A. (2018). *An empirical study on multiple corporate directorships in New Zealand: A new interpretation of selected governance theories*. (Doctoral Thesis, Victoria University of Wellington, Wellington, New Zealand). Retrieved from http://hdl.handle.net/10092/6255

Jensen, M. C. (1993). The modern industrial revolution, exit, and the failure of internal control systems. *The Journal of Finance*, *48*(3), 831-880. https://doi.org/10.1111/j.1540-6261.1993.tb04022.x

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, *3*(4), 305-360. https://doi.org/10.1016/0304-405X(76)90026-X

Jiraporn, P., Kim, Y. S., & Davidson Iii, W. N. (2008). Multiple directorships and corporate diversification. *Journal of empirical Finance*, *15*(3), 418-435. https://doi.org/http://dx.doi.org/10.1016/j.jempfin.2007.07.002

Jiraporn, P., Singh, M., & Lee, C. I. (2009). Ineffective corporate governance: Director busyness and board committee memberships. *Journal of Banking & Finance*, *33*(5), 819-828. https://doi.org/http://dx.doi.org/10.1016/j.jbankfin.2008.09.020

Johnson, S. G., Schnatterly, K., & Hill, A. D. (2013). Board composition beyond independence social capital, human capital, and demographics. *Journal of Management*, *39*(1), 232-262. https://doi.org/10.1177/0149206312463938

Kaczmarek, S., Kimino, S., & Pye, A. (2014). Interlocking directorships and firm performance in highly regulated sectors: the moderating impact of board diversity. *Journal of Management & Governance*, *18*(2), 347-372. https://doi.org/10.1007/s10997-012-9228-3

Karamanou, I., & Vafeas, N. (2005). The Association between corporate boards, audit committees, and management earnings forecasts: An empirical analysis. *Journal of Accounting Research*, *43*(3), 453-486. https://doi.org/doi:10.1111/j.1475-679X.2005.00177.x

Khanna, P., Jones, C. D., & Boivie, S. (2014). Director human capital, information processing demands, and board effectiveness. *Journal of Management*, 0149206313515523. https://doi.org/https://doi.org/10.1177/0149206313515523

Kiel, G. C., & Nicholson, G. J. (2006). Multiple Directorships and Corporate Performance in Australian Listed Companies. *Corporate Governance: An International Review*, *14*(6), 530-546.

Kirkpatrick, G. (2009). The corporate governance lessons from the financial crisis. *OECD Journal: Financial Market Trends, 2009*(1), 61-87.
Klarner, P., Probst, G., & Useem, M. (2015). The board of directors' changing role in company strategy. *Verwaltenzgart: The Reporting Times,* p. 13. Retrieved from https://swissboardinstitute.ch/wp-content/uploads/2018/03/board-of-directors-changing-role.klarner_probst_useem.pdf
Klein, A. (1998). Firm Performance and Board Committee Structure. *The Journal of Law and Economics, 41*(1), 275-304. https://doi.org/10.1086/467391
Koenker, R. (2005). *Quantile regression*: Cambridge university press.
Koenker, R., & Bassett, G. (1978). Regression quantiles. *Econometrica (Pre-1986), 46*(1), 33-50. https://doi.org/10.2307/1913643
Koerniadi, H., Krishnamurti, C., & Tourani-Rad, A. (2014). Corporate governance and risk-taking in New Zealand. *Australian Journal of Management, 39*(2), 227-245. https://doi.org/10.1177/0312896213478332
Koerniadi, H., & Tourani-Rad, A. (2012). Does board independence matter? Evidence from New Zealand. *Australasian Accounting Business & Finance Journal, 6*(2), 3-18.
Kor, Y. Y., & Sundaramurthy, C. (2009). Experience-Based Human Capital and Social Capital of Outside Directors. *Journal of Management, 35*(4), 981-1006. https://doi.org/doi:10.1177/0149206308321551
Kroll, M., Walters, B. A., & Wright, P. (2008). Board vigilance, director experience, and corporate outcomes. *Strategic Management Journal, 29*(4), 363-382.
Kroszner, R. S., & Strahan, P. E. (2001). Bankers on boards: Monitoring, conflicts of interest, and lender liability. *Journal of Financial Economics, 62*(3), 415-452. https://doi.org/10.1016/S0304-405X(01)00082-4
Kuan, T.-H., Li, C.-S., & Liu, C.-C. (2012). Corporate governance and cash holdings: A quantile regression approach. *International Review of Economics & Finance, 24*, 303-314. https://doi.org/https://doi.org/10.1016/j.iref.2012.04.006
Larcker, D. F., & Miles, S. A. (2011). *2011 corporate board of directors survey*. Online: Heidrick & Struggles and Rock Center for Corporate Governance, Stanford University. Retrieved from https://www.gsb.stanford.edu/sites/gsb/files/publication-pdf/cgri-survey-2012-board-succession.pdf
Larcker, D. F., So, E. C., & Wang, C. C. (2013). Boardroom centrality and firm performance. *Journal of Accounting and Economics, 55*(2-3), 225-250. https://doi.org/10.1016/j.jacceco.2013.01.006
Larcker, D. F., & Tayan, B. (2010). Director networks: Good for the director, good for shareholders. *The Stanford Closer Look Series: Topic, issues, and controversies in corporate governance and leadership*. Retrieved from https://public2-stage.gsb.stanford.edu/sites/gsb/files/publication-pdf/cgri-closer-look-08-director-networks.pdf
Larcker, D. F., & Tayan, B. (2015). Seven myths of board of directors. *The Stanford Closer Look Series*. Retrieved from https://www.gsb.stanford.edu/faculty-research/centers-initiatives/cgri/research
Laurent, C. R. (1971). *Interlocking directorates in New Zealand* (Masters Thesis). Victoria University of Wellington.
Lee, J.-H., Choi, C., & Kim, J. M. (2012). Outside Directors' Social Capital and Firm Performance: A Complex Network Approach (September 10, 2012). *Social Behavior and Personality, 40*(8), 1319-1332.
Legatum Institute. (2018). *The Legatum Prosperity Index 2018: Twelfth Edition*: The Legatum Institute Foundation. Retrieved from https://prosperitysite.s3-accelerate.amazonaws.com/2515/4321/8072/2018_Prosperity_Index.pdf
Lin, N. (1999). Building a network theory of social capital. *Connections, 22*(1), 28-51.

Linck, J. S., Netter, J. M., & Yang, T. (2008). The determinants of board structure. *Journal of Financial Economics, 87*(2), 308. https://doi.org/https://doi.org/10.1016/j.jfineco.2007.03.004

Liu, S.-B., Hsueh, S.-J., & Wu, T.-P. (2017). Shareholdings of board members and corporate performance: A panel quantile regression analysis. *Global Economic Review, 46*(3), 271-298. https://doi.org/10.1080/1226508X.2017.1312477

Lu, X., Wang, J., & Dong, D. (2013). Busy boards and corporate performance. *China Finance Review International, 3*(2), 203-219. https://doi.org/https://doi.org/10.1108/20441391311330618

MacKinlay, A. C. (1997). Event studies in economics and finance. *Journal of Economic Literature, 35*(1), 13-39. Retrieved from http://www.jstor.org/stable/2729691

Masulis, R., Ruzzier, C., Xiao, S., & Zhao, S. (2012). Do independent expert directors matter? *Working Paper*. Retrieved from https://mpra.ub.uni-muenchen.de/68200/1/MPRA_paper_68200.pdf

Masulis, R. W., & Mobbs, S. (2011). Are All Inside Directors the Same? Evidence from the External Directorship Market. *The Journal of Finance, 66*(3), 823-872. https://doi.org/10.2307/29789801

Masulis, R. W., Wang, C., & Xie, F. (2012). Globalizing the boardroom - The effects of foreign directors on corporate governance and firm performance. *Journal of Accounting and Economics, 53*(3), 527-554. https://doi.org/10.1016/j.jacceco.2011.12.003

McCaffrey, K. (2012). *Director Network Analysis of New Zealand Organisations*. Published Online: Effective Governance Ltd.

