The role of social and human capital in assessing firm value: A longitudinal study of UK firms

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I certify that all material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

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Abstract

This study examines the role of board social and human capital in assessing the market value of firms in the UK context. As the world economy has shifted from manufacturing to service and knowledge-based economies, attributes such as knowledge, expertise, skills, ability and reputation are increasingly fundamental to the success of business enterprises. There is a growing consensus that these attributes are an increasingly valuable form of capital, asset or resource, despite their intangibility. In accounting, there are a number of problems arising from the accountability of non-physical, non-financial capital. Firstly, some forms of capital and certain assets are neither recognised nor presented in the statement of financial position. Secondly, some accounting practices relating to intangible assets are very conservative, resulting in undervalued assets and overstated liabilities. Consequently, there is an increasing gap between the book value and market value of firms. This gap restricts the relevance of information presented in financial statements and suggests that there is something missing in financial statements. This is the research problem being addressed in this study.

While prior literature demonstrates that it has proven difficult to operationalise intangible forms of capital, there has been significant empirical attention and theoretical development in social and human forms. This thesis aims to contribute to accounting theory and practice by exploring the impact that board social and human capital have on firm market value. In light of extant research, it is hypothesised that social and human capital possessed at board level are positively related to the market value of firms. This study employs the Ohlson's (1995) residual income valuation model to test the impact of social and human capital using a sample of UK firms listed on the FTSE All Share index for a period of 10 years (2001-2010). Social and human capital measures are derived from interlocking directorate ties and detailed biographic information of board directors. This study benefits from Pajek and Ucinet network packages to generate network maps and calculate positional metrics such as centrality and structural hole measures.

Keywords: Social capital, Human capital, Firm valuation, FTSE All Share, Board of directors, Social network theory

Dedication

This thesis is dedicated to my parents (Mrs. Hatun Gundogdu and Mr. Hasan Gundogdu), whose everlasting love and support sustained me throughout my journey to completion of this study.

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List of Abbreviations

ASB - Accounting Standards Board

CAPM - Capital Asset Pricing Model

CEO - Chief Executive Officer

CSR - Clean Surplus Relation

DDM - Dividend- Discounting Model

EMH – Efficient Market Hypothesis

FASB - Financial Accounting Standards Board

FRS - Financial Reporting Standards

FVA - Fair Value Accounting

GAAP - Generally Accepted Accounting Principles

IAS – International Accounting Standards

IASB - International Accounting Standards Board

IFRS- International Financial Reporting Standards

LID - Linear Information Dynamics

MBAR - Market-based Accounting Research

MM - Miller-Modigliani

OHC - Organisational Human Capital

OLS - Ordinary Least Squares

OM - Ohlson Model

OSC - Organisational Social Capital

PAT - Positive Accounting Theory

R&D - Research and Development

RI - Residual Income

RIVM - Residual Income Valuation Model

SHRM - Strategic Human Resource Management

SFAS - Statement of Financial Accounting Standards

SNA - Social Network Analysis

SSAP - Statements of Standard Accounting Practice

TMT - Top Management Team

UK - United Kingdom

US - United States

CHAPTER ONE

OVERVIEW OF THE THESIS

1.1 INTRODUCTION

This study explores the role of social and human capital in explaining the market value of firms. This thesis advances research on organisational social and human capital by examining how, over time, market performance in terms of equity price is affected by interlocking directorates and knowledge, skills, abilities and other characteristics of directors on a firm's board. This research is motivated by the debate on non-recognition of intangibles in financial statements. Current systems of accounting and financial reporting are often criticised for being insufficient to support business models that are largely driven by innovation and intangibles (Davison, 2010; Zeghal and Maaloul, 2011). The accounting problem regarding intangibles emerges from the need to provide relevant and faithfully represented information on the intangible dimension of businesses. Over the last two decades, a large number of accounting researchers have focused on investigating the empirical relation between firms' market values (or changes in values) and specific accounting figures to identify whether the use of such figures can improve financial reporting. Since current accounting standards provide a narrow framework to deal with intangibles and are often inadequate in recognising a wider range of intangibles such as social and human capital, this study links two major research streams to investigate to what extent non-physical, non-financial forms of capital (social and human capital) are value-relevant.

This chapter provides an overview of social and human capital, and a background to the board of directors and market-based accounting research. It clarifies the theoretical context, illustrates the general focus of the study, describes the aims and the objectives of the research, emphasises the academic interest and significance of the study, and concludes with a description of the thesis structure.

1.2 RESEARCH CONTEXT

1.2.1 Introduction

This section briefly presents the theoretical foundations for the research, namely social and human capital, corporate governance and board of directors, and market-based accounting research.

1.2.2 Social and Human Capital

This thesis focuses on social and human capital as two distinct but interrelated forms of non-physical, non-financial capital, which have been subject to significant theoretical development and empirical interest in many disciplinary areas including management, marketing, entrepreneurship, economics, accounting and finance. Social capital refers to the ability of actors to secure benefits by "virtue of membership in social networks or other social structures" (Portes, 1998: 6). Extant organisational research has confirmed the importance of social capital in various contexts, including acquiring information and integrating knowledge (Nahapiet and Ghoshal, 1998; Newell, Tansley and Huang, 2004; Uzzi, 1997), innovation (Gabbay and Zuckerman, 1998; Laursen, Masciarelli and Prencipe, 2012; Tsai and Ghoshal 1998), leadership development (Leitch, Mcmullan and Harrison, 2013) and enhancing firm performance (Cao, Ding and Zhang, 2016; Maurer and Ebers, 2006; Stam, Arzlanian and Elfring, 2014; Walker, Kogut and Shan, 1997).

Human capital, on the other hand, concerns knowledge, skills, abilities and other characteristics of an individual, which provides that individual with positive outcomes (Coff, 2002). At the organisational level, human capital refers to "the aggregate accumulation of individual human capital that can be combined in a way that creates value for the unit" (Wright and McMahan, 2011: 95). Research in organisational theory and strategy has widely adopted this macro perspective and examined the link between human capital and organisational performance (Coff 1997, 1999; Hatch and Dyer, 2004; Kroll, Walters and Wright, 2008; Wright, McMahan and McWilliams, 1994).

There is a growing body of research that examines human and social capital possessed at board level (Johnson, Schnatterly and Hill, 2013). Since boards' actions and activities are perceived as influencing organisational performance and outcomes (Chen, 2014; Core, Holthausen and Larcker, 1999; Fich and Shivdasani, 2006), organisational human and social capital are often captured by examining the individuals that comprise the board of directors (Stevenson and Radin, 2009). This body of research focuses on demographic, human and social capital attributes of corporate boards and refers to these attributes as an increasingly important form of capital despite their intangible nature. To effectively capture social capital embedded in corporate boards, studies have often focused on organisational ties built through interlocking directorships (Lester et al., 2008). Interlocking directorships are perceived as strategically important given that organisations exchange ideas, resources and practices through such ties (Chandler et al., 2013). Acknowledging the increasing importance of intangible forms of capital, the following section provides a brief introduction to the literature on board of directors and board interlocks.

1.2.3 Corporate Governance and Board of Directors

Over the last two decades, research on corporate boards, director selection and performance has gained significant prominence in a variety of disciplines including management, accounting and finance (Withers, Hillman, and Cannella, 2012). This research stream broadly focuses on the composition of directors' demography, human capital and social capital, and explores how these attributes influence outcomes at individual and organisational level (Johnson, Schnatterly and Hill, 2013). Despite having been explored from various perspectives, literature on corporate boards lacks a strong consensus as to what an optimum board should look like (Donnelly and Mulcahy, 2008; Johnson, Schnatterly and Hill, 2013). To extend the understanding of boards' social attributes, scholars have used social network theory to investigate the link between directors' social capital and performance at individual and/or organisational level (e.g. Patel and Terjesen, 2011; Stam, 2010; Tian, Haleblian and Rajagopalan, 2011). A network perspective on boards of directors provides researchers with valuable insights into notions of power, trust and legitimacy by enlightening the dynamics of corporate behaviour and influence both within organisations (Hillman and Dalziel, 2003), and the sharing of resources and dissemination of information and strategies across organisations (Carpenter and Westphal, 2001).

Extant empirical research has typically focused on exploring the impact of board attributes such as social capital on firm-level outcomes, strategy and operating performance (see variously Haynes and Hillman, 2010; Machold et al., 2011; Pugliese et al., 2009; Stevenson and Radin, 2009). To date, most research has been conceptual and the link between characteristics of corporate boards and market value has received limited attention (e.g. Haynes and Hillman, 2010; Horton, Millo and Serafeim, 2012; Johnson, Schnatterly and Hill, 2013). The work of Zajac and Westphal (2004) provided a social constructionist view of financial market behaviour by maintaining that theories of capital markets have been dominated by a financial economics perspective in which the stock market's reaction is deemed a reliable, historically invariant indicator of the efficiency benefits gained (Zajac and Westphal, 2004: 434). More recently, the number of studies adopting a sociological perspective on capital markets has been rising, with scholars emphasising the significance of how investment behaviour is driven by the social dynamics of financial markets[1] (Beunza, Hardie and MacKenzie, 2006; Hardie and MacKenzie, 2007; Horton, Millo and Serafeim, 2012;

[1] See Vollmer, Mennicken and Preda (2009) for a review of advances in the emergent field of social studies of accounting and finance.

MacKenzie 2006). Following this research stream, this thesis seeks to contribute to the sociology of markets and organisations by exploring the link between organisational human capital, organisational social capital that is created and developed through interlocking directorate ties and firm market value.

1.2.4 Market-based Accounting Research

Capital markets-based research in financial accounting has a history of more than five decades and researchers' interest continues to increase as a consequence of the current issues in financial reporting. In general, market-based accounting research examines the relationship between accounting information and key market variables, such as the share price of a firm, the rate of return on its shares over a given period, or the systematic risk of its shares. Fundamental areas in market-based accounting research include value relevance studies, event studies and accounting disclosure studies. This study benefits from and contributes to the literature on value relevance research and examines the value relevance of information on firms' social and human capital stocks in the UK context. There are two primary motivations for the progress of valuation research in addressing financial reporting issues (Barth, 2000). Firstly, investors constitute a large group of financial statement users and are mostly interested in information that can assist them in evaluating the underlying economics of a firm and making sound investment decisions. Secondly, researchers can construct their research designs on a solid foundation, which has been advanced by a large amount of research on valuation (Barth, 2000).

Over the last two decades, a large number of accounting researchers have focused on investigating the empirical relation between firms' market values (or changes in values) and specific accounting figures to identify whether the use of such figures can improve financial reporting and therefore contribute to the development of accounting standards. This category of research, inspired by standard-setting objectives to a certain extent, is referred to as the *value-relevance* literature (Holthausen and Watts, 2001). In value-relevance literature, the majority of studies include an explicit statement of their standard-setting motivations but in other studies, this motivation is implicit. This thesis also aims to make a contribution to the improvement of standard setting through an examination of the value relevance of information on firms' human and social capital possessed at board level.

Akin to any type of research, the value-relevance literature is based on a number of underlying theories: efficient market hypothesis (EMH); capital asset pricing model (CAPM); and arbitrage pricing theory (APT). There are two different theories of accounting and standard setting that are used by value-relevance studies to formulate hypotheses: (1) direct valuation theory, and (2) inputs-to-equity valuation theory (Holthausen and Watts, 2001). In direct valuation theory, accounting earnings are expected to either measure or be highly associated with changes in or levels of equity market value (via permanent income). Underlying this theory is the assertion that the book value of equity is also expected to either measure or be highly associated with equity market values. Since the disparity between market and book value of a firm's equity has long been subject to considerable debate, the relative stock price relations of alternative accounting earnings or equity book value provide a fruitful area of investigation for accounting researchers.

In inputs-to-equity valuation theory, the fundamental objective of accounting is to provide information on inputs, which can be used in valuation models by investors. Underlying this theory, empirical studies that find an accounting figure or a potential accounting figure to be useful in valuing firm equity could provide insights to improve financial reporting. Such a deduction entails a valuation model and an assumed relationship between the accounting number and the variable included in the valuation model. An inputs-to-equity valuation approach is adopted in this study. Network measures, namely centrality and structural hole measures, are used as a proxy for organisational social capital, and organisational human capital is captured through an examination of directors' demographic characteristics. This study examines whether information on organisational social and human capital, being other information in the Ohlson (1995) Model, helps to explain the market value of firms.

1.3 FOCUS OF THE STUDY

Since 1980s, there has been an increased interest in the contribution of executives to the organisational outcomes (Bryman, 1992; Haynes and Hillman, 2010; Shropshire, 2010; Tang, Crossan and Rowe, 2011). The interest in boards of directors has become more evident in the UK and the US than elsewhere, where boards are placed at the heart of a number of accounting scandals involving major public companies and corporations (Lorsch and MacIver, 1989). One of the basic propositions in social network theory is that social dynamics play an important role in driving investment behaviour (Beunza, Hardie and MacKenzie, 2006; Hardie and MacKenzie, 2007; Horton, Millo and Serafeim, 2012; MacKenzie, 2006). This study examines whether organisational social capital in the form of board connectivity and organisational human capital possessed at board level have a significant impact on firm market value.

1.4 RESEARCH AIM AND OBJECTIVES

The primary aim of this study is to empirically examine the relationship between organisational social capital, organisational human capital and market value of firms in the UK context. This study also aims to explore the demand for well-connected and high human capital directors. Furthermore, it offers valuable insights into what a successful board looks like.

In broad terms, the research objectives can be stated as follows:

1) An investigation of the demand for director social and human capital in the UK context.
2) An investigation of the relationship between organisational social capital, human capital and firm market value in the UK context.

3) An investigation of the relationship between organisational social capital, human capital and firms' market value during times of crisis.

1.5 STATEMENT OF SIGNIFICANCE

This thesis makes a contribution to the management and accounting literature by conducting an interdisciplinary research that links intangible forms of capital to firm valuation in order to explore the impact non-physical, non-financial forms of capital have on market value of firms. To the best of the author's knowledge, this is the first study that develops an integrative framework that considers the impact of non-physical, non-financial capital (namely social and human capital) on the market value of firms through the use of a residual income valuation model. The framework comprises both demographic and social attributes of board members and links these attributes to firm market value as an organisational outcome. Unlike other studies, which focus on CEOs or top management teams (TMTs), this study focuses on boards of directors given their importance to the firms and their strategies.

Following the sociological perspective on capital markets; this study benefits from the literature on social construction of market value and social network theory. This study also differs from prior studies in that a number of network measures, namely centrality and structural hole measures, are used to determine which network positions are the most advantageous to firms. Prior research explored the impact of board connectivity on performance indicators such as average annual return and return on assets growth (Larcker, So and Wang, 2013), and total stock return, market to book ratio and return on assets (Horton, Millo and Serafeim, 2012).

Furthermore, the proposed theoretical framework is empirically tested for a sample of UK firms listed on FTSE All Share index for a period of 10 years (2001-2010). This study adds to the

UK literature on the link between board connectivity[2] and firm performance by examining a longer and more recent time period, which also comprises the period leading up to the 2008 global financial crisis. This time period makes this analysis interesting as it allows the identification of differences between the impacts of social and human capital on firms' market value that was/is observed during financial crisis and non-crisis periods. Hence, this study aims to provide meaningful insights into the relationship between social and demographic attributes of board members and firms' market value with important implications to academics and firms in board processes. Despite failing to provide a comprehensive understanding of the internal aspects of board decision-making, this study offers a better understanding of and useful suggestions for effective director selection, which is outlined in section 9.4.2 of Chapter Nine.

This study also makes a methodological contribution. It adds to extant literature on value relevance research by examining the value relevance of information on organisational social and human capital in the UK. Network measures are used to capture social capital at organisational level. Organisational human capital, on the other hand, is captured through an examination of directors' demographic characteristics. Social and human capital proxies are included as "other information" in an extension of the Ohlson (1995) model, and their impacts on firm market value are tested for a period of ten years (2001-2010).

1.6 STRUCTURE OF THE THESIS AND ORDER OF PRESENTATION

This thesis is structured in eight chapters in order to reflect the main aim and objectives of this study.

Chapter One introduces the overview and the background of the study. It presents its aims and research objectives and also refers to academic interest and significance of the study.

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[2] Horton, Millo and Serafeim (2012) examine the impact of director connectivity on directors' compensation levels and firms' overall performance for a sample of UK firms during the period from 2001 to 2007.

Chapter Two examines thoroughly the existing literature in the area of social and human capital and boards of directors. It presents the main issues of the study: the origins of social capital theory; definitions of social capital, organisational social capital, social network theory and social network analysis; the origins of human capital theory; definitions of human capital, organisational human capital; dimensions of organisational human capital; and conceptual and empirical contributions to human capital theory. Furthermore, it proposes a theoretical model.