McCann, P. (2003). Geography, trade and growth: Problems and possibilities for the New Zealand economy. *New Zealand Treasury Working Paper, 03/03*, 1-32. Retrieved from https://treasury.govt.nz/sites/default/files/2007-09/twp03-03.pdf

McConnell, J. J., & Servaes, H. (1990). Additional evidence on equity ownership and corporate value. *Journal of Financial Economics, 27*(2), 595-612. https://doi.org/http://dx.doi.org/10.1016/0304-405X(90)90069-C

Midi, H., Sarkar, S., & Rana, S. (2010). Collinearity diagnostics of binary logistic regression model. *Journal of Interdisciplinary Mathematics, 13*(3), 253-267. https://doi.org/10.1080/09720502.2010.10700699

Mizruchi, M. S. (1996). What do interlocks do? An analysis, critique, and assessment of research on interlocking directorates. *Annual review of sociology, 22*(August), 271-298. https://doi.org/10.1146/annurev.soc.22.1.271

Mizruchi, M. S., & Galaskiewicz, J. (1994). Networks of Interorganizational Relations. In S. Wasserman & J. Galaskiewicz (Eds.), *Advances in Social Network Analysis: Research in the Social and Behavioral Sciences*. Thousand Oaks: SAGE Publications, Inc.

Mizruchi, M. S., & Stearns, L. B. (1994). A longitudinal study of borrowing by large American corporations. *Administrative science quarterly, 39*(1), 118-140. https://doi.org/10.2307/2393496

Mol, M. J. (2001). Creating wealth through working with others: Interorganizational relationships. *The Academy of Management Executive, 15*(1), 150-152.

Murray, G. (2001). Interlocks or ownership: New Zealand boardroom power. *New Zealand Sociology, 16*(1), 176-201.

Nieminen, J. (1974). On the centrality in a graph. *Scandinavian Journal of Psychology, 15*, 332-366.

Non, M., & Franses, P. (2007). Interlocking boards and firm performance: evidence from a new panel database. *Working Paper, Available at SSRN 978189*.

Nyberg, A. J., & Wright, P. M. (2015). 50 years of human capital research: Assessing what we know, exploring where we go. *Academy of Management Perspectives, 29*(3), 287-295. https://doi.org/10.5465/amp.2014.0113

NZ Government. (2013). *The Business Growth Agenda Building Capital Markets Progress Report*. Retrieved from https://www.mbie.govt.nz
NZ History. (2018). *Black Tuesday' share-market crash*. Retrieved April 14, 2019, from https://nzhistory.govt.nz/page/black-tuesday-share-market-crash
NZX Limited. (2017a). *Company research: Issuer listing dates*. Retrieved April 12, 2017, from http://companyresearch.nzx.com/deep_ar/index.php?pageid=codes&code=L
NZX limited. (2017b). *NZX corporate governance code*. Retrieved from https://www.nzx.com/files/attachments/257864.pdf
NZX Limited. (2017c). *NZX Main Board/Debt Market Listing Rules*. Retrieved from https://nzx.com/regulation
O'Reilly, C. A. (1980). Individuals and information overload in organizations: is more necessarily better? *Academy of Management Journal, 23*(4), 684-696.
O'Reilly, C. A., Main, B. G., & Crystal, G. S. (1988). CEO compensation as tournament and social comparison: A tale of two theories. *Administrative science quarterly, 33*(2).
O'Higgins, E. (2002). Non–executive directors on boards in Ireland: Co–option, characteristics and contributions. *Corporate Governance: An International Review, 10*(1), 19-28. https://doi.org/https://doi.org/10.1111/1467-8683.00264
OECD. (2001). *The well-being of nations: the role of human and social capital*. Paris: OECD.
Omer, T. C., Shelley, M. K., & Tice, F. M. (2013). When do well-connected directors affect firm performance? *Working Paper, Texas A&M University*.
Omer, T. C., Shelley, M. K., & Tice, F. M. (2014a). Do director networks matter for financial reporting quality? Evidence from restatements. *Evidence from Restatements (June 1, 2014)*.
Omer, T. C., Shelley, M. K., & Tice, F. M. (2014b). Do Well-connected directors affect firm value? *Journal of Applied Finance, 24*(2), 17-32.
Opsahl, T., Agneessens, F., & Skvoretz, J. (2010). Node centrality in weighted networks: Generalizing degree and shortest paths. *Social networks, 32*(3), 245-251. https://doi.org/10.1016/j.socnet.2010.03.006
Parente, P. M. D. C., & Santos Silva, J. M. C. (2016). Quantile regression with clustered data. *Journal of Econometric Methods, 5*(1), 1-15.
Pashootanizadeh, B. (2013). *Analysis of New Zealand Stock Exchange Companies*. New Zealand: Women on boards New Zealand Inc, Massey University New Zealand. Retrieved from http://www.wob.org.nz/wp-content/uploads/2013/07/Analysis-of-NZ-Stock-Exchange-Main-Board-Companies.pdf
Perry, T., & Peyer, U. (2005). Board seat accumulation by executives: A shareholder's perspective. *The Journal of Finance, 60*(4), 2083-2123.
Perry, T., & Shivdasani, A. (2005). Do Boards Affect Performance? Evidence from Corporate Restructuring. *The Journal of Business, 78*(4), 1403-1432. https://doi.org/10.1086/430864
Petersen, M. A. (2009). Estimating standard errors in finance panel data sets: Comparing approaches. *Review of Financial Studies, 22*(1), 435-480.
Pfeffer, J. (1972). Size and composition of corporate boards of directors: The organization and its environment. *Administrative science quarterly, 17*(2), 218-228. https://doi.org/10.2307/2393956
Pfeffer, J. (1976). Beyond management and the worker: The institutional function of management. *Academy of Management Review, 1*(2), 36-46. https://doi.org/10.5465/AMR.1976.4408661
Pfeffer, J., & Salancik, G. R. (1978). *The external control of organizations: A resource dependence perspective*. New York: Harper and Row.
Raue, J. (2019, March 8). Making your place at the board table/Interviewer: Joan Withers. *The New Zealand Herald*. Retrieved from https://global-factiva-com.ezproxy.aut.ac.nz
Reddy, K., Locke, S., & Scrimgeour, F. (2010). The efficacy of principle-based corporate governance practices and firm financial performance: An empirical investigation.

International Journal of Managerial Finance, 6(3), 190-219. https://doi.org/doi:10.1108/17439131011056224
Redor, E. (2015). Board attributes and shareholder wealth in mergers and acquisitions. *Journal of Management & Governance*, 1-33. https://doi.org/10.1007/s10997-015-9328-y
Roberts, K., & Lacey, J. (2008). What is the relationship between human and social capital: What transfers to whom? *Rural Society, 18*(2), 103-116.
Rose, C. (2007). Does female board representation influence firm performance? The Danish evidence. *Corporate Governance: An International Review, 15*(2), 404-413.
Rosenstein, S., & Wyatt, J. G. (1990). Outside directors, board independence, and shareholder wealth. *Journal of Financial Economics, 26*(2), 175-191.
Roudaki, J., & Bhuiyan, M. B. U. (2015). Interlocking directorships in New Zealand. *Australasian Accounting, Business and Finance Journal, 9*(3), 45-58. https://doi.org/https://doi.org/10.14453/aabfj.v9i3.4
Roy, M. R., Fox, M. A., & Hamilton, R. T. (1994). Board size and potential corporate and director interlocks in Australasia 1984-1993. *Australian Journal of Management, 19*(2), 201-217. https://doi.org/10.1177/031289629401900205
Ruigrok, W., Peck, S., & Tacheva, S. (2007). Nationality and gender diversity on Swiss corporate boards. *Corporate Governance: An International Review, 15*(4), 546-557. https://doi.org/10.1111/j.1467-8683.2007.00587.x
Sabidussi, G. (1966). The centrality index of a graph. *Psychometrika, 31*(4), 581-603. https://doi.org/10.1007/BF02289527
Santos, R., Da Silveira, A., & Barros, L. (2009). Board interlocking in Brazil: Directors' participation in multiple companies and its effect on firm value. *Working Paper, University of Sao Paulo, Available at SSRN: 1018796*.
Schabus, M. (2018). Do director networks help managers to plan and forecast better? *AAA 2017 Management Accounting Section (MAS) Meeting*. https://doi.org/http://dx.doi.org/10.2139/ssrn.2824070
Schmidt, B. (2015). Costs and benefits of friendly boards during mergers and acquisitions. *Journal of Financial Economics, 117*(2), 424-447. https://doi.org/http://dx.doi.org/10.1016/j.jfineco.2015.02.007
Schonlau, R., & Singh, P. V. (2009). Board networks and merger performance. *Working Paper, University of Washington*.
Schoorman, F. D., Bazerman, M. H., & Atkin, R. S. (1981). Interlocking directorates: A strategy for reducing environmental uncertainty. *Academy of Management Review, 6*(2), 243-251.
Schultz, T. W. (1961). Investment in human capital. *The American Economic Review, 51*(1), 1-17. Retrieved from http://www.jstor.org/stable/1818907
Shea, J. (1997). Instrument relevance in multivariate linear models: A simple measure. *The Review of Economics and Statistics, 79*(2), 348-352.
Shivdasani, A., & Yermack, D. (1999). CEO involvement in the selection of new board members: An empirical analysis. *The Journal of Finance, 54*(5), 1829-1853. https://doi.org/10.2307/222505
Shropshire, C. (2010). The role of the interlocking director and board receptivity in the diffusion of practices. *Academy of Management Review, 35*(2), 246-264.
Shuller, T. (2001). The complementary roles of human and social capital. *Canadian Journal of Policy Research, 2*(1), 18-24.
Singh, V., Terjesen, S., & Vinnicombe, S. (2008). Newly appointed directors in the boardroom: How do women and men differ? *European Management Journal, 26*(1), 48-58. https://doi.org/10.1016/j.emj.2007.10.002
Spencer Stuart. (2017a). *Boardroom best practice*. Retrieved from www.spencerstuart.com
Spencer Stuart. (2017b). *Spencer Stuart U.S. board index*. Retrieved from www.spencerstuart.com
Staiger, D., & Stock, J. H. (1997). Instrumental variables regression with weak instruments. *Econometrica, 65*(3), 557-586. https://doi.org/10.2307/2171753

Statistics NZ. (2005). New Zealand in the OECD. Retrieved from http://archive.stats.govt.nz/~/media/Statistics/browse-categories/government-finance/central-government/nz-in-the-oecd/nz-oecd.pdf

Statistics NZ. (2006). Internal Migration: Urban and rural migration. Retrieved from http://archive.stats.govt.nz/~/media/Statistics/browse-categories/population/migration/urban-rural-migration/urban-and-rural-migration.pdf

Stening, B., & Wai, W. T. (1984). 'Interlocking Directorates Among Australia's Largest 250 Corporations 1959-1979. *The Australian and New Zealand Journal of Sociology, 20*, 47-55.

Stuart, T. E., & Yim, S. (2010). Board interlocks and the propensity to be targeted in private equity transactions. *Journal of Financial Economics, 97*(1), 174-189. https://doi.org/https://doi.org/10.1016/j.jfineco.2010.03.012

Swain, M. R., & Haka, S. (2000). Effects of information load on capital budgeting decisions. *Behavoural Research in Accounting, 12*, 171-199.

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International journal of medical education, 2*, 53. https://doi.org/10.5116/ijme.4dfb.8dfd

Terjesen, S., Sealy, R., & Singh, V. (2009). Women Directors on Corporate Boards: A Review and Research Agenda. *Corporate Governance: An International Review, 17*(3), 320-337. https://doi.org/10.1111/j.1467-8683.2009.00742.x

Tian, J., Haleblian, J., & Rajagopalan, N. (2011). The effects of board human and social capital on investor reactions to new CEO selection. *Strategic Management Journal, 32*(7), 731-747. https://doi.org/10.1002/smj.909

Van den Berghe, L. A., & Levrau, A. (2004). Evaluating boards of directors: what constitutes a good corporate board? *Corporate Governance: An International Review, 12*(4), 461-478. https://doi.org/10.1111/j.1467-8683.2004.00387.x

Van der Walt, N. T., & Ingley, C. B. (2003). Board Dynamics and the Influence of Professional Background, Gender and Ethnic Diversity of Directors. *Corporate Governance: An International Review, 11*(3), 218-234. https://doi.org/10.1111/1467-8683.00320

Verbeek, M. (2012). *A guide to modern econometrics* (4th ed.). West Sussex, England: John Wiley & Sons.

Vinnicombe, S., Singh, V., Burke, R. J., Bilimoria, D., & Huse, M. (2008). *Women on corporate boards of directors: International research and practice*. Gloucestershire, United Kingdom: Edward Elgar Publishing Limited.

Volonté, C., & Gantenbein, P. (2014). Directors' human capital, firm strategy, and firm performance. *Journal of Management & Governance*, 1-31. Volonté2014. https://doi.org/10.1007/s10997-014-9304-y

Wasserman, S., & Faust, K. (1994). *Social network analysis: Methods and applications* (Vol. 8): Cambridge University Press.

Wells, P., & Mueller, J. (2014). Boards of directors in New Zealand: what do they reveal about governance? *International Journal of Business and Globalisation, 12*(3), 334-357. https://doi.org/doi:10.1504/IJBG.2014.060216

Westphal, J. D. (1999). Collaboration in the boardroom: Behavioural and performance consequences of CEO board ties. *Academy of Management Journal, 42*(1), 7-24. https://doi.org/10.2307/256871

Westphal, J. D., & Milton, L. P. (2000). How experience and network ties affect the influence of demographic minorities on corporate boards. *Administrative science quarterly, 45*(2), 366-398.

White, J. T., Woidtke, T., Black, H. A., & Schweitzer, R. L. (2014). Appointments of academic directors. *Journal of Corporate Finance, 28*, 135-151. https://doi.org/http://dx.doi.org/10.1016/j.jcorpfin.2013.12.007

Wintoki, M. B., Linck, J. S., & Netter, J. M. (2012). Endogeneity and the dynamics of internal corporate governance. *Journal of Financial Economics, 105*(3), 581-606. https://doi.org/https://doi.org/10.1016/j.jfineco.2012.03.005

Withers, M. C., Hillman, A. J., & Cannella, A. A. (2012). A multidisciplinary review of the director selection literature. *Journal of Management, 38*(1), 243-277. https://doi.org/10.1177/ 0149206311428671

Wong, L. H. H., Gygax, A. F., & Wang, P. (2015). Board interlocking network and the design of executive compensation packages. *Social networks, 41*, 85-100. https://doi.org/https://doi.org/10.1016/j.socnet.2014.12.002

Wood, B. (2010). Not such a small world after all: the structural limits of elite social capital in New Zealand's corporate networks. *New Zealand Sociology, 25*(2), 88-102.

Wooldridge, J. M. (2002). *Econometric analysis of cross section and panel data*. Cambridge, MA: The MIT Press.

Wooldridge, J. M. (2009). *Introductory Econometrics* (4 ed.). Mason, USA: South-Western Cengage Learning.

Xie, B., Davidson III, W. N., & DaDalt, P. J. (2003). Earnings management and corporate governance: the role of the board and the audit committee. *Journal of Corporate Finance, 9*(3), 295-316. https://doi.org/http://dx.doi.org/10.1016/S0929-1199(02)00006-8

Yermack, D. (1996). Higher market valuation of companies with a small board of directors. *Journal of Financial Economics, 40*(2), 185-211.

Yermack, D. (2006). Board members and company value. *Financial Markets and Portfolio Management, 20*(1), 33-47.