Chapter Three explores the demand for social and human capital with a particular focus on well-connected and skilled board directors. The chapter provides a review of the costs associated with acquiring and/or maintaining higher levels of social capital as well as enjoying the benefits acquired through the board interlocks. Extant research on the increasing need for high-skilled directors in the era of knowledge and technology is discussed in the remainder of the chapter.

Chapter Four begins with a review of the reflections on alternative perspectives in accounting. It then goes on to examine the concept of intangibles in accounting and accounting treatment for intangible assets based on the UK Generally Accepted Accounting Principles (GAAP) and International Financial Reporting Standards (IFRS). Following the review, the remainder of the chapter focuses on the market-based accounting research and sheds light on the value-relevance literature with a particular focus on the Ohlson (1995) Model.

Chapter Five is dedicated to hypotheses development. First, hypotheses are presented on the demand for social and human capital at the individual level. Second, the chapter presents the hypotheses on the demand for director social and human capital at the firm level. Third, hypotheses are developed relating to the association between board social and human capital and firm market value. The chapter concludes with a summary of the hypotheses that will be tested in this study.

Chapter Six describes the key aspects of research design, focusing on the foundations of the Ohlson (1995) Model and its empirical specifications in the UK. The chapter starts with a rigorous theoretical examination of accounting-based equity valuation models and goes on to explore how the Ohlson Model is developed on the foundations of Residual Income Valuation Model. Next, the chapter concentrates on the role of 'other information' (*v* term) in explaining market prices and examines the different specifications of *v* term based on prior empirical research. Following the examination of empirical specifications of the *v* term, advantages and disadvantages associated with each estimation method are discussed. Finally, the chapter concludes by providing a benchmark model to examine the role of 'other information' in the context of this study.

Chapter Seven provides insights into the accounting research and illustrates the proposed methodology for the analysis. Next, the chapter elaborates on the research design used to test hypothesised relationships in the statistical model(s) specified in Chapter Six. The major themes in this chapter comprise accounting research, research design, sample and data, and operational measures.

Chapter Eight presents and discusses descriptive statistics and multivariate statistical methods used in data analyses. Results of main effects models are discussed in relation to hypothesised relationships. Furthermore, results for financial crisis and non-crisis subsamples are presented and discussed in this chapter. The remainder of the chapter presents sensitivity checks and concludes with a summary of the findings.

Chapter Nine summarises the key findings from the analyses and highlights the contributions and limitations of the study. The chapter also discusses the implications of the study relating to academic and management practice. Finally, it makes a number of suggestions for further research and concludes by offering new insights into board of directors' research.

1.7 CONCLUDING REMARKS

The introductory chapter serves as a plan for the thesis. It presents a background of the research area and introduces the aims and research objectives. It underlines the contribution of the thesis and concludes with presenting the structure of the thesis.

CHAPTER TWO

THEORIES OF SOCIAL AND HUMAN CAPITAL

2.1 INTRODUCTION

This chapter provides the basis for understanding non-financial forms of capital by examining social and human capital as two widely acknowledged forms. These forms have been subject to significant empirical attention and theoretical development in a wide range of social science disciplines such as management, marketing, entrepreneurship, economics, accounting and finance. As the world economy has shifted from manufacturing to service and knowledge-based economies, attributes such as knowledge, expertise, skills, ability and reputation are increasingly fundamental to the success of organisations. Recently, these attributes have been given significant prominence at board level (Johnson, Schnatterly and Hill, 2013). Despite their intangibility, there is a growing body of research that refers to demographic, social and human capital attributes of corporate boards as an increasingly valuable form of capital (also referred to as board capital[3]).

This thesis seeks to examine whether social and human capital embedded in corporate boards are linked to the market value of firms. Market value (per share) is defined as the current quoted price at which investors buy or sell a share of common stock at a given time. It is also referred to as the "market price". Market value reflects what investors think a firm is worth. Given the increasing importance of intangible forms of capital as key drivers of firm value, market price has been selected as the dependent variable in this study.

Social and human capital are determined as key variables in this study for a number of reasons. Firstly, extant empirical research provides supporting evidence on the impact of human capital

[3] Building on the earlier work of Hillman and Dalziel (2003), Haynes and Hilman define board capital as "the composite of the human and social capital of the board of directors, is intended to capture the ability of the board to provide resources to the firm" (Haynes and Hillman, 2010: 1145).

on corporate outcomes (Kroll, Walters and Wright, 2008; McDonald, Westphal and Graebner, 2008; Westphal and Fredrickson, 2001). Human capital is the earliest form of non-physical, non-financial capital, which has been theoretically developed and empirically tested. Secondly, social capital, defined as the benefits acquired through a network of relationships, has received considerable attention as another crucial form of non-physical, non-financial capital possessed at board level (Lester et al., 2008; Stevenson and Radin, 2009; Wincent, Anokhin and Örtqvist, 2010). Thirdly, prior research on board capital highlights that simultaneous analyses of human and social capital have been limited (Kor and Sundaramurthy, 2009; Tian, Haleblian and Rajagopalan, 2011). Hence, social and human capital, as two distinct but interrelated forms of non-physical, non-financial capital, have been selected and analysed as the key constructs in this study.

The remainder of the chapter is structured as follows: the chapter begins with social capital theory and comprises the origins of social capital theory, definitions of social capital, organisational social capital, social network theory and social network analysis. Then, the chapter goes on to explore the origins of human capital theory, organisational human capital and dimensions of organisational human capital. The chapter concludes with conceptual and empirical contributions to human capital theory.

2.2 SOCIAL CAPITAL THEORY

2.2.1 The Origins of Social Capital Theory

The concept of social capital has been applied in a wide range of social science disciplines, including economics, sociology and politics (Coleman, 1988; Gabbay and Leenders, 1999; Helliwell and Putnam, 2004; Lee, 2009; Nahapiet and Ghoshal, 1998; Portes and Sensenbrenner, 1993; Putnam, 2000; Woolcock and Narayan, 2000), to understand a wide range of social phenomena such as schooling and education, public health, community life, democracy and governance, economic development and problems arising from collective action (Adler and Kwon, 2002). Furthermore, early usage of the concept in an economics context appears to explain the differences among individuals in acquiring access to opportunities through their personal ties (Loury, 1977). Portes (2000) emphasises the diffusion of social capital into different fields by noting that “the concept of social capital is arguably one of the most successful ‘exports’ from sociology to other social sciences and to public discourse” (Portes, 2000: 1). Social capital theory fundamentally derives from the idea that individuals or communities can obtain positive outcomes from their involvement and participation in groups. Despite being anchored in early sociological thinking, it is important to explore how social capital theory has evolved over the last few decades and why the concept has become increasingly popular in recent years (Adler and Kwon, 2002; Johnson, Schnatterly and Hill, 2013; Tian, Haleblian and Rajagopalan, 2011). Hence, rather than exploring the foundations of social capital theory in classical literature, this chapter goes on to examine theoretical and empirical developments by contemporary theorists of social capital.

2.2.2 Definitions of Social Capital

Social scientists have proposed several definitions of social capital in an attempt to clarify what is meant by this “wonderfully elastic term” (Lappe and Du Bois, 1997: 119). Despite its general use, the term ‘social capital’ has been assigned very different meanings by different authors and there is only limited consensus in extant literature as to what should be understood by the term ‘social capital’ (Adler and Kwon, 2002; Narayan and Pritchett, 1997). Social capital theorists have provided different definitions of social capital. Distinguishing between the substance, sources and effects of social capital is critical to prevent ambiguity and tautology arising from contradictory definitions (Robison, Schmid and Siles, 2002). Proposed definitions of social capital demonstrate divergence in relation to their central focus, being placed on the substance, sources or effects of social capital. While these definitions have some attributes in common, they comprise subtle differences (Adler and Kwon, 2002). In their extensive review, Adler and Kwon (2002) examine various definitions of social capital and categorise them depending on whether their focal point is on internal, external, or both types of linkages. These categories and related definitions of social capital are presented in Table 2.1 (see Appendix I).

- Insert Table 2.1 about here -

As demonstrated in Table 2.1, the definitions of social capital primarily vary depending on whether they focus principally on (1) the relations an actor maintains with other actors (external ties), (2) the structure of relations among actors within a collectivity, or (3) both types of relations (Adler and Kwon, 2002). In the first group, the external ties of an actor relate to "bridging" forms of social capital which regard social capital as a resource or sum of resources embedded in an actor's ties to other actors. In the second group, the internal ties within a collectivity relate to "bonding" forms of social capital which deem social capital inherent in collective actors' characteristics. In the third group, relations among actors are defined without a specific reference to internal and external distinction. These three perspectives are core to understanding the different conceptualisations of social capital and are further discussed below.

Putnam (2000) suggests that bridging social capital is useful for "getting ahead" whereas bonding social capital is particularly important for "getting by". The bridging view on social capital focuses on a focal actor's ties to external parties and refers to social capital as a resource or set of resources that can be obtained through such ties in the network (Bourdieu, 1986; Burt, 1992; Knoke, 1999). The general consensus in social capital debate is that bridging social capital emerges in open and heterogeneous networks, whereas dense and homogeneous networks build and cultivate bonding social capital (Burt, 1992; Burt, 1997a, 1997b; Coleman, 1988; Putnam, 2000). The idea intrinsic to bridging forms of social capital is not considered as new. The bridging view shares some similarities with Granovetter's (1973) work on *The*

Strength of Weak Ties[4] which also emphasises the significance of weak ties in providing access to different resources and new information through bridging otherwise disconnected groups or individuals. This work is further advanced by Burt to develop his theory of structural holes, where social capital is seen as “a function of brokerage opportunities in a network” (Burt 1997a: 340). .

Definitions with an emphasis on the bridging aspect (external linkages) have often been adopted to explore whether social capital can explain the differences within individuals’ career success and access to different sources of information and regional development (Burt, 1997a; Narayan, 1999; Woolcock, 1998). Although the bridging view is often used to conceptualise social capital as a private good (Belliveau, O’Reilly and Wade, 1996; Burt, 1997a; Useem and Karabel, 1986), it is also emphasised that outward linkages can be of great importance to the creation of collective benefits for organisations, societies and communities.

In contrast to the bridging view, the bonding view focuses on a collective’s inward linkages as the primary source of social capital. The proponents of the bonding view define social capital as embedded in the internal characteristics of a collectivity (both structural and relational) which enhance coordination and co-operation within the collectivity, and therefore generate mutual benefits (De Carolis, Litzky and Eddleston, 2009; Fukuyama, 1995; Payne et al., 2011; Putnam, 1995). The central assertion in bonding social capital is that there are sufficient levels of associability and trust among individuals or groups within a collectivity to ensure the pursuit of collective goals (Lee, 2009; Szreter and Woolcock, 2004). In the bonding view, the social solidarity developed and cultivated through the social capital within a collectivity is an

[4] Granovetter (1973) maintains that there can be vast strength in weak ties, specifically among higher socio-economic groups. His research demonstrates that weak ties play an important role in upper-level professional and managerial employees’ opportunities for mobility through connections such as distant relatives or remote acquaintances. Distant relatives or acquaintances, compared to close friends, tend to move in different circles of connections, and therefore are more likely to create advantages. Granovetter (1973) also highlights that weak ties existing in low socio-economic groups are not necessarily linked to other networks, thus do not exert great influence on opportunities for mobility (Knoke, 1990; Marsden and Lin, 1982; Wellman, Carrington and Hall, 1988).

important element which leads to the pursuit of collective goals and positive outcomes, such as improvement in economic and employment conditions of different ethnic groups, poverty reduction, and declines in gender and race inequality (Narayan, 1999). However, it is worth noting that the benefits of social capital are balanced between the needs of the individual and the needs of the collective (e.g. organisations) through various dynamics as emphasised in the studies of Cao, Simsek and Jansen (2012) and Leena and Van Buren (1999).

The third group comprises of definitions which do not distinguish between internal and external dimensions of social capital. This approach is adopted in the definitions provided by Adler and Kwon (2002), Nahapiet and Ghoshal (1998), Pennar (1997) and Woolcock (1998). Adler and Kwon (2002) argue that this neutrality can be more beneficial in analysing the concept of social capital since both bridging and bonding aspects are likely to influence individual or collective actors' actions in a network. On the other hand, some studies[5] maintain that there should be a separation between the bridging and bonding aspects of social capital to develop a better understanding of how social capital functions in specific contexts (Edelman et al., 2004; Newell, Tansley and Huang, 2004).

This thesis adopts the definition provided by Burt (1992: 9) which refers to social capital as "friends, colleagues, and more general contacts through whom you receive opportunities to use your financial and human capital". Burt's definition is adopted based on a number of reasons. Firstly, the central aim of this thesis is to examine whether non-financial, non-physical forms of capital, which are not included in the financial statements, contribute to the market value of the firm. Burt's (1992) definition allows social capital to be conceptualised as a valuable

[5] One of these studies that advocate the separate treatment of bridging and bonding social capital is Newell, Tansley and Huang (2004). They argue that bonding social capital is "a prerequisite for using the knowledge that team members may access from their individual networks outside the project team, since knowledge integration must involve dialogue and negotiation" (Newell, Tansley and Huang, 2004: 55). In other words, for the public good of a collective, bonding social capital among the individuals or groups within the collective is deemed to facilitate the use of resources and information acquired through bridging social capital.

instrument that complements and enhances the use of financial and human capital through the opportunities received. Secondly, this definition identifies the source of social capital as "friends, colleagues, and more general contacts" and focuses on the structure of actors' social ties. This focus provides a sound basis for the use of social network theory and, in particular, for the use of interlocking directorates in this thesis.

Thirdly, Burt (1992) provides a definition of social capital that focuses on the external dimension of social capital. This is particularly important since this thesis explores the impact of organisational social capital that is developed and accumulated through the structure of organisations' external ties. Despite adopting an external focus, it is worth emphasising that the internal dimension of organisational social capital is also vital to understanding how organisations derive benefits from the social relationships existing among actors within the organisation. Another reason for adopting Burt's conceptualisation of social capital lies in the fact that the effects of social capital are recognised in two dimensions, namely information and control. Based on these dimensions, the consequences of organisational social capital are examined more efficiently and network measures are selected accordingly.

Finally, this definition allows this thesis to explore the importance of social capital, a theoretically and empirically well-developed form of non-physical, non-financial capital, as a significant element in determining the market value of firms. It provides a working definition that considers individual benefits accrued as a consequence of possessing particular ties in a network. This view allows board directors to be conceptualised as individuals who receive opportunities through interlocking directorates and also offers advantages at organisational level (as well as the individual level). Since this thesis aims to examine the link between social and human capital possessed at the organisational level and the firm market value, the next section goes on to explore organisational social capital and its dimensions.

2.2.4 Organisational Social Capital

Despite the dominance of social capital studies at the individual level, the number of studies analysing the concept at the organisational level is rapidly growing (Nakamura and Yorks, 2011; Pirolo and Presutti, 2010; Shipilov, Li and Greve, 2011; Subramaniam and Youndt, 2005). The management literature includes several studies on the concept of social capital and its applications, with recent work exploring social capital across a wide range of organisations and organisational practices[6] (Edelman et al., 2004). These studies offer insights into the concept of social capital embedded in different types of organisations such as schools, hospitals, non-profit organisations, family and private-sector firms (Leana and Pil, 2006; Ommen et al., 2009; Presutti and Boari, 2008; Schneider, 2009; Zahra, 2010). This section focuses on organisational social capital in private-sector firms as the primary unit of analysis given that this thesis seeks to examine the role of social capital in assessing the market value of firms.

Organisational social capital (referred to hereafter as OSC) is a term introduced by Leana and Van Buren (1999: 540) who define the term as "a resource reflecting the character of social relations within the organisation, realised through members' levels of collective orientation and shared trust". They argue that organisational social capital provides benefits for both the organisation and its members in various dimensions including the value creation and enhancement of the skills of the employees. Leena and Van Buren's (1999) argument is along the same lines as the fundamental conceptualisation of social capital theory which posits that

[6] Social capital research in an organisational context embraces studies on human resource development practices (Belliveau, O'Reilly and Wade, 1996; Fernandez, Castilla and Moore, 2000; Podolny and Baron, 1997), internal organisational activities and processes (Bouty, 2000; Gargiulo and Benassi, 2000), the interconnectedness of human and social capital (DeFilippi and Arthur, 1996) and its role in exchange relationships and strategic alliances (Chung, Singh and Lee, 2000; Kraatz, 1998; Tsai, 2000; Uzzi, 1997). The role of social capital has also been investigated in the field of entrepreneurship (Davidsson and Honig, 2003; De Carolis and Saparito, 2006; Mosey and Wright, 2007), innovation (Fountain, 1998; Maskell, 2000; Tsai and Ghoshal, 1998), knowledge management and the knowledge economy (Hoffman, Hoelscher and Sherif, 2005; Lang, 2004; Maskell et al., 1998; McElroy, Jorna and van Engelen, 2006).

social capital, despite being embedded in social relations among individuals, also belongs to the collective to whom it provides direct benefits through enhancing collective action (Griffith and Harvey, 2004). It is worth noting that the original conceptualisation of organisational social capital was built upon internal social relations, which led to conceptual developments that viewed it as both internal and external.