Zand, D. E. (1972). Trust and managerial problem solving. *Administrative science quarterly, 17*(2), 229-239. https://doi.org/doi:10.2307/2393957

Zhou, X. (2001). Understanding the determinants of managerial ownership and the link between ownership and performance: comment. *Journal of Financial Economics, 62*(3), 559-571. https://doi.org/https://doi.org/10.1016/S0304-405X(01)00085-X

Zhu, X., Wang, W., Wang, H., & Härdle, W. K. (2016). *Network quantile autoregression*. Unpublished Manuscript. (Available from the Humboldt-Universität zu Berlin, Germany)

Zona, F., Gomez-Mejia, L. R., & Withers, M. C. (2018). Board interlocks and firm performance: Toward a combined agency–resource dependence perspective. *Journal of Management, 44*(2), 589-618. https://doi.org/10.1177/0149206315579512

Appendices

Appendix A1: Director-level Variable Definitions

Variable	Type	Definition
Social Capital Measures		
Degree (DEG)	Continuous, Ratio	Number of unique direct connections for director *i* to all other *j* directors in the network at FYE, scaled by *n-1* (*n*=total directors in network).
Closeness (CLO)	Continuous, Ratio	Sum of the inverse of the shortest distance between director *i* and all other directly and indirectly connected j directors in the network at FYE, scaled by its maximum possible value *n-1* (*n*=total directors in network).
Betweenness (BET)	Continuous, Ratio	Sum of the proportions of all the shortest paths linking two directors which pass through director i at FYE, scaled by its maximum possible value ((*n^2-3n+2)/2*).
Eigenvector (EIG)	Continuous, Ratio	Sum of director *i*'s first-degree connections to all other directors in the network, weighted by the connectedness of the firms to which it is connected to.
Aggregate Connectivity (AGG)	Continuous, Interval	Principal Component Analysis of Degree, Closeness, Betweenness and Eigenvector to reduce the dimensions into one principal factor of social capital.
Human Capital Index		
HCI	Count, Discrete	Self-constructed index consisting of 9 different human capital attributes. The individual categories form a human capital index which has a maximum possible value of 18. See Chapter 3 for a detailed description of the index construction.
Director Characteristics		
Age	Count, Discrete	Directors' age in years.
Female (FEM)	Dichotomous	Dummy variable equal to one if the director is a female.
New Zealand (NZ)	Dichotomous	Dummy variable equal to one if the director is an NZ citizen/resides in NZ.
America	Dichotomous	Dummy variable equal to one if the director is an American citizen/Lives in America, zero otherwise (Includes USA, Canada, South America).
Asia_Japan	Dichotomous	Dummy variable equal to one if the director is an Asian or Japanese citizen/Lives in Asia or Japan, zero otherwise (Includes China, HK, Japan, Malaysia, Philippines, Singapore, Thailand).
Australia	Dichotomous	Dummy variable equal to one if the director is an Australian citizen/Lives in AU, zero otherwise.
EU_UK	Dichotomous	Dummy variable equal to one if the director is an American citizen/Lives in America, zero otherwise (Includes England, Finland, France, Germany, Greece, Ireland, Isle of man, Italy, Netherlands, Sweden, Switzerland).
Other	Dichotomous	Dummy variable equal to one if the director is not included in any other nationality group.
Education		
Undergraduate	Dichotomous	Dummy variable equal to one if the director's highest degree is a bachelor’s degree or LLB.

Postgraduate	Dichotomous	Dummy variable equal to one if the director's highest degree is a postgraduate-level qualification including honours, JD, postgraduate cert/dip, masters, MBA and PhD.
No Degree	Dichotomous	Dummy variable equal to one if no degree qualifications (minimum degree level is a bachelor's degree).
Director Experience		
Director Experience (Years)	Count, Discrete	Number of prior years' experience as a director of firms in NZ database (years counted concurrently).
Directorships (DIR)	Count, Discrete	Number of current directorships the director holds at listed firms in NZ.
DIR+2	Dichotomous	Dummy variable equal to one if the director has three or more other directorships at NZ listed firms.
Director Expertise		
NZX10	Dichotomous	Dummy variable equal to one if a director at an NZX10 firm, zero otherwise. NZX firm is defined as one that has been part of the index at any time during the respective year.
NZX50	Dichotomous	Dummy variable equal to one if a director at an NZX50 firm, zero otherwise. NZX firm is defined as one that has been part of the index at any time during the respective year.
CEO Experience		
Prior CEO Experience	Dichotomous	Dummy variable equal to one if the director is a former CEO of a listed or non-listed firm either in NZ or abroad.
Current CEO (listed)	Dichotomous	Dummy variable equal to one if (if information given) director is currently a CEO of an NZ listed firm, or another listed firm abroad.
Current CEO (non-listed)	Dichotomous	Dummy variable equal to one if (if information given) director is currently a CEO of another non-listed firm.
Other Significant Experience		
International Experience	Dichotomous	Dummy variable equal to 1 if the director had international exposure (sales), who lived or worked abroad, or who are foreigners. Foreigners exclude those who have lived in NZ for most of their life.
M & A Experience	Count, Discrete	Cumulative number of completed deals a director has been associated with for the sample of NZ firms between 1993 and 1 - the respective year. Deals include directing firms that have acquired, sold, or were the target.
Professional Expertise		
Accountant	Dichotomous	Dummy variable equal to one if the director's occupation is classified as an accountant or financial controller (experience as a CA, CPA, CFO).
Banker	Dichotomous	Dummy variable equal to one if the director's occupation is classified as a banker (experience as an investment banker, commercial banker, fund manager, stock-broker, finance industry experience, CFA).
Consultant	Dichotomous	Dummy variable equal to one if the director's occupation is classified as a consultant (management, IT, marketing, strategy, Industry-specific).
General Executive	Dichotomous	Dummy variable equal to one if the director's occupation is classified as a general executive/businessperson (not classified into another occupation group).
Financial Expert	Dichotomous	Dummy variable equal to one if the director has any of the following qualifications: CA, ACA, CMA, CPA, CFA/CSA.

Lawyer	Dichotomous	Dummy variable equal to one if the director's occupation is classified as a lawyer (experience as a practicing lawyer).
Prof Director	Dichotomous	Dummy variable equal to one if the director is identified as a professional director (often a retiree or corporate governance expert).
Industry Experience		
Banking	Dichotomous	Dummy variable equal to 1 if the director has significant experience with a banking/savings/loan firm (GIC code 04 / ICB Code 8300).
Consumer Goods	Dichotomous	Dummy variable equal to 1 if the director has significant experience in the consumer goods industry (ICB Code 3000).
Consumer Services	Dichotomous	Dummy variable equal to 1 if the director has significant experience in the consumer services industry (ICB Codes 5000).
Farming, Fishing, Forestry	Dichotomous	Dummy variable equal to 1 if the director has significant experience in the Primary Industries, Forestry, Farming &Fishing (GIC code 02 / ICB codes 1733 & 3573).
Finance	Dichotomous	Dummy variable equal to 1 if the director has significant experience with a financial or insurance firm, including banks, insurance or real estate firms and other financial firms (GIC codes 05 and 06 / ICB Codes 8500 & 8700).
Industrial	Dichotomous	Dummy variable equal to 1 if the director has significant experience with an industrial /transportation firm (GIC code 01 & 03 / ICB Code 2000).
Firm Size		
Average Market Value	Continuous Interval	The cumulative market value for all of the firms where directorships are currently held divided by the number of directorships held.

Board Appointments		
NEW APPT	Dichotomous	Dummy variable equal to one if the director gained a new appointment at a listed firm in NZ.
N APPTS	Count, Discrete	Number of new appointments gained at listed firms in NZ.
Exec Appt	Dichotomous	Dummy variable equal to one if the director gained a new executive director appointment at a listed firm in NZ.
N Exec Appts	Count, Discrete	Number of new executive director appointments gained at listed firms in NZ.
AR	Continuous, Ratio	The daily abnormal security return around the event day measured by the market adjusted return model. The market portfolio is measured using the NZX ALL Index.
CAR	Continuous, Ratio	The cumulative abnormal return (CAR) is the abnormal returns (AR) accumulated for each director appointment over three event windows. CARs are winsorized at the 1st and 99th percentiles.

Appendix A1 (cont): Firm-level Variable Definitions

Variable	Type	Definition
Firm Performance		
ROA	Continuous	Earnings before interest on debt, taxes, depreciation and amortization divided by total book assets. Winsorized at the 1st and 99th percentiles.
ROE	Continuous	Earnings before interest on debt, taxes, depreciation and amortization divided by the value of total book assets minus total book liabilities. Winsorized at the 1st and 99th percentiles.
TSR	Continuous	Stock returns measured at the end of December using the adjusted closing price of the firm's security and incorporate gross dividends with the assumption that dividends are reinvested into the closing price of the security on the ex-dividend date. Winsorized at the 1st and 99th percentiles.
Social Capital Measures		
DEG	Continuous	Number of unique direct connections for director i to all other j directors in the network at FYE, scaled by *n-1* (n=total directors in network). The total value for all directors divided by board size.
CLO	Continuous	Sum of the inverse of the shortest distance between director i and all other directly and indirectly connected j directors in the network at FYE, scaled by its maximum possible value n-1 (n=total directors in network). The total value for all directors divided by board size.
BET	Continuous	Sum of the proportions of all the shortest paths linking two directors which pass through director *i* at FYE, scaled by its maximum possible value *((n^2-3n+2)/2)*. The total value for all directors divided by board size.
EIG	Continuous	Sum of director i's first-degree connections to all other directors in the network, weighted by the connectedness of the firms to which it is connected to. The total value for all directors divided by board size.
AGG	Continuous	Principal Component Analysis of firm-level Degree, Closeness, Betweenness and Eigenvector to reduce the dimensions into one principal factor of social capital.
AGG^2	Continuous	The square root of AGG.
Board-level Controls		
Human Capital		
HCI	Count, discrete	The board's average measure of the self-constructed index consisting of 9 different human capital attributes. The individual categories form a human capital index which has a maximum possible value of 18.
BSI	Categorical, Discrete	Self-constructed board skills index based on counting the number of different board skills out of 20 (See Appendix 7B)
Board Attributes		
AGE	Discrete	Average age in years of the board.
FEM	Categorical, discrete	No of female directors divided by board size.
NZ	Discrete	Number of directors of the focal firm that reside in New Zealand divided by board size.
BUSY	Discrete	Number of directors of the focal firm who hold three or more public firm directorships divided by board size.
Log Board Size	Discrete	Natural logarithm of the number of directors of the focal firm currently on the board

Horwath CGI	Categorical, Discrete	Self-constructed corporate governance index based on the number of 17 objective criteria of the Horwath report met by the firm (Ahmed & Ali, 2017). See Appendix 6B
Firm-level Controls		
Log Assets	Continuous	Natural logarithm of the firm's total book value of assets. Winsorized at the 1st and 99th percentiles.
Log MVE	Continuous	Product of market price fiscal-year end and common shares outstanding. Winsorized at the 1st and 99th percentiles.
Log Firm age	Discrete	Natural logarithm of the number of years since the firm was founded (or first incorporated, when founding date was not identified).
Log Segments	Discrete	Number of business segments in which the firm operates.
Leverage (LEV)	Continuous	Book value of total liabilities divided by book value of total assets. Winsorized at the 1st and 99th percentiles.
Firm Risk	Continuous	Standard deviation of daily stock returns in the firms preceding fiscal year including dividends and adjusted for stock splits. Winsorized at the 1st and 99th percentiles.
RISK	Continuous	Regression analysis of the preceding five-year monthly stock returns on five-year monthly NZX All index returns. Winsorized at the 1st and 99th percentiles.
Additional Variables		
AGG Max	Continuous	Highest measure of director-level AGG for the focal firm's board.
AGG (industry med)	Continuous	Industry median AGG based on the Industry Classification Benchmark level one coding system. Median is measured annually.
LC Dummy	Dichotomous	Dummy variable equal to one if the firm is in the largest connected network component, zero otherwise.
Tobin's Q (TQ)	Continuous	Book value of total liabilities, minority interests, the total market value of common stock measured at fiscal year-end, divided by the firm’s book value of total assets. Winsorized at the 1st and 99th percentiles.

Appendix 5A: Univariate Analysis of Human Capital and Degree, Closeness, Betweenness and Eigenvector Centrality

	DEG p90 = 1	DEG p90 = 0	Mean Difference (DEG p90 - Non-DEG p90)		CLO p90 = 1	CLO p90 = 0	Mean Difference (CLO p90 - Non-CLO p90)		BET p90 = 1	BET p90 = 0	Mean Difference (BETp90 - Non-BET p90)		EIG p90 = 1	EIG p90 = 0	Mean Difference (EIGp90 - Non-EIG p90)	
Observations	1,258	10,953			10958	1253			10967	1244			10,967	1,244		
Female	11%	9%	2%	b	13%	8%	5%	a	11%	9%	2%	a	10%	9%	2%	c
Age	57.7	56.0	1.7	a	57.2	56.1	1.1	a	58.8	55.9	2.9	b	56.5	56.2	0.3	c
NZ Resident	81%	69%	11%	a	82%	69%	13%	a	93%	68%	26%	a	73%	70%	3%	b
Undergraduate	42%	35%	7%	a	39%	35%	4%	b	44%	35%	10%	a	35%	36%	-1%	-
Postgraduate	37%	34%	3%	c	39%	34%	4%	a	36%	35%	2%	-	39%	34%	5%	a
No Degree	21%	31%	-10%	a	23%	31%	-8%	a	20%	31%	-11%	a	26%	30%	-4%	a
Director Experience (Years)	7.8	6.4	1.4	a	7.5	6.4	1.1	a	9.2	6.2	3.0	a	7.1	6.5	0.6	a
Directorships	2.3	1.1	1.2	a	2.0	1.1	0.9	a	2.5	1.1	1.5	a	1.6	1.2	0.4	a
NZX10	23%	6%	17%	a	30%	5%	24%	a	27%	6%	21%	a	30%	5%	24%	a
NZX50	74%	34%	40%	a	80%	34%	46%	a	76%	34%	42%	a	69%	35%	34%	a
Prior CEO Experience	65%	60%	5%	-	64%	60%	4%	-	73%	59%	14%	a	55%	61%	-6%	b
Current CEO (listed)	5%	15%	-10%	a	9%	15%	-6%	a	9%	15%	-6%	a	11%	15%	-4%	a
Current CEO (non-listed)	7%	12%	-5%	a	9%	12%	-3%	a	7%	12%	-5%	a	10%	12%	-2%	b
International Experience	43%	45%	-2%	-	40%	45%	-5%	a	36%	45%	-9%	a	48%	44%	4%	b
M & A Experience (ln)	1.1	0.5	0.6	a	1.1	0.5	0.6	a	1.3	0.5	0.8	a	0.8	0.5	0.3	a
Professional Expertise																
Accountant	23%	17%	5%	a	21%	18%	3%	b	28%	17%	11%	a	19%	18%	1%	-
Banker	14%	16%	-1%	-	15%	16%	-1%	-	19%	15%	3%	a	13%	16%	-3%	a
Consultant	5%	10%	-5%	a	7%	10%	-3%	a	9%	10%	0%	-	4%	10%	-6%	a
Financial Expert	28%	23%	5%	-	29%	23%	6%	a	36%	22%	14%	a	26%	23%	3%	b
General Executive	29%	32%	-3%	b	28%	32%	-4%	a	24%	33%	-9%	a	33%	31%	2%	-
Lawyer	8%	7%	1%	-	10%	7%	3%	a	9%	7%	2%	c	6%	7%	-1%	c
Prof Director	30%	9%	21%	a	24%	9%	14%	a	33%	8%	25%	a	15%	10%	5%	a
Industry Experience																
Banking & Finance	48%	44%	4%	a	51%	44%	7%	a	59%	43%	16%	a	39%	45%	-7%	a
Consumer Gds & Sces	51%	40%	11%	a	52%	40%	12%	a	48%	40%	8%	a	49%	40%	9%	a
Farming, Fishing, Forestry	24%	12%	13%	a	23%	12%	11%	a	19%	12%	7%	a	17%	12%	5%	a
Industrial	20%	16%	5%	a	24%	15%	9%	a	24%	15%	8%	a	20%	16%	4%	a

Note: Directors in the top 10th quantile = 1. Two-sample t-test with unequal variances. Significance is denoted by a, b, c representing 1%, 5% and 10% statistical significance, respectively. All variables are defined in Appendix A1.

Appendix 5B: OLS Regressions of Degree Centrality on Human Capital

	1 DEG OLS	2 DEG OLS	3 DEG OLS	4 DEG OLS	5 DEG OLS	6 DEG OLS
Constant	0.007***	0.002***	-0.004***	-0.007***	-0.001**	-0.007***
	(18.39)	(7.83)	(-7.01)	(-18.83)	(-2.24)	(-10.60)
HCI	0.001***	0.000***	0.000***	-0.000*	0.000***	0.000
	(13.42)	(8.10)	(7.44)	(-1.74)	(7.70)	(-0.24)
FEM	0.001***	0.000	0.000	0.000	0.001**	0.000
	(2.62)	(1.47)	(0.17)	(-1.58)	(2.38)	(-1.03)
NZ	0.001***	-0.001***	0.002***	0.000*	-0.001***	0.000
	(2.59)	(-7.17)	(9.50)	(1.84)	(-5.96)	(1.26)
DIR		0.006***		0.006***	0.006***	0.006***
		(24.51)		(25.55)	(23.27)	(24.55)
AMV			0.001***	0.001***		0.001***
			(23.72)	(35.14)		(25.48)
Age					0.000***	0.000
					(2.71)	(-0.59)
Observations	12,211	12,211	12,025	12,025	7,400	7,304
R2	0.137	0.562	0.271	0.692	0.615	0.718
F Stat	18.8	50.75	60.73	164.71	41.56	118.64
p(F)	0.000	0.000	0.000	0.000	0.000	0.000
Year fixed effects	Y	Y	Y	Y	Y	Y

This table presents results for OLS regressions where each observation represents a director for a given year between 2000 and 2015. The dependent variable is the Degree Centrality measure *DEG*. The *t*-statistics are reported in parentheses below coefficients and are based upon robust standard errors clustered at the director level. Year dummies are included but not shown. ***, **, * indicates statistical significance at the 1%, 5% and 10% level, respectively. All variables are defined in Appendix A1.