Another definition of organisational social capital is provided by Leenders and Gabbay (1999, 2001) through a more specific framework. They employ the term *corporate social capital* and define it as "the set of resources, tangible or virtual, that accrue to a corporate player through the player's social relationships, facilitating the attainment of goals" (Gabbay and Leenders, 1999: 3). In their definition, "corporate players" refer to the organisations and organisational members. Gabbay and Leenders (2001) maintain that distinguishing between the sources and consequences of social capital is crucial to identifying the level of analysis, which is deemed a fundamental requirement, particularly for studies examining social capital in the organisational context. Furthermore, Leenders and Gabbay[7] (1999) emphasise that social structure may produce both positive and negative consequences for corporate players, and thus make the distinction between "corporate social capital" and "corporate social liability".

Organisational social capital comprises both internal and external dimensions as social capital resources are derived from both intra- and inter-organisational ties (Arregle et al., 2007; Yli-Renko, Autio and Tontti, 2002). Akin to Gabbay and Leenders' (2001) argument, Borgatti and Foster (2003) also emphasise the importance of identifying the level of analysis in social capital (social network) research for methodological issues. In a similar manner, research by Payne et

[7] Leenders and Gabbay refer to social capital as an individual and organisational asset, and introduced the term "social capital management" to embrace the processes through which social capital is actively and intentionally accumulated for the use of individuals and organisations. The strong emphasis on the separation of social capital sources (social structures) and outcomes have led to a growing interest in exploring social capital at meso-level, which exists between the micro level of individual social networks and the macro level of regional, national or global social networks.

al. (2011) identifies four sub-categories[8] to analyse social capital studies in relation to their level of analysis (individual vs. collective) and to the locus of activity (internal vs. external).

These sub-categories include (a) social capital of individuals with internal ties, (b) social capital of collectives with internal ties, (c) social capital of individuals with external ties, and (d) social capital of collectives with external ties (Payne et al., 2011: 494). In their classification, the "level of analysis" is based on the micro-macro division whereas the "locus of activity" dimension is built on Adler and Kwon's (2002) notions of internal and external ties, which clarify the ties and relationships through which actors acquire social capital resources.

From this point of view, internal organisational social capital concerns actors who build and cultivate social capital through their social relationships with other actors within the organisation. On the other hand, external organisational social capital relates to actors who develop and harness social capital through their social ties and relations with other actors who are embedded in external social structures. Many of the same debates relating to bonding and bridging dimensions occur within the area of organisational social capital as individual social capital. As emphasised previously, bridging/bonding distinction is important and useful for developing a better understanding of how social capital functions in specific contexts.

Despite distinguishing between internal and external dimensions, in essence, this division may be contingent upon the size of an organisation and the context in which it is embedded. For example, in the case of multinational firms, the network of relationships between two firms operating in different locations can be considered as external social capital since such ties are built among different parties and individuals working in culturally different environments. On the contrary, such relationships can be referred to as internal social capital since individuals

[8] A similar categorisation of social capital and liability is suggested by Gabbay and Leenders (2001) who label the four types of connection based on the level of structures and outcomes: structure at individual level, structure at organisational level, social capital (liability) at individual level, and social capital (liability) at organisational level.

linked to each other through two divisions of a multinational firm must possess *shared values, goals and global vision* as part of being a multinational organisation (Hitt, Lee and Yucel, 2002).

As highlighted earlier, this thesis focuses on external organisational social capital since the central argument in this thesis is that board directors' access to external resources and information networks can leverage firms' market value. Despite acknowledging that internal organisational social capital may have important implications on firm performance and/or value, this thesis focuses only on the external dimension for a number of reasons. Firstly, understanding social relationships within boardrooms entails a detailed examination of the formal and informal ties among directors. Such an examination would require gaining access to boardrooms, which has proven difficult for most researchers (see Leblanc and Schwartz, 2007). Secondly, this thesis aims to examine the impact of social capital on firm market value over a period of 10 years to understand how social capital effects evolve over time. Hence, exploring internal relationships among board members during each financial year would require a long-term data collection project, which is beyond the scope of this thesis. Thirdly, this thesis concentrates on the social capital as one of the non-physical, non-financial forms of capital, which is not included in the financial statements, but is likely to contribute to the firm value through its provision of access to resources through virtue of relationships. Therefore, the sample for this analysis is specified as the firms listed on FTSE All Share index, which disclose information in their annual reports and whose market values are publicly available. Based on the size of the sample, measurement and interpretation of internal organisational social capital are, to a certain extent, problematic. Furthermore, it is assumed that such internal factors are not communicated to investors in capital markets, and therefore are less likely to have a direct impact on the market value of firms. Following this rationale, internal dimension of organisational social capital is excluded from this study.

Board of Directors and Market Value

Over the last two decades, research on corporate boards, director selection and performance has gained significant prominence in a variety of disciplines including management, accounting and finance (Withers, Hillman and Cannella, 2012). Policy statements such as the Cadbury Report (1992), the Greenbury Report (1995), the Hampel Report (1998) and the Higgs Review (2003) have focused on the role and responsibilities of corporate boards and highlighted the special contribution that non-executive directors make in developing firms' strategy, managing risks and scrutinizing their performance.

This research stream broadly focuses on the composition of directors' demography, human and social capital, and explores how these attributes influence outcomes at the individual and organisational level (Johnson, Schnatterly and Hill, 2013). Despite being explored from various perspectives, literature on corporate boards lacks a strong consensus as to what an optimum board should look like (Donnelly and Mulcahy, 2008; Johnson, Schnatterly and Hill, 2013). To extend the understanding of boards' social attributes, scholars have used the social network theory to investigate the link between directors' social capital and performance at the individual and/or organisational level (e.g. Patel and Terjesen, 2011; Stam, 2010; Tian, Haleblian and Rajagopalan, 2011). A network perspective on boards of directors provides researchers with valuable insights into the notions of power, trust and legitimacy by revealing the dynamics of corporate behaviour and influence both within the organisations (Hillman and Dalziel, 2003), and the sharing of resources and dissemination of information and strategies across the organisations (Carpenter and Westphal, 2001).

Extant empirical research has typically focused on exploring the impact of board attributes such as social capital on firm-level outcomes, strategy and operating performance (see variously Haynes and Hillman, 2010; Machold et al., 2011; Pugliese et al., 2009; Stevenson and Radin, 2009). To date, most research has been conceptual and the link between characteristics of corporate boards and market value has received limited attention. Exceptions include Haynes and Hillman (2010), Horton, Millo and Serafeim (2012) and Johnson, Schnatterly and Hill (2013). The work of Zajac and Westphal (2004) provides a social constructionist view of financial market behaviour by maintaining that theories of capital markets have been dominated by a financial economics perspective, in which the stock market's reaction is deemed a reliable, historically invariant indicator of the efficiency benefits gained (Zajac and Westphal, 2004: 434). More recently, the number of studies adopting a sociological perspective on capital markets has been rising, with scholars emphasising the significance of how investment behaviour is driven by social dynamics[9] (Beunza, Hardie and MacKenzie, 2006; Hardie and MacKenzie, 2007; Horton, Millo and Serafeim, 2012; MacKenzie, 2006). Following this research stream, this thesis seeks to contribute to the sociology of markets and organisations by exploring the link between organisational social capital created and developed through the interlocking directorate ties and firms' market value.

Antecedents and Consequences of Organisational Social Capital

Despite the large number of studies concentrating on the outcomes of social capital (including organisational social capital), there are relatively few studies that primarily explore the antecedents of social capital (Payne et al., 2011). In a study of the creation of social capital in organisations, Bolino, Turnley and Bloodgood (2002: 507) note that, "although organisational researchers have acknowledged the role of social capital in the effective functioning of organisations, they have paid relatively less attention to how organisations might build social capital". Instead, the majority of the work at the organisational level has focused on inter-

[9] See Vollmer, Mennicken and Preda (2009) for a review of advances in the emergent field of social studies of accounting and finance.

organisational networks[10] and analysed the formation and evolution of ties among the organisations (Borgatti and Foster, 2003).

Empirical studies in the OSC literature have fundamentally focused on the link between social capital as a valuable asset and firm-level outcomes, such as firm performance and competitive advantage. Extant research has sought to understand how and why social capital possessed at the organisational level contributes to the firm value (Maurer and Ebers, 2006). There are various propositions on the positive consequences of organisational social capital. It is argued that OSC can enhance firm performance through the development of intellectual capital (Nahapiet and Ghoshal, 1998; Leana and Van Buren, 1999), the creation of human capital (Coleman, 1988), access to resources (Park and Luo, 2001; Florin, Lubatkin and Schulze, 2003; Van Wijk, Jansen and Lyles, 2008; Yiu and Lau, 2008), the acquisition and creation of knowledge (Yli-Renko, Autio and Tontti, 2002), strategy selection (Acquaah, 2007; Yoo et al., 2009), increased innovation (Salman and Saives, 2005), employee mobility (Somaya, Williamson and Lorinkova, 2008) and entrepreneurial orientation (Stam and Elfring, 2008).

Organisational social capital developed through individuals' ties to external parties can also yield negative consequences (social liability) for the organisations. This thesis makes another contribution to existing literature by considering the negative aspects of social capital that are rarely investigated, and also by embracing the idea that organisations may be negatively affected by possessing higher levels of social capital. For instance, findings of the research by Snyder, Priem and Levitas (2009) demonstrate that illegal innovations such as backdating of options are diffused through the interlocking directorates. The example of information

[10] Borgatti and Foster (2003: 1000) explain: "... there is much more work on network antecedents than people give the field credit for, and the volume is increasing rapidly. The work is not very visible in part because there isn't a single area of research called 'network change.' Rather, work on change is embedded in the various substantive areas (e.g. Gulati and Gargiulo, 1999; Madhavan, Koka and Prescott, 1998; Shah, 2000). For example, the majority of recent work on inter-organisational networks is about explaining how and why organisations form ties and select partners (whether interlocking directorates or alliances or supply chains)".

diffusion recalls the role of bridging social capital in providing access to information about new technologies or innovations possessed by external linkages. However, gaining resources and information from open and heterogeneous networks does not always result in positive outcomes for the organisations. Similarly, Maurer and Ebers (2006) argue that the development and value of social capital can evolve over time and that it may turn into a liability. Their findings suggest that strong normatively grounded ties to cohesive contacts and network closure lead to lower adaptability, and consequently to cognitive lock-in within the organisations.

Furthermore, it is argued that higher levels of social capital may be detrimental to organisational success. Lee (2007: 22) maintains that "as the number of direct ties increases, network costs may outweigh the benefits derived from network resources", thus transforming social capital into social liability. Extant research has also highlighted that a firm may experience deterioration in the quality of its directors' performance since well-connected directors are expected to be involved in other positions on different boards (Fich and Shivdasani, 2006; Fich and White, 2001; Loderer and Peyer, 2002). For instance, Fich and Shivdasani (2006) argue that firms with busy boards, those in which the majority of outside directors are engaged in three or more directorships, are likely to suffer from poor corporate governance. As a result of weaker governance, they find that these firms experience lower profitability, declines in market-to-book ratios and lower sensitivity of CEO turnover to firm performance. Another study by Ahn, Jiraporn and Kim (2010) finds that directors serving on multiple boards lead to value-destroying acquisitions when the number of outside board seats surpasses a certain threshold. The rationale for the decline in value is that multiple directorships have an impact on the quality of managerial oversight, and thus lead to agency conflicts in acquisition decisions. Hence, the effect of multiple board directorships is moot.

Another consequence of organisational social capital with negative implications is that information acquired through board networks can be misleading and inaccurate, and therefore may lead to declines in shareholder value (Larcker, So and Wang, 2013). This is particularly significant in knowledge sharing processes. A study by Levin and Cross (2004) highlights the importance of the relational and structural characteristics of social capital for effective knowledge transfer, and argue that perceived trustworthiness mediates the link between strong ties and receipt of useful knowledge. Prior literature has also acknowledged that, in trusting relationships, the amount and value of exchanged knowledge is greater in relation to the knowledge transfer under uncertainty and conflict (Andrews and Delahaye, 2000; Penley and Hawkins, 1985; Tsai and Ghoshal, 1998). Furthermore, trust decreases the costs arising from the knowledge transfer by reducing the conflicts and the need to verify the information at the individual and organisational levels (Currall and Judge, 1995; Zaheer, McEvily and Perrone, 1998). Hence, trust plays an important role in the efficient use of the information acquired through networks.

2.2.5 Dimensions of Organisational Social Capital

Despite the abundance of studies examining the concept of social capital and its distinct forms and/or dimensions, there are few studies that analyse the dimensions of organisational social capital as well as their separate and combined effects on organisational outcomes (Andrews, 2010). Based on prior research (Coleman, 1988; Nahapiet and Ghoshal, 1998; Putnam, 2000), organisational social capital is examined as a multidimensional concept which comprises both *structural* (social networks) and *attitudinal* (norms) aspects of social capital. While scholars such as Leana and Van Buren (1999) focus on the normative aspects[11] (reciprocity, collective goal orientation and shared trust) of organisational social capital as facilitators of value

[11] Leana and Van Buren (1999) note that normative recommendations for developing social capital vary across extant approaches to social capital since these approaches adopt different perspectives in defining social capital and focus on different levels of analysis.

creation, empirical studies such as Pirolo and Presutti (2010) and Yoo et al. (2009) draw attention to the structural aspects (network ties and network configuration) of OSC to understand their impacts on firm-level outcomes.

Nahapiet and Ghoshal's (1998) framework on dimensions of social capital is adopted by a large number of researchers who attempt to examine the concept in different settings (see Andrews, 2010; Inkpen and Tsang, 2005). Nahapiet and Ghoshal (1998) identify three distinct but interrelated dimensions of social capital, namely structural, cognitive and relational dimensions. The structural dimension relates to "the pattern of relationships between the network actors and can be analysed from the perspective of network ties, network configuration, and network stability[12]" (Inkpen and Tsang, 2005: 152). The cognitive dimension concerns the need for a common context and shared language/narratives to create and sustain social capital (Nahapiet and Ghoshal, 1998). The third dimension, the relational aspect of social capital, is related to the normative qualities of social relationships between the actors and embraces the key aspects such as trust and trustworthiness (Fukuyama, 1995; Putnam, 1993), norms and sanctions (Coleman, 1990; Putnam, 1995), obligations and expectations (Burt, 1992; Coleman, 1990; Granovetter, 1985), and identity and identification (Hakansson and Snehota, 1995; Merton, 1968).

This thesis focuses on the structural dimension of organisational social capital for a number of reasons. Firstly, this study aims to understand whether inter-corporate relations developed through the interlocking directorates have a significant impact on firm value. Secondly, since one of the aims of this thesis is to examine the differences between the market value and book value of firms, and the sample identified for this analysis consists of listed firms with large

[12] In Nahapiet and Ghoshal's framework, the third element of structural dimension is identified as "appropriable organisation". Inkpen and Tsang (2005) substitute this element with "network stability" based on the argument that network types largely differ in respect of their stability, which they consider as having significant implications for firm-level outcomes.

market capitalisations, researching the cognitive and relational aspects of social capital in each firm could be challenging given their number and size. Thirdly, the structural dimension of social capital allows the identification of individuals' personal and organisational ties, which is crucial for quantifying their social capital. Given the aims of this thesis, the following section will discuss the structural dimension of organisational social capital and related key concepts.

Structural Dimension of Organisational Social Capital

The structural dimension of organisational social capital refers to the sum of network ties, network configuration, and network appropriability in a social structure (Nahapiet and Ghoshal, 1998, Bolino, Turnley and Bloodgood, 2002). The structural domain is deemed to concern actors' social networks and their impacts on a range of organisational outcomes (Adler and Kwon, 2002; Gargiulo and Benassi, 2000). Scott (1991:182) highlights "the social networks in which enterprises are embedded, and the importance of viewing these networks as arenas of power". In fact, analyses on corporate (inter-organisational) networks date back to 1980s when scholars started focusing on interlocking directorates to explain inter-corporate influence and power, co-optation mechanisms and channels of communication (Fennema and Schijf, 1979; Koenig and Gogel, 1981; Mariolis and Jones, 1982; Scott, 1979; Soref, 1979; Useem, 1980).