Appendix 5C: OLS Regressions of Closeness Centrality on Human Capital

	1 CLO OLS	2 CLO OLS	3 CLO OLS	4 CLO OLS	5 CLO OLS	6 CLO OLS
Constant	0.072***	0.054***	-0.045***	-0.060***	0.039***	0.003
	(17.54)	(13.45)	(-5.72)	(-7.83)	(3.92)	(0.25)
HCI	0.007***	0.005***	0.003***	0.001***	0.006***	0.003***
	(14.93)	(10.46)	(6.77)	(3.03)	(9.55)	(4.98)
FEM	0.009*	0.007	0.000	-0.002	0.004	-0.004
	(1.88)	(1.54)	(-0.04)	(-0.43)	(0.82)	(-0.66)
NZ	0.022***	0.014***	0.038***	0.031***	0.022***	0.034***
	(7.77)	(5.03)	(14.28)	(11.41)	(6.61)	(10.25)
DIR		0.028***		0.027***	0.025***	0.026***
		(16.63)		(17.32)	(13.20)	(13.96)
AMV			0.010***	0.010***		0.007***
			(16.02)	(16.03)		(8.34)
Age					0.000	-0.000***
					(-1.55)	(-3.18)
Observations	12,211	12,211	12,025	12,025	7,400	7,304
R2	0.111	0.158	0.202	0.246	0.199	0.240
F Stat	59.67	89.25	89.83	120.15	65.67	75.04
p(F)	0.000	0.000	0.000	0.000	0.000	0.000
Year fixed effects	Y	Y	Y	Y	Y	Y

This table presents results for OLS regressions where each observation represents a director for a given year between 2000 and 2015. The dependent variable is the Closeness Centrality measure *CLO*. The *t*-statistics are reported in parentheses below coefficients and are based upon robust standard errors clustered at the director level. Year dummies are included but not shown. ***, **, * indicates statistical significance at the 1%, 5% and 10% level, respectively. All variables are defined in Appendix A1.

Appendix 5D: OLS Regressions of Betweenness Centrality on Human Capital

	1 BET OLS	2 BET OLS	3 BET OLS	4 BET OLS	5 BET OLS	6 BET OLS
Constant	-0.006***	-0.014***	-0.010***	-0.017***	-0.016***	-0.018***
	(-7.74)	(-16.20)	(-8.21)	(-15.40)	(-13.10)	(-11.22)
HCI	0.001***	0.000***	0.001***	0.000	0.000***	0.000
	(9.85)	(3.90)	(8.63)	(1.44)	(3.35)	(1.49)
FEM	0.001*	0.000	0.001	0.000	0.001	0.001
	(1.88)	(0.87)	(1.48)	(0.45)	(1.62)	(1.15)
NZ	0.004***	0.000**	0.005***	0.001***	0.001	0.001**
	(10.17)	(2.21)	(10.17)	(3.55)	(1.64)	(2.52)
DIR		0.013***		0.013***	0.014***	0.014***
		(15.28)		(15.29)	(13.21)	(13.23)
AMV			0.000***	0.000***		0.000***
			(4.96)	(5.05)		(3.47)
Age					0.000	0.000
					(0.74)	(0.19)
Observations	12,211	12,211	12,025	12,025	7,400	7,304
R2	0.098	0.576	0.103	0.578	0.597	0.599
F Stat	8.15	31.01	8.15	30.51	26.65	25.34
p(F)	0.000	0.000	0.000	0.000	0.000	0.000
Year fixed effects	Y	Y	Y	Y	Y	Y

This table presents results for OLS regressions where each observation represents a director for a given year between 2000 and 2015. The dependent variable is the Betweenness Centrality measure *BET*. The *t*-statistics are reported in parentheses below coefficients and are based upon robust standard errors clustered at the director level. Year dummies are included but not shown. ***, **, * indicates statistical significance at the 1%, 5% and 10% level, respectively. All variables are defined in Appendix A1.

Appendix 5E: OLS Regressions of Eigenvector Centrality on Human Capital

	1 EIG OLS	2 EIG OLS	3 EIG OLS	4 EIG OLS	5 EIG OLS	6 EIG OLS
Constant	0.009***	0.001	-0.036***	-0.043***	0.003	-0.013
	(2.93)	(0.11)	(-5.35)	(-5.46)	(0.39)	(-1.52)
HCI	0.001**	0.000	0.000	-0.001*	0.001	0.000
	(2.37)	(0.46)	(0.06)	(-1.74)	(1.56)	(-0.09)
FEM	0.000	-0.001	-0.003	-0.003	0.000	-0.004
	(0.06)	(-0.25)	(-0.93)	(-1.22)	(-0.02)	(-1.03)
NZ	0.001	-0.003	0.007***	0.003	0.001	0.006*
	(0.47)	(-1.25)	(2.70)	(1.46)	(0.34)	(1.88)
DIR		0.014***		0.013***	0.009***	0.010***
		(3.54)		(3.51)	(3.16)	(3.25)
AMV			0.004***	0.004***		0.003***
			(7.41)	(7.45)		(4.84)
Age					-0.000*	-0.000***
					(-1.72)	(-2.68)
Observations	12,211	12,211	12,025	12,025	7,400	7,304
R2	0.005	0.028	0.033	0.055	0.024	0.039
F Stat	2.68	3.06	7.48	7.55	3.62	5.12
p(F)	0.000	0.000	0.000	0.000	0.000	0.000
Year fixed effects	Y	Y	Y	Y	Y	Y

This table presents results for OLS regressions where each observation represents a director for a given year between 2000 and 2015. The dependent variable is the Eigenvector Centrality measure *EIG*. The *t*-statistics are reported in parentheses below coefficients and are based upon robust standard errors clustered at the director level. Year dummies are included but not shown. ***, **, * indicates statistical significance at the 1%, 5% and 10% level, respectively. All variables are defined in Appendix A1.

Appendix 5F: Robustness Test: Quantile Regressions of Social Capital on Human Capital - Parente-Santos Silva

	q10	q25	q50	q75	q90
	AGG	AGG	AGG	AGG	AGG
Constant	-2.272***	-2.672***	-2.178***	-1.954***	-2.037***
	(-22.32)	(-25.58)	(-26.33)	(-19.21)	(-13.00)
HCI	0.059***	0.090***	0.074***	0.046***	0.016*
	(8.64)	(11.19)	(11.78)	(8.12)	(1.96)
FEM	0.039	0.139*	0.154***	0.109**	0.051
	(0.83)	(1.84)	(2.99)	(2.04)	(1.01)
NZ	-0.098***	-0.028	0.024	-0.092***	-0.126***
	(-3.04)	(-0.61)	(0.66)	(-2.80)	(-3.14)
DIR	0.761***	1.302***	1.531***	1.965***	2.658***
	(9.15)	(14.25)	(22.60)	(21.56)	(17.24)
Observations	12,211	12,211	12,211	12,211	12,211
R2	0.477	0.491	0.496	0.495	0.488

This table presents results for quantile regressions (Stata function: QREG2) where each observation represents a director for a given year between 2000 and 2015. The dependent variable is the aggregate connectivity measure *AGG* at the Q^{th} quantile for director *i* in year *t*. Coefficients are estimated at the 10^{th}, 25^{th}, 50^{th}, 75^{th} and 90^{th} percentiles. The *t*-statistics are reported in parentheses below coefficients and are calculated from clustered standard errors (Parente & Santos Silva, 2016). Year dummies are included but not shown. ***, **, * indicates statistical significance at the 1%, 5% and 10% level, respectively. All variables are defined in Appendix A1.