Despite the lack of an explicit definition in the literature[13], corporate networks can be defined as the sum of formal and informal linkages between companies at an industry, country or global level. Akin to any type of network, network ties and configurations are regarded as central elements of corporate networks since they influence the propensity of companies to harness social capital benefits or to encounter its negative consequences. In corporate networks literature, extant research has focused on the value of director ties as the potential sources of

[13] With respect to the issue of defining corporate networks, Beckman (2010: 120) notes: "First, the boundary question: what are corporate networks? I use the term synonymously with inter-organisational or inter-firm relationships and focus primarily (although not exclusively) on horizontal linkages between firms".

network relations which promote the flow of relevant, better quality and timely information (Adler and Kwon, 2002). From this perspective, a director's network position is identified in relation to a desirable pattern of ties, "such as having a sparse ego-network or being located along the shortest path between otherwise unconnected actors" (Borgatti and Foster, 2003: 1004).

Reflecting the contrast between bonding and bridging, there are two fundamental views regarding an actor's (director's) position in the network: network closure and structural holes. The first view derives from Coleman's (1988, 1990) closure argument. In the closure argument, Coleman's key assertion is that closed (dense) networks create and enhance social capital. Coleman (1990) identifies two primary benefits of a closed network: access to information and the observance of norms and sanctions. The first benefit relates to the diffusion of information between network actors (individuals, groups or organisations) who are tied to each other through various types of social relationships (friendship, partnership, alliance etc.). Coleman (1990) argues that information is circulated more rapidly in closed networks and provides better communication among network members which can facilitate favourable outcomes such as stabilising prices in markets (see Baker, 1984). The second benefit of closed networks, which is more accentuated by Coleman (1990), concerns the facilitation of norms and effective sanctions. Coleman (1990) maintains that close ties, in which trustworthiness is taken for granted, provide assurance for any transactions that occur between actors. Therefore, individual risk embedded in social relations is neutralised by the existence of norms and effective sanctions which monitor and guide the behaviour of network actors. In the case of corporate actors, trustworthiness and reduced risk arising from the network closure lead to the sharing of higher quality information[14] across the organisations (Lee, 2007).

[14] The quality of information shared between two parties who have a mutual third-party contact is more likely to be high. This is emphasised by Granovetter (1992: 44) who refers to the consequence of distorting information as "unbearable when (the mutual third party) uncovers the deceit and tells one another".

Despite being one of the most important contributions to the social capital and social network theory, Coleman's notion of network closure has not been the only perspective on the importance of strong ties. Almost ten years after his weak-ties hypothesis, Granovetter (1982) also focuses on the strength of strong ties and underlines the consequences of strong ties for the actors in the network. In his seminal article, Granovetter (1973) conceptualises strong ties as social networks that are created through a high degree of emotional closeness and reciprocity, and comprise a high degree of redundant information. In his review of research on the strength of weak ties hypothesis, Granovetter (1982: 113) argues that "weak ties provide people with access to information and resources beyond those available in their own social circles; but strong ties have greater motivation to be of assistance and are typically more easily available". Following this idea, he suggests that individuals in insecure positions are more inclined to develop strong ties to reduce uncertainty and to increase protection. From this perspective, Granovetter's (1982) strong ties are similar to Coleman's (1990) network closure in which the behaviour of network actors is guided and monitored by the existence of norms and sanctions. It is important to note that Granovetter's (1982) strong ties differ from network closure in being characterised by frequent interaction as opposed to a pattern of dense, mutually interconnected relationships as highlighted by Coleman (1990). In his later work, Granovetter (1992) also expands upon how trust and norms that are cultivated in dense networks enhance the functioning of sanctions deriving from structural embeddedness (Burt, 2000).

Despite focusing on the positive consequences of network closure, it is important to acknowledge that network closure also has negative consequences. As emphasised in Coleman (1990), strong social norms (e.g. elite norms) cultivated in cohesive groups may impose negative externalities such as exclusion of non-members and strong behavioural pressure on members of such groups. These negative consequences are also identified by Portes (1998). The exclusion of outsiders is highlighted by Portes who states that "the strong ties that bring benefits to members of a group commonly enable it to bar other from access" (Portes, 1998: 15). Furthermore, Portes (1998) refers to the excess claims on group members as another negative consequence of social capital (closure). Portes (1998) states that a network of interconnected relationships may give rise to a "gigantic free-riding problem" which emerges when less diligent group members demand more on successful members as a result of the existing normative structure[15].

Portes (1998) identifies two more negative consequences, namely restriction on individual freedoms and the downward levelling of norms. In closed networks, individuals' actions and receptivity to outside contacts are constrained by strong solidarity, which in turn may have a negative impact on the flow of new ideas into the group[16]. On the other hand, downward levelling pressures relate to counter efforts arising from group solidarity to keep members of a group in the same situation as their peers. Such pressures emerge as a reaction to "the partial breakdown of this last source of sanctioning capacity" (Portes and Sensenbrenner, 1993: 1344). Despite theoretically being discussed at the individual and group level, such negative consequences may also arise for organisations maintaining a network of dense ties.

An alternative and equally important view on an actor's network position is Burt's (1992, 1997a) structural hole argument. In contrary to the network closure argument, which advocates the creation of social capital through high density networks embracing high levels of reciprocity and mutuality, Burt's structural holes approach suggests that "social capital is created by a network in which people can broker connections between otherwise disconnected segments" (Burt, 2001: 31). According to the structural hole theory, network actors (individuals or organisations) derive benefits from being connected to many actors who are themselves unconnected to other actors in the network. In other words, actors create and enhance social

[15] This is also discussed in Portes and Sensenbrenner (1993).
[16] See Gargiulo and Benassi (1999).

capital through bridging structural holes in a network, which is known as brokerage (Burt 1992, 1997a, 2001, 2007). Burt's idea of structural holes stems from Granovetter's (1973) earlier work on the strength of weak ties. Burt (1992) criticises the weak tie theory and emphasises the importance of bridging property of ties rather than their strength (Krackhardt, 1999; Seibert, Kraimer and Liden, 2001).

Burt (1992, 1997a) argues that networks rich in structural holes provide actors with two primary benefits, namely information and control. Burt's conceptualisation of social capital benefits comprises two of Adler and Kwon's (2002) social capital outcomes, which are information, influence and solidarity. Burt (1997a) identifies information benefits as access, timing and referrals. For instance, a firm bridging a structural hole (connecting firms) is deemed to have access to more and unique information since it brokers the flow of information between otherwise disconnected firms in the network. Furthermore, firms with brokerage positions are considered to have early access to information which can be of great importance to identifying and extending valuable opportunities[17] (information arbitrage). The last key facet of information benefits comprises referrals, which Burt (1997a) refers to as the likelihood of being engaged in a variety of opportunities (e.g. promotion, alliance or investment opportunities) on account of having a diverse network.

The second benefit derived from bridging structural holes concerns the control over the relationships and resources including information. Based on sociological thoughts developed by Simmel (1955) and Merton (1968), Burt (1992) emphasises that actors (individuals or organisations) with brokerage positions are the ones who draw control benefits from spanning structural holes. Burt (1992: 30-32) draws on Simmel's (1950) concept of *tertius gaudens*[18] to

[17] See Burt (2004) for a detailed discussion of information arbitrage.
[18] Simmel (1950) calls one particular triad type the tertius gaudens, or "the third who enjoys," based on the inherent benefit of a position between two disconnected parties. These two parties, because of their unfamiliarity with each other, can be manipulated to the third party's benefit. Simmel's use of the tertius gaudens concept therefore refers to an active separation of the two parties tied to the third.

explain the social activity that occurs around the structural holes. Burt maintains that social networks rich in structural holes present opportunities through a tertius gaudens strategy, by which an actor positioned between two disconnected parties, can manipulate or exploit those parties to the actor's benefits (Obstfeld, 2005).

Network actors who bridge structural holes can exert control over their non-redundant ties and resources embedded in such ties. Furthermore, brokers (e.g. firms) foster negotiation power through their positions in the network, which allows them to acquire more favourable terms (Burt, 1992; Gargiulo and Benassi, 2000; Woolcock, 1998). Overall, individuals and organisations are deemed to increase their added value through information and control benefits, which reinforce each other and accumulate over time (Burt, 2004; Hite and Hesterly, 2001; Thieme, 2007).

Social capital developed through the network brokerage may also give rise to negative consequences as well as positive. Open networks are likely to suffer from the lack of trust, and therefore may be detrimental to firms' market performance (Shipilov and Li, 2008). In networks rich in structural holes, broker's connections may avoid engaging in resource sharing or intense collaboration as a result of having suspicions about the broker's intentions. Unlike closed networks, the opportunistic behaviour of a broker would not be disseminated to all mutual third parties and its misbehaviour would not be sanctioned in open networks (Walker, Kogut and Shan, 1997). Such social dynamics, particularly in the case of alliances, will have a negative influence on the sharing of resources, knowledge and information among Bolino, Turnley and Bloodgood (2002: organisations (Gulati, 1995).

Another negative consequence of network brokerage relates to the costs (time and other resources) of bridge building and maintaining structural holes (Burt, 1992). From a brokerage perspective, the accumulation of social capital is largely contingent upon the creation and maintenance of bridges between otherwise disconnected actors. Consistent with the dynamics of *rapidly decaying opportunity structures* (Burt, 2002b), brokerage benefits are shown to be short-lived and temporary.

In a study of project teams over a 12-year period, Soda, Usai and Zaheer (2004) observe the strongest impact of bridging ties in the present network of connections. However, this impact does not persist over time. Similarly, Baum, McEvily and Rowley (2012) demonstrate that benefits derived from hybrid network positions are greatest when old closure ties are combined with very young or very old bridging ties. Both studies put an emphasis on the age of bridging ties as a key indicator of the longevity of brokerage benefits (McEvily, Jaffee and Tortoriello, 2012). Based on a prior study by Antcliff, Saundry and Stuart (2007), a framework for conceptualising inter-organisational networks is provided in Table 2.2.

- Insert Table 2.2 about here -

2.2.6 Social Network Theory

Social capital research is further advanced by social network researchers who have taken the lead in measuring social capital created and developed through the social ties. This idea is broadly referred to as social network theory, and has been extended by various scholars such as Baker (2000), Brass et al. (2004), Burt (2005), Cohen and Prusak (2001), Cross and Parker (2004) and Lin (2001). Borgatti and Halgin (2011) define network theory as "the mechanisms and processes that interact with network structures to yield certain outcomes to individuals and groups" (Borgatti and Halgin, 2011: 4). Social network theorists have contributed to extant social capital research through their formalisation and empirical analyses of theories associated with the concept of social capital. These theories comprise social resources theory (Lin 1990), weak tie theory (Granovetter 1993), and structural holes theory (Burt 1992). Seibert, Kraimer and Liden (2001: 221) highlight the importance of not referring to these theories as mutually exclusive, “as competitive model testing implies, but *(they)* can function together because they focus on different points in the process of accumulating social capital”.

Extensive efforts of social network theorists can be classified into two main categories, namely structuralist versus connectionist (Borgatti and Foster, 2003). This classification is based on how network studies treat ties and their functions. The first category, the structural approach, relates to the work of network theorists whose focus is on the structure (configuration) of ties in the ego-network. The structuralist puts emphasis on the pattern of connections rather than the content of ties. The most prominent examples of structural approach include Burt (1992) and Coleman (1990). On the other hand, the connectionist approach focuses on the resources that flow through the social ties, and is often embedded in the literature on social support (e.g. Walker, Wasserman and Wellman, 1994) and entrepreneurs (e.g. Baron and Markman, 2003; Shane and Stuart, 2002). In the connectionist approach, an actor is deemed successful when he/she can draw on the resources (such as information, money, power and material aid) controlled by his/her alters (Borgatti and Foster, 2003). Given that the aim of this thesis is to explore the link between external organisational social capital and the market value of firms, a structural approach is adopted to measure social capital created and developed through the interlocking directorates.

Social Network Analysis and Board Interlocks

Extant literature widely recognises that social capital effects flow from information, control and solidarity, and that network structures play an important role in determining the extent to which such benefits could be acquired (Adler and Kwon, 2002; Nahapiet and Ghoshal, 1998). Social network analysis (SNA) has been the primary tool to empirically test and construe the relationships in a social network. In social network analysis, social “ties” are regarded as the fundamental data, and each actor is defined in relation to her/his ties in a network. A network is typically defined as “the pattern of ties linking a defined set of persons or social actors” (Seibert, Kraimer and Liden, 2001: 220). Actors are referred to as “nodes”, and can be individuals, groups or organisations[19]. The focal actor in network analysis is called the “ego” and other actors to whom the ego is tied, are described as “alters” (Knoke and Kuklinski, 1982).

The applications of social network analysis are found in various fields such as inter-personal networks (Wellman et al., 2006), inter-corporate networks (Horton, Millo and Serafeim, 2012), political and policy networks (Koger, Masket and Noel, 2009), social movements (Burt and Uchiyama, 1989; Friedkin and Johnsen, 1990), innovation (Sammarra and Biggiero, 2008; Tsai, 2001), and entrepreneurship (Aldrich and Kim, 2007; Jack 2005). Corporate networks in the form of interlocking directorships are regarded as one of the earliest and principal areas in which social network analysis has been applied to explore the structure of inter-corporate relations and its impact on organisational outcomes (Scott, 2011). Sociology and management literature comprise various examples of theoretical and empirical research on board interlocks (e.g. Dalziel, Gentry and Bowerman, 2011; Hillman, 2005; Johnson, Schnatterly and Hill, 2013; Shropshire, 2010; Yue, 2012).

Early work on interlocking directorships comprise studies exploring resource dependence theory and class perspectives in which such ties are referred to as a means of managing organisational dependencies (Pfeffer, 1972; Pfeffer and Salancik, 1978), and of sustaining power and control for social elites (Dumhoff, 1967; Palmer, 1983; Pennings, 1980; Useem, 1979). Both research streams are predominantly motivated by the objective to identify the antecedents of board interlocks (Palmer, 1983; Pfeffer, 1972; Zajac, 1988), although some of

[19] It is worth distinguishing between Social Network Theory and Actor Network Theory. Originating in studies of science, technology and society, actor network theory (also known as the sociology of translation) advocates a socio-philosophical approach in which human and material factors are considered together in the same analytical view. The theory is advanced by the work of Callon (1986) and Latour (1999, 2005).

this early work examines board interlocks to anticipate similarity in organisational behaviours (Mizruchi, 1989).

Initial studies on board interlocks are followed by a research stream which adopts an informational perspective (Borgatti and Foster, 2003). Through this perspective, interlocking ties are seen as a way of reducing uncertainties, and sharing information about effective and acceptable corporate practices among organisations. This stream of research uses board interlocks to explore the adoption of organisational structures (Palmer, Jennings and Zhou, 1993), CEO pay premiums (Geletkanycz, Boyd, and Finkelstein, 2001), joint venture formation (Gulati and Westphal, 1999), the diffusion of poison pills (Davis, 1991), corporate acquisition behaviour (Haunschild, 1993), and the use of imitation strategies in general (Westphal, Seidel and Stewart, 2001). In particular, the benefits of interlocking directorate ties in reducing uncertainty are highlighted in studies exploring the importance of board interlocks in dynamic and uncertain environments (Carpenter and Westphal, 2001; Geletkanycz and Hambrick, 1997).

The majority of extant research on board interlocks has focused on financial performance and corporate governance outcomes such as director selection, director remuneration and CEO succession. Therefore, the link between the external ties of an organisation and its market value is relatively underexplored. This is one of the gaps that this thesis aims to address through analyses of longitudinal data.

This section concludes the present discussion of social capital, as the methodology chapter will introduce widely used network measures and how they are operationalised in the empirical analyses presented in this thesis. The chapter now moves on to the concept of human capital and explores the origins of human capital theory and organisational human capital. Following a review of the dimensions of organisational human capital, the chapter concludes with the conceptual and empirical contributions to human capital theory.

2.3 HUMAN CAPITAL THEORY

Following a detailed examination of social capital theory, the remainder of this chapter focuses on human capital theory and central themes within the concept. Prior literature has maintained that human and social capital are two distinct but related forms of capital (Coleman, 1988; Schuller, 2001). The link between human and social capital is explored by Coleman (1988) who argues that whilst social capital plays a crucial role in the creation of human capital, investments that build human capital are fundamentally different. Schuller (2001) also focuses on the complementary role of human and social capital, and provides a framework for considering the relationships between these two forms. Similarly, Burt (1997a) argues that social capital is the contextual complement to human capital because "while human capital refers to individual ability, social capital refers to opportunity" (1997a: 339).

Therefore, in the absence of social capital, accumulated human capital is insufficient for acquiring superior returns. In the case of corporate boards, this thesis argues that a firm's market performance is a function of directors' skills, abilities and knowledge, as well as network advantages they bring to the firm's board. Hence, this study aims to perform a simultaneous examination of the impact of human and social capital (possessed at the board level) on the market value of firms. The next section will discuss the origins of human capital theory and introduces organisational human capital.

2.3.1 The Origins of Human Capital Theory

Human capital theory was formally developed in the 20th century, but the origins of its conceptualisation can be traced back to centuries ago (Kiker, 1968). The most eminent economists who wrote on the subject of human capital were Adam Smith (1776), John Stuart

Mill (1848) and Alfred Marshall (1948). Since then, the human capital debate has gone beyond the theoretical arguments and has been assessed by using empirical methods that are conventionally applied to the capital machinery. The conceptualisation and development of human capital theory are ascribed to the efforts of economists[20] since the associated investments, economic benefits and growth are deemed to be the fundamentals of economic thought (Sweetland, 1996). The initial writings on human capital were produced by economists of education such as Becker (1964, 1976), Mincer (1962) and Schultz (1971, 1981) who investigated the economic benefits derived from the investments in individuals. This stream of literature was primarily based on empirical research which challenged the central proposition that economic success is dependent upon the growth of physical capital (Stiles and Kulvisaechana, 2003). Becker (1964: 1) argues that physical capital “explains only a relatively small part of the growth of income in most countries”. Hence, the pivotal idea of human capital theory emerged: that investments in people yield economic benefits for individuals and society.

Although human capital investments can comprise education, health and nutrition, the primary focus has been on the investments in education, which are assumed to contribute to the health and nutrition status of individuals as well as their knowledge, skills and abilities (Schultz, 1963). Studies on human capital distinguish between different types and means of education to explore the impact they have on individuals at micro-level, and on the society and economy at macro-levels (Becker, 1975; Becker, 1993; Psacharopoulos, 1973; Schultz, 1971).

Different forms of education include formal education at primary, secondary and higher levels (Cohn and Geske, 1990), informal education at home and at work (Schultz, 1981), job-specific

[20] Since 1971, five Nobel prizes have been awarded to scholars who were recognised for their contribution in the field of human capital theory (Becker, 1993; Wright, 1992). Scholars who received the Nobel merit were Theodore W. Schultz and Gary S. Becker, the two most prominent scholars of human capital theory; Milton Friedman and Simon Kuznets (1945), who explored the link between investments in education and income; and Robert M. Solow (1957), whose work provided a basis for understanding the relevance of education in the aggregate production function.

training and apprenticeships (Mincer, 1974) and specialised vocational education at secondary and higher levels (Corazzini, 1967). Human capital literature provides robust empirical evidence supporting the link between education and productivity (Denison, 1962; Denison, 1967), earnings growth (Becker, 1964; Schultz, 1971) and economic growth (Psacharopoulos, 1973).

Human capital has also been fundamental in explaining why earnings vary across individuals (e.g. Blundell et al., 1999; Levy and Murnane, 1992; Mincer, 1958; Mincer, 1970). Individuals' higher earnings are justified based on the argument that employees who invest in education and training will improve their skills and abilities, and therefore will be more productive than those who are less educated or trained. This perspective can also be applied to explore organisational-level returns derived from education and training completed by organisational members (Ballot, Fakhfakh and Taymaz, 2006; Blundell et al., 1999; Dimov and Shepherd, 2005).

2.3.2 Organisational Human Capital

Akin to social capital research, studies on human capital have long debated the distinction between individual and collective human capital. While the human capital concept fundamentally emerged and was developed at the individual level, the concept has also been perceived as an attribute of the collective and analysed at a unit-level (team, organisation or country) in various disciplines (Wright and McMahan, 2011). The majority of human capital research has adopted a micro perspective that focuses on individual differences and individual-level outcomes driven by the existence of such differences. Despite having micro-level foundations, human capital research has not been confined to individual-level analysis (e.g. Coff, 2002; Felin and Hesterly, 2007; Hitt et al., 2001). Rather, drawing from a micro perspective, human capital researchers have attempted to build a multilevel model to analyse human capital at various levels (see Ployhart and Moliterno, 2011).

At the individual level, human capital concerns knowledge, skills, abilities and other characteristics of an individual, which provides that individual with positive outcomes (Coff, 2002). In general, this micro perspective is more dominant in research areas such as human resources management (Kuvaas, 2008), organisational behaviour (Muse et al., 2008), industrial and organisational psychology (Crook et al., 2011) and strategic human resources management (Becker and Huselid, 2010). On the other hand, at collective (organisational) level, human capital is defined as "the aggregate accumulation of individual human capital that can be combined in a way that creates value for the unit" (Wright and McMahan, 2011: 95). This macro perspective has often been adopted in organisational theory and strategy literature in which human capital is perceived as a valuable resource that can yield sustained competitive advantage and superior performance (Coff, 1997; Coff, 1999; Mahoney and Pandian, 1992; Wright, McMahan and McWilliams, 1994; Hatch and Dyer, 2004).

In contrast to micro-level human capital research, which fundamentally draws from differential psychology, macro-level human capital research has been reinforced by economics in which human capital is treated as a unit-level resource without in-depth consideration of cognitive and non-cognitive variations of individual differences (Ployhart and Moliterno, 2011). One of the reasons for following such an approach is the difficulty in acquiring and analysing cognition-related data for every unit (organisation or country), particularly when examining long-term patterns of association between human capital and the outcomes at the unit level. Based on the definition provided by Wright and McMahan (2011), this thesis identifies organisational human capital (referred to hereafter as OHC) as the aggregate accumulation of directors' human capital on a firm's board, which contributes to firm market value through decision-making and monitoring processes. Dimensions of organisational human capital and issues relating to its measurement are discussed in the following sections.

2.3.3 Dimensions of Organisational Human Capital

General Human Capital

General human capital refers to an individual's wide range of knowledge, skills and abilities that are acquired through his/her formal education and prior work experience and can be applicable to a variety of occupations (Becker, 1975). Human capital scholars have long argued that increasing levels of education and experience are expected to enhance performance outcomes at both individual and organisational level (Boxman, De Graaf and Flap, 1991; Colombo and Grilli, 2010; Dimov and Shepherd, 2005; Gimeno et al., 1997). General human capital is often measured by employing a number of proxies such as years of formal education, years of work experience (after graduation), years of management and supervisory experience, individuals' age, gender and race (Bates, 1990; Castanias and Helfat, 2001; Cooper, Gimeno-Gascon and Woo, 1994; Hatch and Dyer, 2004; Hitt et al., 2001; Jones, 2001; Pennings, Lee and Van Witteloostuijn, 1998; Preisendorfer and Voss, 1990). However, it is worth noting that some of these measures have been questioned with respect to their validity in particular settings. Controversial debates, particularly those associated with the validity of human capital measures, will be revisited in the remainder of this chapter.

Human capital research often refers to education as one of the fundamental components of the concept (Ucbasaran, Westhead and Wright, 2008). Cooper, Gimeno-Gascon and Woo (1994: 376) define education as a source of "knowledge, skills, problem-solving ability, discipline, motivation and self-confidence". In relation to social capital, highly educated individuals are also deemed to have invested in valuable social contacts through their education, from which they can acquire access to different resources (Arenius and DeClercq, 2005; Shane, 2003).

Prior work experience is referred to as the second key component of general human capital. Individuals with prior work experience are regarded as having the capability to integrate and accumulate new knowledge (Ucbasaran, Westhead and Wright, 2008; Weick, 1996).

Previous work experience is believed to provide individuals with a range of business-related skills and abilities which may enable them to be more productive (Parker, 2006), obtain access to diverse social networks (Kim, Aldrich and Keister, 2006), monitor diverse functions (Cooper, Gimeno-Gascon and Woo, 1994) and solve complex problems (Davidsson and Honig, 2003). Although prior work experience is referred to as the number of years an individual has been in employment, this component has also been associated with individuals' achievement levels. Gimeno et al. (1997) argue that management or supervisory experience and previously held full-time jobs can be better indicators for experience components of general human capital. Being exposed to different job settings is believed to enhance the extent of an individual's work experience, and subsequently his/her general human capital.

Human capital research also refers to an individual's demographic characteristics as components of his/her general human capital (Bates, 1990, Gimeno et al., 1997; Preisendorfer and Voss, 1990). Age, gender and race are used to operationalise individuals' general human capital in different contexts. Studies examining the link between age and performance indicators are inconclusive (Fairchild and Li, 2005; Nielsen and Nielsen, 2010). These inconclusive findings are identified as a gap in human capital research and will be addressed in this thesis.

Specific Human Capital

Specific human capital refers to the other dimension of human capital that concerns "education and experience with a scope of application limited to a particular activity or context" (Dimov and Shepherd, 2005: 6). Specific human capital differs from general human capital in that investments in specific human capital can only yield value in a particular context due to its limited applicability (Gimeno et al., 1997). Hence, while knowledge and skills that an individual has attained through formal education and prior work experience can be applied to a number of occupational alternatives, skills and knowledge acquired through education and experience in a specific domain can only be used when the individual performs activities and tasks within that domain. As a consequence, specific human capital is deemed to be less mobile than general human capital (Becker, 1975).

Human capital research has explored the role of specific human capital in different contexts. In theoretical and empirical literature, this dimension of human capital has been examined as industry-specific (Parent, 2000; Sullivan, 2010), firm-specific (Slaughter, Ang and Fong Boh, 2007), entrepreneurship-specific (Baptista, Karaoz and Mendonca, 2007; Bosma et al., 2004), occupation-specific (Groen, 2006; Kambourov and Manovskii, 2009), location-specific (Krupka, 2009; Winters, 2011), and task-specific human capital (Gibbons and Waldman, 2004; Zarutskie, 2010). Use of the terms general and specific human capital can vary across different analyses. For instance, Pennings, Lee and Van Witteloostuijn (1998) refer to industry-specific human capital as general human capital, and use graduate education in accounting and industry tenure to operationalise this dimension in their study. Despite the existence of a number of studies employing these terms on a different scale, human capital literature exhibits a high degree of consensus on the usage of these terms.

Specific human capital, akin to general human capital, is typically developed through investments in education, training and experience (Becker, 1993). While individuals' investments in all types of education contribute to their general human capital, only some of them enable those individuals to develop specific human capital (Dimov and Shepherd, 2005). Therefore, education or training in a distinct subject area provides individuals with specific skills, abilities and knowledge which are transferable to a particular industry, firm or occupation (Groen, 2006).

Specific work experience is regarded as a key indicator for specific human capital in all contexts (e.g. industry-specific, firm-specific or task specific). Individuals with specific work experience are deemed to possess tacit knowledge and a set of valuable skills in a particular context. While firm-specific experience (firm tenure) enables partners of a professional service firm to cultivate their human capital stocks through the accumulation of tacit knowledge (Hitt et al., 2001), industry-specific experience assists non-executive directors in providing high-quality services rooted in their "tacit knowledge of the opportunities, threats, competitive conditions, technology and regulations specific to an industry" (Kor and Sundaramurthy, 2009: 986).

2.3.4 Conceptual and Empirical Contributions to Human Capital Theory

Educational Level

Investments in education and training play an important role in the accumulation of human capital at both individual and organisational level (Becker, 1975). As previously emphasised, education provides individuals with knowledge, skills and abilities as well as valuable contacts that may enable them to obtain access to unique information and resources (Arenius and DeClercq, 2005; Shane, 2003). In management literature, individuals' educational levels are associated with the possession of cognitive skills and abilities (Hambrick and Mason, 1984; Rajagopalan and Datta, 1996; Smith, Collins and Clark, 2005). Individuals with high educational attainments are considered as being more capable of acquiring, processing and transmitting information and generating more creative ideas for their organisations (Bantel and Jackson, 1989; Gradstein and Justman, 2000; Wincent, Anokhin and Örtqvist, 2010). Extant research has also argued that CEOs or executives with higher levels of education are likely to possess greater propensity to receive new ideas and undergo change (Boeker, 1997; Datta and Rajagopalan, 1998; Datta, Rajagopalan and Zhang, 2003; Wiersema and Bantel, 1992).

Consistent with theoretical implications on education, empirical studies widely refer to individuals' educational achievements as a proxy for human capital stocks of an organisation. While the impact of board human capital on firm performance is relatively under researched (Hillman and Dalziel, 2003; Kor and Sundaramurthy, 2009; Nicholson and Kiel, 2004), there have been extensive empirical investigations examining the links between CEO (Castanias and Helfat, 1991, 2001; Finkelstein and Hambrick, 1996) and TMT (Cohen and Dean, 2005; Dimov and Shepherd, 2005; Le, Kroll, and Walters, 2013) human capital and organisational outcomes. Highly educated CEOs or executives are perceived as contributing to organisational legitimacy (Cohen and Dean, 2005), organisational innovation (Bantel and Jackson, 1989; Hambrick and Mason, 1984; Thomas, Litschert and Ramaswamy 1991), firm survival (Bruderl, Preisendorfer and Ziegler, 1992; Cooper, Gimeno-Gascon and Woo, 1994; Gimeno et al., 1997; Pennings, Lee and Van Witteloostuijn, 1998), firm growth (Norburn and Birley, 1988) and strategic change (Datta, Rajagopalan and Zhang, 2003). In human capital literature, the most frequently used educational level proxies are years of schooling (Wiersema and Bantel, 1992; Young and Tsai, 2008) and highest educational degree (Westphal and Zajac, 1995).

Educational Specialisation

Human capital research concerns overall education as an indicator of general human capital, while education in a particular context is deemed to indicate specific human capital which has a peculiar value to a particular firm, industry or activity (Becker, 1975; Gimeno et al., 1997). It is acknowledged that education in a particular domain assists individuals in enhancing their knowledge base and improving their skills that can directly be applied to work-related actions and decisions (Dimov and Shepherd, 2005). Prior literature has also referred to specific human capital developed through educational specialisation as functional or educational background

(Datta and Guthrie, 1994; Haniffa and Cooke, 2002) and functional area knowledge and skills (Forbes and Milliken, 1999).

Functional area knowledge and skills of directors on a firm's board are identified as "knowledge and skills (that) span the traditional domains of business, including accounting, finance and marketing, as well as those domains that pertain to the firm's relationship with its environment, such as law" (Forbes and Milliken, 1999: 495). From this point of view, educational specialisation in the form of holding a business and/or law degree is expected to provide board members with relevant knowledge base, skills and functional expertise which may enable them to exercise better strategic leadership for their organisations through their control and service tasks. On a firm's board, control tasks relate to a set of duties such as monitoring the firm's activities, assessing firm performance, monitoring the CEO's actions and decisions and other control-related activities (Huse, 2005; Johnson, Daily and Ellstrand, 1996; Stiles and Taylor, 2001). On the other hand, a board's service tasks involve evaluating and counselling the firm's strategic decisions, maintaining and enhancing organisational legitimacy, communicating and informing the firm's external environment, coordinating the interests of shareholders, stakeholders and public, and providing support for firm management (Daily and Dalton, 1994; Demb and Neubauer, 1992; Hung, 1998; Pfeffer and Salancik, 1978).

Professional qualifications are referred to as a further indicator of specific human capital developed through educational specialisation. Prior literature has acknowledged that individuals holding qualifications from externally recognised and validated professional bodies are highly valued, particularly in dynamic and competitive business environments (Storey, Watson and Wynarczyk, 1995; Watson et al., 1994). From a specific human capital perspective, individuals who have undergone professional training are expected to possess a greater knowledge base, advanced skills and capabilities and professional expertise, which are likely to enhance their performance in related tasks.

In accounting literature, executives with professional qualifications are deemed to improve the quality of internal control systems and enhance investors' confidence in companies' financial reporting (Li, Sun and Ettredge, 2010). There is empirical evidence establishing a positive and significant relationship between having qualified directors on a firm's board and the market reaction to "good news" (Cai, Keasey and Short, 2006). It is also argued that share price reactions are sensitive to a number of board characteristics, including professional qualifications (Yermack, 2006). Although studies on corporate boards have widely emphasised the importance of board expertise as one of the key antecedents of effective board performance (Hillman, Cannella and Paetzold, 2000; Minichilli, Zattoni and Zona, 2009; Payne, Benson and Finegold, 2009; Ruigrok, Peck and Keller, 2006), the relationship between qualified board members and performance outcomes still remains a challenging open question and one to which this thesis aims to respond.

Educational Quality

Human capital theory posits that individuals who have educational backgrounds from high status institutions are able to derive additional benefits from having studied at such institutions (Becker, 1964). Scholars have long argued that educational credentials have a distinct impact on individuals' earnings (James et al., 1989; Kingston and Smart, 1990; Solomon, 1975; Trusheim and Crouse, 1981) and status attainment (Karabel and McClelland, 1987; Tinto, 1980; Useem and Karabel, 1986) since such credentials reflect stocks of human, social and cultural capital (Lee and Brinton, 1996).