Appendix 5G: Logit Regressions of Social Capital (Top 10%) on Human Capital

	1 AGG^{Q90} LOGIT	2 AGG^{Q90} LOGIT	3 AGG^{Q90} LOGIT	4 AGG^{Q90} LOGIT
Constant	0.003***	0.001***	0.000***	0.000***
	(-17.61)	(-18.20)	(-16.96)	(-16.11)
HCI	1.417***	1.149***	1.300***	1.000
	(12.40)	(3.88)	(8.48)	(0.01)
FEM	1.719***	1.494	1.348	0.946
	(2.87)	(1.62)	(1.43)	(-0.21)
NZ	4.003***	1.320	9.851***	3.597***
	(7.39)	(1.21)	(8.49)	(4.20)
DIR		14.141***		20.110***
		(16.77)		(17.41)
AMV			1.436***	1.719***
			(9.46)	(9.88)
Observations	12,211	12,211	12,025	12,025
Pseudo R2	0.132	0.436	0.190	0.515
Log	-3,476	-2,258	-3,167	-1,895
Wald Chi2	189.4	419.2	351.9	588.2
p(F)	0.000	0.000	0.000	0.000
Year fixed effects	Y	Y	Y	Y

This table presents results for logit regressions where each observation represents a director for a given year between 2000 and 2015. The dependent variable equals one if a director is in the top 10% quantile of *Aggregate Connectivity* at time *t*, and zero otherwise. Odds ratios are reported representing the likelihood of a change in the dependent variable arising from a one-unit change in the independent variable. Z-statistics, displayed in parentheses below each odds ratio estimate, are based upon robust standard errors clustered at the director level. Year dummies are included but not shown. ***, **, * indicates statistical significance at the 1%, 5% and 10% level, respectively. All variables are defined in Appendix A1.

Appendix 6A: Methodology for Identifying Board Appointments

Board appointments are identified by fiscal year. For a given calendar year, a new appointment is counted if a director joins a firm's board before its fiscal year end. For example, Director number 3 joined Firm number 99 on the 10th of March, 2000. The reporting date for Firm 99 in the year 2000 is the 31st of March. Therefore, the *New Appt* dummy variable equals one for Director 3 in 2000. If a director joins a board after the fiscal year end but before the calendar year-end, a new appointment is observed in the following calendar year. For example, Director 2815 joined Firm 17 on the 13th of November 2014 while the reporting date for Firm 17 is the 31st of March. The *New Appt* dummy variable equals one for Director 2815 in 2015. This method follows the methods undertaken for measuring centrality as well as the human capital generated through director and executive appointments at the firms in the sample, such as director and CEO experience. We exclude 18 directors that have missing board appointment dates, which are largely alternate directors or directors of foreign companies.

Firm-Level Data

Firm ID	YEAR	Dir ID	Board Appt Date	Board Resign Date	Firm Report Date	Appt
99	2000	3	10/03/2000	27/03/2002	31/03/2000	1
17	2015	2815	13/11/2014		31/03/2015	1
20	2015	2815	12/10/2006	16/12/2015	31/03/2015	0
132	2015	2815	17/05/2011		30/06/2015	0

Director-level Data

Dir ID	Year	New_Appt	Directorships
3	2000	1	1
2815	2015	1	3

Appendix 6B: OLS Regressions for Number of Appointments on Centrality Measures

	1 N APPTS OLS	2 N APPTS OLS	3 N APPTS OLS	4 N APPTS OLS
Constant	-0.025*	-0.014	-0.005	-0.007
	(-1.76)	(-1.08)	(-0.38)	(-0.55)
DEG_{t-1}	2.638***			
	(3.03)			
CLO_{t-1}		0.160***		
		(4.24)		
BET_{t-1}			0.408	
			(0.95)	
EIG_{t-1}				0.138**
				(2.19)
HCI_{t-1}	0.006***	0.006***	0.007***	0.007***
	(5.42)	(5.58)	(6.10)	(6.36)
FEM_{t-1}	0.027**	0.027**	0.028**	0.028**
	(2.35)	(2.36)	(2.41)	(2.43)
NZ_{t-1}	0.046***	0.042***	0.045***	0.046***
	(8.87)	(8.34)	(8.35)	(8.71)
$DIR+2_{t-1}$	0.066**	0.095***	0.090***	0.098***
	(2.44)	(4.27)	(3.22)	(4.37)
N Exec Appts	1.113***	1.110***	1.112***	1.111***
	(16.28)	(16.20)	(16.35)	(16.29)
Observations	9,620	9,620	9,620	9,620
R2	0.086	0.086	0.084	0.085
Adj R2	0.084	0.084	0.082	0.083
F Stat	21.88	21.49	21.97	21.25
p(F)	0.000	0.000	0.000	0.000
Year fixed effects	Y	Y	Y	Y

This table presents results for OLS regressions where each observation represents a director for a given year between 2000 and 2015. The dependent variable is the number of board appointments. The *t*-statistics are reported in parentheses below coefficients and are based upon robust standard errors clustered at the director level. Year dummies are included but not shown. ***, **, * indicates statistical significance at the 1%, 5% and 10% level, respectively. All variables are defined in Appendix A1.

Appendix 6C: Horwath Simplified Corporate Governance Index

N	Governance categories	Yes	No
1	**Board of Directors**		
1.1	A board with the majority of independent directors	1	0
1.2	An independent chairperson; and	1	0
1.3	Met at least six times annually.	1	0
2	**Audit Committee**		
1.2	Existence of audit committee	1	0
2.2	With all the members, including the chair, independent;	1	0
2.3	With a chair, who is not also the chair of the main board	1	0
2.4	With at least three members;	1	0
2.5	That does not comprise the full board; and	1	0
2.6	That meets at least four times annually.	1	0
3	**Remuneration Committee**		
3.1	Existence of remuneration committee	1	0
3.2	With all the members, including the chair, independent;	1	0
3.3	With at least three members; and	1	0
3.4	That does not comprise the full board.	1	0
4	**Nomination Committee**		
4.1	Existence of nomination committee	1	0
4.2	With all the members, including the chair, independent;	1	0
4.3	With at least three members; and	1	0
4.4	That does not comprise the full board.	1	0

This table lists the 17 scoring components of the *Horwath CGI* measure of corporate governance employed in this thesis. The index is based on the Horwath Australian Corporate Governance Index. We follow Ahmed & Ali's (2017) version of this index to construct our corporate governance index: *Horwath CGI*.

Appendix 6D: Pearson Pairwise Correlations for Event Study Variables

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	CAR(-1,1)	1															
2	CAR(-2,2)	0.67	1														
3	CAR(-3,3)	0.48	0.79	1													
4	AGG_{t-1}	-0.17	-0.09	-0.08	1												
5	HCI_{t-1}	0.08	-0.05	-0.10	0.25	1											
6	FEM_{t-1}	-0.09	-0.10	-0.09	-0.10	0.05	1										
7	NZ_{t-1}	-0.20	-0.11	-0.07	0.16	0.02	0.07	1									
8	$DIR+2_{t-1}$	-0.09	-0.01	-0.02	0.67	0.16	-0.10	0.17	1								
9	Log Board Size	-0.06	-0.11	-0.15	0.15	0.20	0.08	-0.04	-0.15	1							
10	Horwath CGI	-0.03	-0.14	-0.18	0.10	0.34	0.19	0.00	-0.12	0.49	1						
11	Log Assets	-0.18	-0.15	-0.21	0.23	0.23	0.19	-0.05	-0.02	0.61	0.54	1					
12	Log MVE	-0.21	-0.16	-0.20	0.22	0.29	0.21	-0.10	-0.05	0.59	0.56	0.89	1				
13	Firm Risk	0.21	0.07	0.15	-0.25	-0.25	-0.17	0.01	-0.19	-0.19	-0.20	-0.47	-0.52	1			
14	Leverage	-0.06	-0.02	-0.06	-0.02	0.15	0.00	-0.07	-0.19	0.41	0.37	0.58	0.37	-0.06	1		
15	MTB	0.12	0.09	0.04	-0.09	0.06	-0.08	-0.19	-0.09	-0.06	0.02	-0.33	-0.02	0.13	-0.30	1	
16	ROA	-0.19	-0.05	-0.11	0.16	0.07	0.06	-0.04	0.17	0.05	0.12	0.24	0.23	-0.51	0.15	-0.42	1

This table presents Pearson pairwise correlations for the variables employed in the OLS regression analysis testing ***Hypothesis 2***. All variables are defined in Appendix A1.