Educational attainment from elite institutions is deemed to contribute to an individual's human capital in three different aspects (Long et al., 1998; Useem and Karabel, 1986). The first aspect relates to the quality of an individual's knowledge base that he/she develops through his/her education at a prestigious institution (also referred to as scholastic capital). Individuals who are graduates of elite universities are perceived to have acquired higher levels of explicit knowledge (greater knowledge base) in the course of their studies (Palia, 2000, 2001) Furthermore, individuals with such educational credentials are regarded as possessing superior intellectual capacity to learn and accumulate tacit knowledge (Hitt et al., 2001).

The second aspect involves elite social networks that an individual develops and maintains through his/her personal contacts, who are also members of such elite institutions (Kim, 2005; Terjesen, Sealy and Singh, 2009; Yoo and Lee, 2009). Prior research has argued that individuals' elite connections can be seen as an important organisational resource since organisations may benefit from such connections in various aspects (D'Aveni, 1990; D'Aveni and Kesner, 1993). Consistent with the resource dependence theory, board members with elite social ties are deemed to contribute to their organisations by providing access to diverse resources (Hillman and Dalziel, 2003). Resource dependence theory was developed by Pfeffer and Salancik (1978) who argue that "when an organisation appoints an individual to a board, it expects the individual will come to support the organisation, will concern himself with its problems, will variably present it to others, and will try to aid it" (Pfeffer and Salancik, 1978: 163). From this perspective, educational attainment from elite institutions can be regarded as overlapping between forms of human and social capital given that, in addition to accumulating higher stocks of human capital, individuals derive further social capital benefits from having studied at an elite institution.

The third aspect concerns how educational attainment from an elite institution is perceived on the basis of reputation and prestige (Useem and Karabel, 1986). Based on the earlier works of Baltzell (1958), Clement (1977), Domhoff (1967) and Mills (1956), D'Aveni (1989: 587) maintains that "association with elite universities creates more credibility and prestige than does association with less visible schools". Studying at a prestigious educational institution provides an individual with elite credentials which contribute to the legitimacy of the firm where the individual serves as a CEO or board member (Bennett, 2009; Daily and Johnson, 1997; Hambrick and D'Aveni, 1992; Selznick, 1957). As Bazerman and Schoorman (1983: 211) note, "an organisation's reputation can be affected by who serves on the board of directors and to whom the organisation is seen to be linked". Prior literature has also argued that board members' provision of legitimacy and reputation improves firm performance by signalling credibility to potential investors (Certo, 2003; Cohen and Dean, 2005). Educational attainment from distinguished institutions is deemed to confer prestige that enhances individuals' credibility, and can be of great importance to organisational success through the provision of diverse resources.

Experience

Human capital theory suggests that post-school investments such as work experience enhance individuals' human capital stocks through the accumulation of cognitive abilities and knowledge (Becker, 1964; Mincer, 1974). Previous work experience is deemed to provide individuals with a range of business-related skills and abilities that enable them to increase productive and efficient activity (Ballot, Fakhfakh and Taymaz, 2001; Parker, 2006), monitor diverse functions (Cooper, Gimeno-Gascon and Woo, 1994) and solve complex problems (Davidsson and Honig, 2003). Furthermore, prior work experience in a particular context provides individuals with access to diverse social networks (Certo, 2003; Hillman and Dalziel, 2003; Kim, Aldrich and Keister, 2006), tacit knowledge required for understanding current dynamics in an industry or sector (Arthur, 1994; King and Zeithaml, 2003; Kor and Sundaramurthy, 2009) and familiarity and internal knowledge that nourish group functioning and decision-making (Fischer and Pollock, 2004; Westphal and Bednar, 2005).

Extant research has operationalised prior work experience (broad labour market experience) by using a number of indicators. The most frequently used indicator is the number of years of prior work experience (Bruderl, Preisendorfer and Ziegler, 1992; Colombo, Delmastro and Grilli, 2004; Davidsson and Honig, 2003; Evans and Leighton, 1989). Although prior work experience is mostly referred to as the number of years that an individual has been in employment, this component is also associated with individuals' achievement levels. Therefore, two further indicators have been proposed to operationalise work experience as an indicator of general human capital. These indicators include the number of jobs previously held (Addison and Portugal, 2002; Gimeno et al., 1997; Veum, 1995) and the number of years of previous managerial or supervisory experience (Davidsson and Honig, 2003; Kim, Aldrich and Keister, 2006). Similarly, these indicators[21] have also been employed in various analyses to operationalise specific human capital (Colombo and Grilli, 2010; Kor and Misangyi, 2008; Tian, Haleblian and Rajagopalan, 2011).

Industry-specific Experience

Previous studies on human capital refer to industry experience as a proxy for specific human capital (Bruderl, Preisendorfer and Ziegler, 1992; Neal, 1995; Pennings, Lee and Van Witteloostuijn, 1998; Zarutskie, 2010). Extant literature comprises several empirical studies that present evidence suggesting that individuals with prior experience in a particular industry (or sector) decrease the failure rates (Bruderl, Preisendorfer and Ziegler, 1992), contribute to firm survival and growth (Cooper, Gimeno-Gascon and Woo, 1994; Siegel, Siegel and Macmillan, 1993) and enhance organisational success (Bates, 2005). Industry-specific experience is deemed to increase individuals' human capital since prior work experience in a particular industry provides individuals with higher levels of tacit knowledge and a variety of skills in both technical and commercial dimensions (Colombo and Grilli, 2005).

In management literature, it is argued that executives possessing long-term industry experience accumulate larger stocks of knowledge concerning competition, opportunities, regulations and other conditions within a specific industry (Eisenhardt and Schoonhoven, 1990; Kor, 2003;

[21] In human capital literature, the number of previously held positions (e.g. managerial or board positions) and the number of years of specific work experience (e.g. industry, firm or task-specific) are used as proxies of specific human capital.

Kor and Sundaramurthy, 2009) and tend to have more influence on their firms' strategy than their peers with less experience (Boeker, 1997; Mintzberg, 1983). Directors who have had work experience in a particular industry, in which their successive firms operate, are expected to have developed a distinct understanding of the industry dynamics and, therefore, of their firms' operations (Rajagopalan and Datta, 1996; Vancil, 1987).

Human capital literature comprises numerous studies that examine the role of director or CEO industry-specific experience in different contexts such as firm's liability of newness (Kor and Misangyi, 2008), firm growth (Kor, 2003; Kor and Sundaramurthy, 2009), inter-organisational alliances (Eisenhardt and Schoonhoven, 1996), firms' internationalization (Barroso, Villegas and Perez-Calero, 2011), outcomes of corporate acquisition (Kroll, Walters and Wright, 2008) and new CEO selection (Tian, Haleblian and Rajagopalan, 2011). In light of existing research, board members with industry-related experience are expected to contribute to firm value by providing better advice and counselling on firms' strategic decisions and conferring social capital benefits derived from their industry-related connections. Furthermore, it is argued that firms signal strong credibility to the market by having directors with extensive industry-specific expertise (Certo, 2003; Zimmerman and Zeitz, 2002).

Despite the virtues of industry-specific experience, it is important to acknowledge that directors with extensive industry expertise may also be detrimental to firm performance (Sundaramurthy, Pukthuanthong, and Kor, 2013). Shared industry knowledge may lead to tunnel vision or reinforcement of industry recipes (Spender, 1989). Directors' possession of similar views on industry conditions may result in groupthink (Janis, 1972), and diminish the diversity of ideas and functional task conflict necessary for effective governance (Sundaramurthy and Lewis, 2003). From a social capital perspective, extant research highlights that intra-industry ties lead to conformity to industry norms whereas inter-industry ties promote new ideas and change (Geletkanycz and Hambrick, 1997). In particular, older and well-performing firms may be more inclined to possess self-satisfaction, inertia, groupthink and strategic persistence than change and growth (Janis, 1982; Kisvalfi, 2000). Although analysing the impact of directors' industry expertise may be useful to shed light on the current debate, due to the limitations on the availability of data, this thesis does not explore the link between directors' industry-specific experiences and the market value of firms.

Firm-specific Experience

According to human capital theory, individuals develop firm-specific human capital throughout the period that they work in an organisation. Firm (organisational) tenure is regarded as a key indicator for firm-specific human capital, which denotes an individual's accumulated knowledge of a particular organisation and its operations (Becker, 1975; Hatch and Dyer, 2004; Pennings, Lee and Van Witteloostuijn, 1998; Weiss, 1995). Yet research on TMTs has investigated the effects of organisational tenure from a group dynamics perspective (e.g. Finkelstein and Hambrick, 1990; Grimm and Smith, 1991; Hambrick and Mason, 1984; Wiersema and Bantel, 1992). Prior research on organisational tenure of TMTs demonstrates that the length of director or TMT tenure may affect organisational processes and decisions in both positive and negative ways (Goll and Rasheed, 2005).

With regard to positive effects of organisational tenure, it is argued that organisational members (directors) with long tenures accumulate knowledge concerning each other's skills, limitations and idiosyncratic skills (Kor, 2006; Penrose, 1959) and develop internal social capital. This in turn enables the development of interpersonal trust, shared norms, language and routines which are deemed to improve group-functioning (Hambrick and D'Aveni, 1992; Sundaramurthy and Lewis, 2003; Westphal, 1999; Zenger and Lawrence, 1989). Furthermore, individuals with long tenures are expected to have developed a better grasp of organisational procedures and policies (Hambrick and Mason, 1984) as well as the organisation's external environment which is seen as a valuable resource for the implementation of firm's strategic decisions (Bergh, 2001; Cannella and Hambrick, 1993).

On the other hand, prior research on TMTs suggests that executives with long organisational tenures are less likely to make changes to a firm's strategies and configurations (Gabarro, 1987; Finkelstein and Hambrick, 1990; Wiersema and Bantel, 1992), collect and process new information (Miller, 1991), adopt a risk-taker approach (Hambrick and Fukutomi, 1991) and have a willingness to develop new ideas and directions (Miller, 1993). It is also argued that long-tenured executives are associated with the status quo (Bantel and Jackson, 1989), strategic inertia (Boeker, 1997) and risk aversion (Herrmann and Datta, 2005). The underlying reason stems from the fact that long-tenured executives are more likely to have greater commitment to company history, procedure and processes (Katz, 1982; March and March, 1977), to engage in previous company strategies (Hambrick, Geletkanycz and Fredrickson 1993), and to depend on routine information sources and past experience (Finkelstein and Hambrick, 1996). Miller (1991) maintains that CEOs with long organisational tenures tend to become "stale in the saddle" since they fail to make crucial organisational changes to adapt to the external environment.

Extant research on TMT demographics has often used tenure heterogeneity rather than the tenure length. This thesis does not employ heterogeneity measures as prior studies have widely used these measures to explore the link between board diversity and organisational outcomes. In extant literature, findings on the impact of directors' organisational tenures are inconclusive, which is identified as a gap in knowledge. This study intends to address these questions and inconsistencies through a longitudinal examination of a large dataset and to shed further light upon the current debate in human capital research.

Age

Human capital research has employed age as a proxy measure for an individual's human capital since increased age is associated with increased experience and thus, higher stocks of human capital (Becker, 1964; Conyon et al., 2001; Fisher and Govindarajan, 1992). It is argued that an individual's age is an important factor in decision-making since it affects the entire process from beginning to the end (Kirchner, 1958). For instance, Taylor (1975) finds that individuals at an older age spend more time on making decisions, search for more information and are more hesitant about their decisions and therefore are keener to review them. In the same manner, prior research demonstrates that, as individuals get older, they are more inclined to prefer established routines (Carlsson and Karlsson, 1970; Chown, 1960) and less inclined to confront the system of formal rules and authority in effect (Child, 1974).

Consistent with early research on managerial age, upper echelons literature has argued that executive age, as well as other characteristics, influences how a firm's situation is perceived and how pertinent decisions are made (e.g. Guthrie and Datta, 1997; Hambrick and Mason, 1984; Tihanyi et al., 2000). Studies on TMTs have viewed age as a proxy for director and/or CEO experience and also as an indicator for directors' and/or CEO's tendency to take risks and undergo change (Wiersema and Bantel, 1992). It has long been argued that younger executives have greater propensity for risk-taking than their older counterparts who tend to place more importance on their career and financial stability (Child, 1974; Hart and Mellons, 1970). Furthermore, older executives are deemed to have greater commitment to the status quo (Hambrick and Mason, 1984; Stevens et al., 1978) which leads to reluctance toward any organisational change. Hence, managerial youth is associated with corporate change and growth (Herrmann and Datta, 2005; Wiersema and Bantel, 1992).

In addition to propensity for change and risk-taking, executive age has also been linked to information gathering and processing capacity. Prior research has maintained that increased managerial age is likely to decrease the amount of physical and mental energy devoted to firm decisions (Child, 1974). Older executives are thought to possess fewer abilities to learn new ideas and behaviours and integrate information in decision-making (Chown, 1960). On the other hand, it is argued that older executives are associated with rationality in decision-making (Goll and Rasheed, 2005) since they tend to search for more information and provide a more accurate analysis of related information than their younger counterparts (Taylor, 1975). While increased managerial age is linked to advanced experience (Anderson et al., 2004; Cornett et al., 2003) and rational decision-making (Goll and Rasheed, 2005), prior research demonstrates that director age affects firm growth and strategic change in a negative way by limiting firms' capacity to renew and expand (Child, 1974; Hambrick and Mason, 1984; Wiersema and Bantel, 1992). Since existing literature provides no clear and significant relationship between director age and firm value and/or performance, it is a challenging task to assess how firms are influenced by directors' age on their boards but one that the present research aims to clarify.

Elite Titles

Prestige, in its most general sense, can be described as having status. D'Aveni (1990: 121) defines prestige as "a multidimensional construct that can be established by various status characteristics associated with membership in elite social circles". Elite educational connections, top-level positions in business, military or government institutions and participation in corporate networks are examples of such characteristics (D'Aveni, 1990). Contrary to D'Aveni's conceptualisation of prestige which is anchored in objective measures such as education, experience and social ties, sociology refers to prestige as a subjective concept (Certo, 2003). In sociology, empirical research on prestige is built on the basis of a firm belief that prestige is a hierarchy of occupational positions (see Wegener, 1992).

According to the dominant view in sociology, prestige is dependent upon how other individuals perceive occupational and social positions and to what extent such positions are valued.

Therefore, there has been a broad stream of research attempting to create prestige scales through various surveys to identify individuals' perceptions of different occupations (Goldthorpe and Hope, 1974; Hodge, Treiman and Rossi, 1966; Wegener 1992). In a similar manner, a recent study by Kirchmaier and Kollo (2006) maintains that directors' possession of honorary titles such as "Lord, Sir or The Rt. Honourable" and academic titles such as "Professor" are public indicators of director competence and prestige.

Although prior literature is replete with studies examining the importance of boards and non-executive directors on firm performance, the impact of prestigious directors on firm value has been less extensively studied. An existing study on the role of prestige and social networks established through prestige is the one by Kirchmaier and Kollo (2006), which examines whether prestige and social circles possessed by non-executive directors have a significant impact on firm value in the UK context. While they present evidence of value creation by prestigious non-executive directors in UK firms with larger boards, they find that prestige has no significant impact on value creation in firms with smaller boards. Kirchmaier and Kollo's work (2006) examines the relationship between the firm value and prestige signalled only by non-executive directors, whereas all prestigious board members are likely to contribute to firm value by enhancing organisational legitimacy, participating in social networks and establishing various social ties which may enable them to obtain access to diverse and unique resources. Due to the limitations on data availability, this study does not test the relationship between directors' possession of elite titles and firm market value.

2.4 CONCLUDING REMARKS

This chapter begins with an examination of social and human capital theories, explores related key themes, and provides the theoretical basis of the research conducted and documented in this thesis. The main body of the literature review comprises the origins of social capital theory, definitions of social capital, organisational social capital, social network theory and social network analysis, the origins of human capital theory, organisational human capital, dimensions of organisational human capital, and conceptual and empirical contributions to human capital theory. A theoretical framework linking social and human capital, two theoretically and empirically established forms of non-physical, non-financial capital, is also included in this chapter.

Following Burt (1997a), this study maintains that social capital is the contextual complement to human capital. In the case of corporate boards, this thesis argues that a firm's market performance is a function of its directors' skills, abilities, and knowledge as well as network advantages they bring to the firm's board. Therefore, this study aims to perform a simultaneous examination of the impact of organisational social and human capital, two significant forms of non-physical, non-financial forms of capital, on the market value of firms. The following chapter will examine the demand for social and human capital in the UK context and provide a review of the extant literature.

CHAPTER THREE

THE DEMAND FOR SOCIAL AND HUMAN CAPITAL

3.1 INTRODUCTION

The preceding chapter focused on the theories of social and human capital and examined the origins, dimensions, conceptual and empirical contributions for both concepts. This chapter explores the demand for social and human capital with a particular focus on the demand for well-connected and skilled (high human capital) directors.

3.2 THE DEMAND FOR SOCIAL CAPITAL

Social capital is embedded in social networks. Scholars such as Mobius (2001) and Pollitt (2002) have examined the notion of social capital in a supply-demand framework. In this framework, individual actors have some demand for social capital. In particular, the actors have demand for the services provided (acquired) by (through) social capital such as having access to the support in times of need. Actors acquire access to the services by establishing links to other members in the network. Hence, the level of supply of social capital is determined by the joint investments of all actors in establishing links within the network.

Shifts in the demand for the services of social capital over time can be observed as a result of the changes in actors' characteristics. Similarly, the opportunity cost of time to invest in social capital can increase over time as new opportunities to consume free time evolve and more individuals (particularly women) participate in the work force (Mobius, 2001). In their study of social capital, Glaeser, Laibson, and Sacerdote (2002) find that changes in individual characteristics and the opportunity cost of time affect the equilibrium level of social capital. At a community level, Putnam (2000) and Costa and Kahn (2001) also examine the impact of demographic trends, shifts in income inequality and changes in the opportunity cost of time, and they find that these factors are the predictors of the demand for and the provision of social capital.

While the value to firms of enhancing their firm's specific social capital is evident (Pennings et al., 1998), it is also argued that firms may benefit from the investments in general social capital (Pollitt, 2002). When markets fail and transaction costs are high, social capital can contribute to firm performance by providing access to information and reducing the costs of contracting and coordination (Schoorman et al., 1981). Failure to recognise and explicitly incorporate the concept of social capital as an input into business operations may limit an understanding of how firms use social capital to generate economic benefits. In support of this view, Johnson, Suarez and Lundy (2002) find that social capital markets are not perfect and firms' demand for social capital is partly determined by their endowments of social capital. Furthermore, their results suggest that firms can benefit from extending their networks and by reinforcing their existing ties to other actors in the network.

3.3 THE DEMAND FOR WELL-CONNECTED DIRECTORS

Board interlocks are deemed to serve corporations well as they link major boards and directors into social networks that form the basis of business communities (Carroll, 2004; Domhoff, 1975; Useem, 1984). Firms perceive well-connected directors as assets to the corporation as largest firms can communicate and disseminate information and best practices through board interlocks (Useem 1984). Well-connected directors are seen as opinion leaders who play an important role in setting the agenda and exercise influence for change (Scott 1991, Stokman et al., 1985; Useem, 1984). Directors acquire power 'not through direct intervention in the discretionary decision-making of corporate boards, but through their ability to set the parameters of the corporate environment within which all large enterprises must act' (Scott 1991: 188).

In extant literature, there are no clear predictions of firms' demand for well-connected directors. As discussed in preceding sections, prior research in organisational sociology, economics and finance underlines the potential benefits and costs associated with being well-networked. Firms can benefit from having a well-connected board in several dimensions. Firstly, well-connected directors have access to information on industry trends, market conditions and regulatory changes through board interlocks, which will assist them in strategic decision-making (Mizruchi, 1990; Mol, 2001). Secondly, board interlocks provide firms with benefits of social relationships and reduce information asymmetry when designing contracts (Schoorman et al., 1981). Both aspects could help firms improve the terms of their contracts. Thirdly, well-connected directors have ties to important and useful contacts that can be beneficial sources of useful business relationships (e.g. clients, suppliers) or sources of other economic benefits and resource exchange (see Cohen, Frazzini and Malloy, 2008; Nicholson et al., 2004). Fourthly, board interlocks can facilitate information diffusion through which value-enhancing business innovations and corporate practices, such as corporate financial policies (Fracassi, 2016), dividend policy (Bouwman and Xuan, 2010), and private equity deal exposure (Stuart and Yim, 2010), can propagate. Fifthly, firms can benefit from boardroom networks as a channel of communication and resource exchange with others, which can lead to the development of collusive competitive behaviour and generate economic benefits for a set of closely linked firms (Pennings, 1980). Finally, consistent with legitimacy theory, firms with greater connectedness are likely to have higher visibility and improved investor perceptions of firm quality and reputation (Chuluun, Prevost and Puthenpurackal, 2014; Fang and Peress, 2009; Merton, 1987).

There are also costs associated with the board interlocks as well as the benefits acquired through them. Early studies of director connectivity find that a director's possession of multiple seats (busyness) reduces his/her monitoring effectiveness and shareholder wealth (Core et al., 1999; Fich and White, 2003; Loderer and Peyer, 2002; Fich and Shivdasani, 2006). This is attributed to limited attention and less time that a well-connected director could devote to his/her advising and monitoring duties in each firm. Holding multiple board positions also raises questions over the independence of board decisions and several studies link board interlocks to the spread of poor corporate practices, such as option backdating (Armstrong and Larcker, 2009; Bizjak et al. 2009; Snyder et al., 2009) and accounting irregularities (Chiu, Teoh and Tian, 2013). In addition to poor corporate practices, it is argued that board interlocks could lead to the transmission of misleading or incorrect information which may result in value-decreasing strategies and investments (Larcker, So and Wang, 2013). Finally, despite affecting the shareholder value positively, collusive competitive behaviour can lead to the regulatory, litigation and reputation costs that may result in net losses of shareholder value.

In a study of board status and firm centrality in the US context, Davis and Robbins (2005) find that corporate boards' desire to appoint well-connected directors is dependent upon their need for displays of status. Firms particularly seek to recruit well-connected directors when they are owned by institutional investors rather than individuals, and when they have been the subject of governance-related shareholder proposals. Their results demonstrate that firms are able to recruit well-connected directors when they have a history of superior performance, but most importantly when they are already central. Overall, their findings indicate that board network centrality is self-reproducing: central boards appoint central directors, whereas peripheral boards do not (see White, 1981). Consistent with this notion, more recent investigations of overall board connectedness provide empirical evidence for higher abnormal stock returns (Larcker, So and Wang, 2013) and better financial reporting quality (Omer, Shelley and Tice, 2016), suggesting that the costs of multiple directorships are outweighed by the benefits of acquiring information, resources or learning from other firms. Furthermore, directors' external connections are shown to have a significant impact on the outcomes of director labour market in the form of director appointment (Barnae and Guedj, 2007) and director compensation (Kim, 2013). Based on prior research, firms' demand for well-connected directors is expected to be greater than its supply (directors' investments in establishing links in the network). To date, firms' demand for well-connected directors has not been studied empirically in the UK context. This is one of the knowledge gaps that will be addressed in this thesis.

3.4 THE DEMAND FOR HUMAN CAPITAL

Over the last two decades, it has become more visible that education, knowledge and human capital constitute a key element of modern economics at both individual and aggregate levels (Zagler and Zanzottera, 2009). Developed economies are focusing more and more on skill-intensive industries in order to maintain their leading positions in the global economy. In this context, information and knowledge are the crucial inputs and outputs of nearly all economic processes and subsequently economic growth. It is widely acknowledged that, over time, human capital has become more significant as an input due to the knowledge-intensive nature of production processes (Bell, 1973; Drucker, 1993; Winter, 1987). Knowledge has in fact replaced physical capital as the main driver of economic growth. A large and increasing fraction of occupations are related to the processing of information or require the application of specialised knowledge and skills to produce increasingly sophisticated goods and services. In particular, research and development (referred to hereafter as R&D) activities are increasingly skill intensive.

There is vast literature on the role of education from both a microeconomic and a macroeconomic point of view. Microeconomic studies, on the one hand, are mostly concerned about the estimation of private returns to investments in education. On the other hand, macroeconomic studies typically focus on the link between education and growth. An important branch of the microeconomic empirical research, which is also linked to the macroeconomic analyses, explores the impact of technological change on the demand for human capital and on the wage differentials between low and high-skilled workers.

The first argument regarding the demand for human capital posits that highly educated workers have a comparative advantage in adjusting to new technologies and developing them. Hence, the diffusion of these new technologies leads to an increase in the demand for high human capital workers. When there is a case of mismatch between the demand and supply for these skills (e.g. the demand is greater than the supply), the Mincerian return to education increases. The second argument regarding the link between new technologies and the demand for better educated workers posits that firms have greater demand for human capital in the production processes as the new technologies substitute labour-intensive tasks and are complementary to high human capital workers.

In their study of the development of new technologies and education, Doms, Dunne and Troske (1997) demonstrate that human capital is a requirement for the implementation of new technologies. Consistent with this view, Upadhyay (1994) develops a model where the demand for new types of human capital increases with technological innovation[22]. Furthermore, studies by Galor and Weil (1999, 2000) and Galor and Moav (2002) maintain that the acceleration in the pace of technological progress has led to an increase in the demand for human capital. It is argued that technological progress and capital accumulation complement mental-intensive tasks and substitute for physical-intensive tasks in industrial production (Galor and Weil, 1996, 1999). Lucas (1993) and Greiner (1999) also note that increases in physical capital must be met by increases in human capital to ensure the sustainability of growth in per-capita income.

Following the empirical evidence establishing a link between the technological progress and the increasing demand for high skilled workers, several studies have explored the mechanisms

[22] Empirical studies examining the link between technological innovation and skills demand include Berman, Bound and Griliches (1994), Chapman and Tan (1992), and Autor, Katz and Krueger (1998).

that drive this process at the firm level adopting an organisational change perspective (Caroli and Van Reenen, 1999; Dunne, Haltiwanger and Troske, 1996; Machin and Van Reenen, 1998). Changes in organisational practices include the decentralisation of authority, the delayering of managerial functions and increased multi-tasking. In particular, Caroli and Van Raneen (1999), using a panel of British and French plants, find that these changes reduce the demand for less skilled (low human capital) workers and lead to greater productivity growth (particularly in establishments with higher levels of human capital).

Over the last two decades, the demand for employees with exceptional talent, training, autonomy and management ability is increasing much faster than for employees in low and middle-wage occupations (Bresnahan, Brynjolfsson and Hitt, 2002). Part of this change in labour demand is explained by such wider economic patters as globalisation, sectoral changes in employment, and changes in labour market institutions. Krugman and Lawrance (1993) argue that these factors seem to be too small to shed light on the breadth and depth of the shift, leaving a large residual change. Economists have widely referred to this residual as an indicator of a “skill-biased technical change” in the way goods and services are produced in the economy (Griliches, 1969; Berndt, Morrison and Rosenblum, 1992; Berman, Bound and Griliches, 1994). Hence, several studies have linked the change in skills demand to the largest and most widespread technical change of the current era, information technology (Abowd et al., 2007; Autor, Katz and Krueger, 1998; Bresnahan, Brynjolfsson and Hitt, 2002).

With the start of the information technology era, the context of work within corporations has rapidly changed. As the economy has moved from the industrial age to the age of information, there is a growing demand for the possession of new skills. Changes in technology have had remarkable effects on the way individuals learn and work by creating new job types and eliminating or transforming skills needed for existing jobs. Developments in information technology have influenced the accessibility of information and how knowledge is produced and protected. Given the rapidly evolving nature of the global markets, it is crucial that firms have skilled (high human capital) directors who are able to foresee the developments in their respective industry or sector and provide strategic leadership to the firm with the ultimate purpose of creating wealth for their shareholders.

3.5 THE DEMAND FOR SKILLED DIRECTORS

Directors are appointed to corporate boards to protect shareholder wealth. In addition to setting the corporate strategy, directors have the power to select and dismiss managers if needed. Hence, the board of directors can be seen as the primary mechanism for monitoring and advising management. It is often argued that board of directors' effectiveness in monitoring depends upon the existence of outstanding directors on the board (Dunn, 1987). Conventionally, characteristics such as integrity, competence, and an ability to make collective decisions with other members are referred to as essential qualities for board directors (Fairchild and Li, 2005). However, recent studies show that determining the requirements for directors' skills and experiences is a more complex task (e.g. Anderson et al., 2011; Johnson, Schnatterly and Hill, 2013; Kim and Lim, 2010).

The provision of human capital is one of the reasons why directors are elected on corporate boards. Different firms have different demands for monitoring and advising, subject to the costs and benefits of such services (Adams 2003, Demsetz and Lehn, 1985; Gillan, Hartzell and Starks, 2011). From a resource dependence theory (RDT hereafter) perspective, directors must provide critical resources to a firm or help the firm secure these resources through their external ties in order to advise and counsel the management according to the firm's environment (Pfeffer, 1973; Pfeffer and Salancik 1978; Hillman et al. 2000, 2008, 2009). Prior research provides empirical evidence that directors' human capital affects firm behaviour (Dalziel et al., 2011). Fama (1980) and Fama and Jensen (1983) argue that the market for outside directorships provides incentives for outside directors to develop their reputation as good monitors. In other words, managers of high performing firms are more likely to acquire positions as outside directors in other boards as they are assumed to have the relevant skills and experience to direct and assess managerial behaviour. Fama and Jensen's view suggests that a board with a more reputable outside director, with high stocks of human capital, monitor more effectively than other boards as they possess significant reputation capital as well as extensive knowledge and experience regarding the firm's external environment.

The increasing internationalisation of business has led to a higher demand for directors with relevant knowledge and contacts in foreign markets which will help firms establish links in different contexts of the countries in which they operate (Carpenter et al., 2001). It is argued that more-diversified firms have a higher demand for different expertise on their boards (Yermack, 1996). Such firms are expected to have more complex operations which require more board effort (Adams, 2003; Boone et al., 2007; Coles et al., 2008; Lehn et al., 2009; Linck, Netter and Yang, 2008). A recent study by Nguyen (2014) maintains that the demand for monitoring and advising, in turn, influences the way firms contract with their directors, which includes the use of different types of compensation such as stock, stock options and meeting fees. The study reveals that different components of director compensation have different effects on board monitoring and advising activity.

Prior research on the impact of regulatory changes in corporate governance demonstrates that there has been a substantial increase in the workload of directors and the associated reputational[23] and litigation risks[24] (Linck, Netter and Yang, 2009). In addition, corporate scandals such as Enron and Worldcom have led to considerably increased public scrutiny of corporate governance over the last decade. Following the corporate governance reforms, time demands on corporate boards are growing, with more frequent meetings and greater preparation

[23] See Lel and Miller (2015) for a discussion on the market for director reputation around the world.
[24] Both real and perceived risks including concerns about governance transparency and board effectiveness have increased in the aftermath of corporate reforms.

time (Canavan and Gallo, 2003). Furthermore, there is an increased need for specific expertise such as finance and accounting (Krishnan and Lee, 2009; Badolato, Donelson and Ege, 2014) and for non-executive directors to serve as board/committee chair (Engel, Hayes and Wang, 2010). Consequently, over time, corporate boards have become larger, more independent, have more committees, meet more often and have more responsibility and risk (Linck, Netter and Yang, 2009). Following these changes, it is observed that there is a significant decrease in the supply of directors whereas the demand for non-executive directors is greater (Sharma, 2011; Linck, Netter and Yang, 2009). In the context of UK corporate boards, to date, the demand for skilled (high human capital) directors has not been empirically examined. This is one of the gaps this thesis intends to address through various empirical analyses.

3.6 CONCLUDING REMARKS

This chapter explored the demand for social and human capital with a particular focus on well-connected and skilled board directors. A review of prior literature demonstrates that firms have to bear the costs associated with acquiring and/or maintaining higher levels of social capital, as well as enjoying the benefits acquired through the board interlocks. Furthermore, in the current era of knowledge and technology, extant research provides evidence on the increasing need for high-skilled directors, which has led to the increases in their workload, public scrutiny and associated reputational and litigation risks. The following chapter presents the literature review on intangibles from an accounting perspective and explores the role of financial reporting in firm valuation.

CHAPTER FOUR

INTANGIBLES IN ACCOUNTING: A REVIEW OF THE ROLE OF FINANCIAL REPORTING IN FIRM VALUATION

4.1 INTRODUCTION

Following the literature review on social and human capital, this chapter aims to shed light on intangibles from an accounting perspective and examines the use of accounting-based valuation models for corporate valuation. Despite extensive theoretical and empirical work on social and human capital as two significant forms of non-physical, non-financial capital, existing accounting systems neither recognise nor prescribe an accounting treatment[25] for these forms. Following the rise of a knowledge-based economy, non-recognition of intangible assets in the financial statements has resulted in a growing difference between the book value and market value of firms (El-Tawy and Abdel-Kader, 2013). Accounting information has two important roles in market-based economies: valuation role and stewardship role (Beyer et al., 2010). The valuation role of accounting information enables shareholders and creditors to assess the return potential of investment opportunities whereas the stewardship role of accounting information enables capital providers to monitor the use of their capital once committed. Therefore, from a valuation perspective, the increasing disparity between the book value and market value of firms indicates the inadequacy of accounting information[26] in reflecting firms' current economic position and financial performance.