Appendix 6E: OLS Regressions of Cumulative Abnormal Returns on Centrality Measures

	CAR(-1,1) OLS	CAR(-1,1) OLS	CAR(-1,1) OLS	CAR(-1,1) OLS
Constant	0.086*	0.090**	0.084*	0.094**
	(1.98)	(2.15)	(1.93)	(2.18)
DEG_{t-1}	-71.247			
	(-1.27)			
CLO_{t-1}		-7.356		
		(-1.20)		
BET_{t-1}			-28.612	
			(-1.21)	
EIG_{t-1}				2.721
				(0.71)
HCI_{t-1}	0.376***	0.381***	0.353***	0.363***
	(3.00)	(2.91)	(2.88)	(3.02)
FEM_{t-1}	-0.813	-0.654	-0.753	-0.64
	(-1.11)	(-0.89)	(-1.02)	(-0.82)
NZ_{t-1}	-2.185	-1.879	-2.054	-2.182
	(-1.64)	(-1.42)	(-1.52)	(-1.63)
$DIR+2_{t-1}$	-0.537	-1.091	-0.539	-1.505*
	(-0.50)	(-1.20)	(-0.46)	(-1.75)
Exec Appt	6.524	6.698	6.472	6.587
	(1.44)	(1.49)	(1.42)	(1.43)
Log Board Size	0.163	0.229	-0.018	-0.134
	(0.11)	(0.15)	(-0.01)	(-0.09)
Log MVE	-0.516*	-0.524*	-0.540**	-0.571**
	(-1.90)	(-1.93)	(-2.02)	(-2.07)
Horwath CGI	0.031	0.002	0.037	0.012
	(0.32)	(0.02)	(0.38)	(0.12)
Leverage	0.447	0.423	0.487	0.732
	(0.26)	(0.23)	(0.28)	(0.41)
Firm Risk	14.668	11.899	15.168	14.116
	(0.36)	(0.30)	(0.37)	(0.34)
ROA (Wins)	0.434	0.501	0.43	0.699
	(0.17)	(0.19)	(0.17)	(0.28)
MTB	0.026	0.082	0.051	0.055
	(0.11)	(0.36)	(0.22)	(0.24)
Observations	130	130	130	130
R2	0.419	0.421	0.418	0.413
Adj R2	0.194	0.197	0.193	0.186
F Stat	1.97	2.37	2.4	2.3
p(F)	0.005	0.001	0.000	0.001
Industry fixed effects	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y

This table reports the results for OLS regressions of the average market reaction to an appointed director on the four centrality measures *DEG*, *CLO*, *BET EIG*, measured at *t-1* relative to the appointment, and director, board and firm characteristics. CARs represent the abnormal returns measured using the market-adjusted returns model over the (-1,1) event window. The *t*-statistics are reported in parentheses below coefficients and are based upon robust standard errors. Year and industry dummies are included but not shown. ***, **, * indicates statistical significance at the 1%, 5% and 10% level, respectively. All variables are defined in Appendix A1.

Appendix 7A: Robustness Tests using Different Measures of Board Connectivity

	1 ROA_{t+1}	2 ROE_{t+1}	3 TSR_{t+1}
Panel A: Degree Centrality			
DEG	6.994***	13.475**	7.307
	(3.02)	(2.28)	(1.43)
Panel B: Closeness Centrality			
CLO	0.491***	0.703***	0.460**
	(5.27)	(2.58)	(2.01)
Panel C: Betweenness Centrality			
BET	0.916	2.362	-0.992
	(1.43)	(1.41)	(-0.64)
Panel D: Eigenvector Centrality			
EIG	0.370***	0.466*	0.739**
	(3.27)	(1.71)	(2.39)
Panel E: Dependent variable is the maximum AGG measure of the board			
AGG Max	0.018***	0.023**	0.012
	(5.32)	(2.48)	(1.38)
Panel F: Dependent variable is AGG orthogonal to board size			
AGG Orthog	0.028***	0.047***	0.022
	(4.80)	(2.95)	(1.48)
Observations	1,547	1,530	1,542
Average R2	0.174	0.113	0.144
Average Adj R2	0.155	0.092	0.124
Controls	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes

This table reports results for OLS regressions of firm performance measured at *t+1* on several different measures of social connectivity employing Equation (7.1). The social connectivity measures include *DEG*, *CLO*, *BET*, *EIG*, *AGG Max* and *AGG Orthog*. T-statistics are displayed in parentheses below each coefficient estimate and are based upon robust standard errors. Significance levels are denoted by *, **, and *** for 10%, 5%, and 1% confidence levels, respectively. All variables are defined in Appendix A1.

Appendix 7B: Board Skills Index

Explanation	Skill No	Variable	Obs	Mean	Std. Dev.	Min	Max	Measurement
Index of how many different skills are on the firm's board generated by a skills matrix.	1 to 20	Board Skills Index	2238	12.14	2.55	3	20	Count variable = The board has at least one director with skill 1 to 20
The director is from academia or has a PhD.	1	Academic and Research	2238	0.32	0.46	0	1	Academic is primary or secondary occupation, hasPhD = 1
The director has (prior) CEO experience at a public company.	2	CEO Public Company	2238	0.79	0.41	0	1	Prior Listed CEO experience
The director is a professional director or has corporate governance skills or experience.	3	Corporate Governance	2238	0.63	0.48	0	1	Professional Director = 1, plus bio word search "corporate governance"
The director has entrepreneurial experience.	4	Entrepreneurial	2238	0.60	0.49	0	1	Founders listed and unlisted firms
The director has financial acumen.	5	Financial Acumen	2238	0.98	0.15	0	1	Accountant, banker, economist is primary or secondary occupation or banking & finance industry experience = 1 or financial expert = 1
The director has general management or business experience.	6	General Management	2238	0.92	0.26	0	1	General executive is primary or secondary occupation
The director has governmental, policy, or regulatory experience.	7	Government & Policy	2238	0.37	0.48	0	1	Politician as primary or secondary occupation, word searches "governmental", "regulation", "public policy", "trade policy", "government affairs", "local government", "government advis", "regulatory", "government appoin", "experience with government bodies", "policy advis".
The director is experienced in the firm's business or industry.	8	Industry Experience	2238	0.96	0.19	0	1	Experience in same industry as firm, inside director (Exec_onboard or CEO_onboard = 1)
The director has international experience.	9	International Experience	2238	0.87	0.33	0	1	Int_experience = 1
The director has legal expertise.	11	Law	2238	0.45	0.50	0	1	Lawyer is primary or secondary occupation
The director is someone that has leadership skills/experience.	10	Leadership	2238	0.94	0.23	0	1	All prior CEO-level experience plus bio word searches "leaderships skill, leadership experience, business leader", leadership awards.
The director has mergers and acquisitions experience at an NZ listed company	12	M & A Experience	2238	0.74	0.44	0	1	manda >0

The director has marketing and sales skills/experience or knowledgeable in marketing activities.	13	Marketing or Public Relations	2238	0.53	0.50	0	1	word searches "marketing", "advertising", "public relations", marketing (honours and awards), "marketing" (current position in firms), CMOs
Experience in business operations assumed to be on every board.	14	Operations	2238	1.00	0.00	1	1	Assumed all boards will have this skill (Adams, 2017)
The director has risk management experience or expertise.	15	Risk Management	2238	0.21	0.41	0	1	Word searches in biographies and education ", risk management", "actuar", "actuar" (Education)", "FIA (Education)", "experience in risk","expertise in risk", "risk management exper", "risk management adv", "hedg", "risk management" (excl risk management comm), "risk assessment"
The director has scientific or engineering experience or expertise.	16	Scientific	2238	0.37	0.48	0	1	Scientist or Engineer is primary or secondary occupation
The director is a strategy expert.	17	Strategy	2238	0.28	0.45	0	1	Consultant is primary or secondary occupation (filter), with biography word search "strateg"
The director has experience in the technology industry.	18	Technology	2238	0.30	0.46	0	1	Technology Industry experience = 1
The director is an executive of another NZ listed firm.	19	Outside Executive	2238	0.25	0.43	0	1	Executive = 1 and is not focal firm's executive
The director has outside board experience (is also on the board of another NZ listed firm).	20	Outside Directorship / Interlock	2238	0.62	0.49	0	1	Directorships >1

THE END