Among standard setting bodies, the majority of current views[27] on the measurement concept is based on an idealised view of markets as being *complete* and in *perfectly competitive*

[25] It is worth noting that there is an exception to this statement. Some listed football clubs do include investments in player contracts in their statements of financial position (see Amir and Livne, 2005).
[26] See Beyer et al. (2010) for a discussion on the tension between the valuation and stewardship perspectives.
[27] Contrary to the current view, an informational approach to measurement concerns the existence of incomplete and imperfect markets, and advocates the use of different measurement methods to provide the most relevant

equilibrium (Whittington, 2010). Under such conditions, every asset and liability has a unique market price, and this price is referred to as the ideal measure for accounting purposes. From this point of view, the IASB conceptual framework suggests a single ideal measurement method which is based on the market price, such as the fair value as defined in IFRS 13.

However, in reality, markets are neither perfect nor complete, therefore unique market prices as ideal measures for accounting are not available for all assets and liabilities[28]. The existence of *information asymmetry* is a fundamental source of imperfection in markets. Market imperfection stems from the fact that market participants are not provided with equal amounts of information. Based on an informational approach, the objective of accounting should be designed to improve such asymmetry in capital markets (Christensen, 2010; Whittington, 2010). Applying a single measurement method may not be sufficient in reflecting the current market conditions or firms' financial performance. Hence, it is vital for accounting systems to identify and provide the information that will assist users of financial statements in predicting future performance of entities. Following an informational approach, this thesis intends to explore the role of intangibles in firm valuation, in particular, the value relevance of information on board social and human capital.

The chapter begins with a review of the concept of intangibles in accounting and accounting treatment for intangible assets in accordance with the UK Generally Accepted Accounting Principles (GAAP) and International Financial Reporting Standards (IFRS). Following the review, the chapter will discuss the market-based accounting research and examine the value-relevance literature with a particular focus on the Ohlson (1995) Model.

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information in assessing the current economic position and financial performance of the entity (Whittington, 2010).

[28] IFRS 13 establishes a fair value hierarchy that categorises into three levels (para. 76-90) the inputs to valuation techniques used to measure fair value. The fair value hierarchy gives the highest priority to quoted (unadjusted) prices in active markets for identical assets or liabilities (Level 1 inputs) and the lowest priority to unobservable inputs (Level 3 inputs).

4.2 INTANGIBLES IN ACCOUNTING

4.2.1 The Intangible Dimension of Businesses

Over the past decade, academics have argued that existing systems of accounting and financial reporting[29] are insufficient to support business models that are largely driven by innovation and intangibles (Davison, 2010; Eckstein, 2004; Lev, 2001; Petty and Guthrie, 2000; Zeghal and Maaloul, 2011). The central argument asserts that current accounting and reporting systems were designed for a manufacturing-based economy, trade and consumption of physical goods. These systems are therefore inadequate for a knowledge-based economy driven by intangible experience, technologies and ideas. The accounting problem regarding intangibles emerges from the need to provide relevant and faithfully represented information about the intangible dimensions of businesses. The dimension comprises innovations and technologies, organisational structures and capabilities, control processes, brand names, customer lists and databases, and social, professional, and political networks that contribute to a firm's operations at different levels (Blair and Wallman, 2001; Bond and Cummins, 2000; OECD, 2006). The OECD (2006: 7) underlines this problem by noting that:

> *Although accounting standards can probably be developed further to take into account a wider range of intangibles, clear limits are set by the difficulty of establishing monetary values (valuation) that are at the same time consistent across firms, verifiable and that cannot be easily manipulated. As a result, a significant portion of corporate assets go under-reported in the financial accounts. The relative lack of accounting recognition of intangibles coupled with their growing importance in the value creation process means*

[29] "An accounting system records transactions and events according to a set of accounting standards in force, and produces the base information for a periodic financial report" (Ewert and Wagenhofer, 2005: 1104). A financial reporting system comprises various processes which link an accounting system to financial reports with an objective to provide useful information to external stakeholders.

that the financial statements have lost some of their value for shareholders. If other information does not fill the void, there could be misallocation of resources in capital markets.

The function of financial accounting and reporting is to provide a formal representation that reflects a firm's activities, which are complex and have an unfolding nature in the form of reported figures and narrative statements (Biondi and Reberioux, 2012). Since current accounting standards provide a narrow framework to deal with intangibles and are often inadequate in recognising a wider range of intangibles such as social and human capital, this thesis benefits from management literature to explore the concept of intangibles and the extent to which they can be included in accounting and financial reporting systems. Hence, next section addresses the existing debate over current accounting practices for intangible assets.

4.2.2 Extant Debate over Current Standards for Intangible Assets

Intangible assets recognised by accounting standard-setters can be examined under two fundamental groups[30]. The first group comprises a set of activities such as advertising, distributing, training, start-up and research and development (R&D) which could lead to the creation of intangible assets in firms. There has been a long debate over the issue of the link between the scope of investment in activities that can facilitate the creation of intangible assets and related accounting practices (Dedman et al., 2009). Accounting treatment for expenditures related to intangible-creating activities is the immediate expensing rather than capitalisation, which remained the same excluding development costs (see IAS 38.57, Appendix II) after the introduction of IAS 38 (Stark, 2008). Following the revision of financial reporting standards (FRS), this view still holds.

[30] See Appendix II for a review of current accounting standards and practices for intangibles in the UK and global context.

The revised version of FRS requires the immediate expensing of start-up, training, advertising and promotional activities and intangible assets arising from research (FRS 102, Para. 18.8C and 18.8E). Only intangible assets arising from development can be recognised if they fulfil the relevant criteria for recognition (FRS 102, Para. 18.8H). The UK accounting system does not set any requirements on the disclosure of these expenditures (except R&D expenditure which is recognised as an expense during the period) while other accounting systems, such as the US system, requires a limited amount of disclosure on such activities (SFAS No.142). In the UK context, there has been little investigation regarding the accounting treatment of expenditures arising as a result of the activities that lead to the creation of intangible assets (Stark, 2008). The majority of prior studies focus on the US accounting system and explore the value relevance of such expenditures[31] (e.g. Aboody and Lev, 1998; Barth, Beaver and Landsman, 2001; Chan et al., 2001; Lev and Sougiannis, 1996).

Over the years, a number of concerns relating to these accounting treatments have been raised. The first concern is that most of the expenditures in intangible-creating activities are expensed even though they result in the creation of economic assets. The second concern involves the restricted amount of disclosure required by the accounting standards to provide information on these items. Furthermore, it is argued that inappropriate measurement practices regarding these activities and limited amount of disclosures lead to a misleading representation of firms[32] since the benefits of these activities are not fully reflected in the stock prices (Dedman et al., 2009). This argument is particularly robust for the accounting standards and practices with respect to R&D activities (Akbar and Stark, 2003a; Green, Stark and Thomas, 1996; Stark and Thomas, 1998).

[31] For a review, see Wyatt (2008).
[32] See Dedman et al. (2009) for a detailed discussion on accounting, intangible assets and stock market activity.

The second group includes a range of legal rights such as brands, patents, trademarks, secret processes, licences, operating rights and copyrights which are legally possessed and used by firms to generate future cash flows. The second group is also referred to as accounting intangibles and firms are allowed to report accounting intangibles that are purchased in an arm's length transaction at their acquisition values (Basu and Waymire, 2008). However, the majority of accounting intangibles are internally developed and firms are not permitted to capitalise their internally-generated intangible assets which do not have readily ascertainable market values under the UK GAAP. Revised FRS requires the immediate expensing of expenditure on internally generated intangible assets such as brands, logos, publishing titles, and customer lists (FRS 102, Para. 18.8C). In some accounting systems such as the US system, firms can report these intangibles on their balance sheets at historical costs or nominal amounts rather than at their market values[33]. Academics[34] have long ascribed conservative accounting practices to the expensing of R&D expenditures regulated by SFAS No. 2 (FASB 1975).

Accounting conservatism in the recognition and disclosure of intangibles has led to several calls for accounting standard-setters to re-evaluate how intangibles are recognised and to improve existing accounting practices for intangibles (Lev, 2001; Oliveira, Rodrigues and Craig, 2010; Wyatt, 2008; Zeghal and Maaloul, 2011). A review of intangibles demonstrates that there are a number of difficulties associated with the concept itself (Biondi and Reberioux, 2012; Choong, 2008; Kaufmann and Schneider, 2004). These difficulties relate to their recognition, measurement, impairment (and amortisation) and disclosure. The major difficulty lies in the fact that it is challenging for academics and accounting standard-setting bodies to provide a precise definition of intangibles. Existing definitions provided by accounting

[33] In the US accounting system, the practice of reporting valuable intangibles at conservative nominal values such as $1 can be traced back to General Electric's balance sheet of 1907 (Ely and Waymire, 1999; Waymire and Basu, 2008).
[34] See Aboody and Lev (1998), Aboody and Lev (2000) and Lev and Sougiannis (1996).

standard-setters are very limited in their scope and therefore fail to account for firms' intangibles, such as social and human capital. The lack of a comprehensive framework for recognising and disclosing information on intangibles as well as the increased use of intangible assets has led to a decline in the relevance of financial statements for valuation (Zeghal and Maaloul, 2011). To date, extant research has not examined the value relevance of information on firms' social and human capital stocks. This research gap is addressed in this thesis.

4.2.3 Concluding Remarks

Section 4.2 focuses on intangibles and examines the accounting treatment of intangible assets and goodwill in the UK and global contexts. The review reveals that there is a lack of a comprehensive framework for defining and categorising intangibles, and major accounting issues relate to their recognition, measurement, impairment (and amortisation) and disclosure. Following the review of intangibles in accounting, the remainder of the chapter explores the literature on equity valuation and market-based accounting research, which provides a useful framework for examining the link between the summary accounting figures and the market value of firms. In particular, this thesis focuses on the Ohlson (1995) Model which allows the inclusion of other information (information on social and human capital) in firm valuation.

4.3 EQUITY VALUATION AND MARKET-BASED ACCOUNTING RESEARCH

4.3.1 A Review of Market-based Accounting Research

Capital markets-based accounting research (referred to hereafter as MBAR) in financial accounting has a history of more than four decades and researchers' interest continues to increase as a consequence of the issues in financial reporting. Market-based accounting research examines the relationship between accounting information and key market variables, such as the share price of a firm, the rate of return on its shares over a given period or the systematic risk of its shares[35]. The study of Ball and Brown (1968) is the first to investigate the relationship between an accounting measure (e.g. earnings or cash flows from operations) and stock returns. Ball and Brown (1968) maintain that market participants (investors) have access to more timely sources of information about firms' ability to generate cash flows, and therefore assume that financial statements are not the only source of information for market participants. Following Ball and Brown's study, a large number of researchers examine the relative informativeness of earnings and cash flows. This research stream broadly investigates the changes in stock returns caused by accounting information (earnings announcements), value relevant economic events and accounting disclosure. Examples include, but are not limited to, Ali and Pope (1995), Ball (1972, 1978), Beaver (1968), Beaver and Dukes (1972), Dechow (1994), Grant (1980), McLeay, Kassab and Helan (1997) and Wilson (1987).

The other stream in MBAR focuses on explaining values (valuation models) rather than changes in value (return models). Lev and Ohlson (1982) maintain that accounting researchers have exclusively focused on the link between financial statement data and stock returns, and ignored the crucial role of accounting figures in asset valuation. Lev and Ohlson (1982: 305) emphasise this idea by noting:

[35] See Brown and Howieson (1998) and Kothari (2001) for a review of capital markets-based accounting research.

> *... If the relevance of accounting information to investors is at issue, surely the extent to which this information accounts for (explains) the values of stock, rather than just triggers a change in these values, should be of major concern.*

The advantages and disadvantages of return and valuation models are discussed in several studies (e.g. Beaver and Landsman, 1983; Gonedes and Dopuch 1974; Kothari and Zimmerman, 1995; Lev, 1989; Lev and Ohlson, 1982). For instance, Beaver and Landsman (1983) advocate both return and valuation approaches rather than promoting one over the other. They maintain that each approach will provide information that is not provided by the other, and therefore support the use of both approaches. On the other hand, Kothari and Zimmerman (1995) provide empirical evidence supporting the superiority of valuation models over the return models in MBAR. Their analysis suggests that the estimated slope coefficient from the price model is unbiased. In a similar manner, Lev (1989) argues that the goodness of fit obtained through modelling the link between unexpected earnings and stock returns is poor. This poor statistical performance may be caused by a number of factors such as poor model specification, measurement errors in the earnings and the research design, which ignores the impact of firm-specific, industrial and macro-level dynamics.

Valuation models are increasingly being used to examine different types of relationships to explain the variation in stock prices. Ohlson's work (1995) has been seminal in valuation research. Ohlson (1995) expresses firm market value as a linear function of book value and the present value of expected abnormal earnings, which is defined as current earnings minus a capital charge (equal to the risk-free rate) multiplied by the opening book value. Furthermore, Ohlson[36] (1995) suggests additional assumptions of linear information dynamics where firm

[36] Merits and limitations of the Ohlson (1995) model are discussed in detail in the remainder of this chapter whereas its methodological foundations are examined in section 6.4 of Chapter Six.

value can be re-expressed as a linear function of equity book value, clean surplus earnings and dividends. Feltham and Ohlson (1995) expand on the work of Ohlson (1995) and develop a model of accounting data and firm market value when data on financial and operating activities are available. The valuation models suggested by Ohlson (1995), Feltham and Ohlson (1995) and Stark (1997) advance the theoretical foundation for re-defining the link between accounting figures and firm market value.

In recent years, a substantial amount of the empirical valuation research uses Ohlson's valuation framework as a theoretical benchmark. A large number of studies examine the value relevance of accounting numbers in developed markets through the price model. In these studies, firm market value is expressed as a function of the book value and reported earnings (or their components). This stream of research provides empirical evidence on the value relevance of book values and earnings (e.g. Akbar and Stark, 2003b; Bernard 1995; Bettman 2007; Bettman, Sault and Welch, 2006; Brief and Zarowin, 1999; Collins, Maydew and Weiss, 1997; Green, Stark and Thomas, 1996; Hand and Landsman, 2005; Rees 1997). Some of these studies also include non-accounting variables such as growth, firm size, industry type, market share and risk as control variables in their models.

In value relevance literature, there are numerous studies that are rooted in a wide range of explanations of the standard setting and accounting theories which determine the basis for estimating relationships and drawing various conclusions. Despite the existence of some studies with no or minimal explanation, the majority of value relevance studies refer to the fundamental objective of financial reporting (financial statements and disclosures) as equity valuation. Such studies assume that accounting's role is to provide either measures of equity value or measures associated with the equity values, or information relevant for equity valuation. These assumptions are deemed to derive from both the descriptions of accounting practice as part of an accounting theory, and the descriptions of the objective pursued by accounting standard setters as part of a standard-setting theory. It is worth noting that value relevance research that contributes to the improvement of accounting standards fundamentally stems from inputs-to-equity valuation theory since, under this theory, research focuses on accounting numbers relating to particular assets, liabilities or components of earnings (Barth, Beaver and Landsman, 2001). Hence, despite using prices as a benchmark for equity value, studies vary in the assumptions made and the models specified.

4.3.2 Valuation Models in Market-based Accounting Research

Valuation models employed in market-based accounting research literature comprise the dividend-discounting model (DDM) and its transformations such as the earnings (capitalisation) model and the residual income model. *The balance sheet model*, which equates the market value of equity to the market value of assets minus the market value of liabilities, is also widely used among incremental association studies in the literature (Barth, 1991, 1994; Barth, Beaver and Landsman, 1992; Barth and Landsman, 1995). This approach is contingent upon the implicit assumption that a firm's assets and liabilities are separable and that book values of these assets and liabilities convey information about their market values (Kothari, 2001). The balance sheet model holds only if there is a relevant market for each asset, liability and stock, and there is no expectation of above-competitive returns (all markets are competitive) to the firm (Holthausen and Watts, 2001). Furthermore, the balance sheet model is generally extended to comprise earnings as an added variable and therefore is converted into an empirically similar model to other dividend-discounting models.

The development of the dividend-discounting model is ascribed to Williams (1938). The model describes share price as the present value of expected future dividends discounted at their risk-adjusted expected rate of return. Stock price is calculated based on the forecasts of future dividends and the discount rates for future periods. A number of assumptions about the dividend process and discount rates were made by Gordon (1962) to develop a simple valuation formula, known as the Gordon Growth Model. These assumptions particularly concern the discount (r) and growth (g) rates. The dividend-discounting model has been reformulated based on the attribute that future dividends can be rewritten as a function of forecasted values of future earnings and future investments. The work of Fama and Miller (1972) provide a complete explanation of how the dividend-discounting model is transformed into an earnings capitalisation model. They analyse the key drivers of share prices and highlight the important features of equity valuation.

In accounting literature, earnings capitalisation models are predominantly used in studies on the earnings response coefficient (see Beaver, Lambert and Morse, 1980; Beaver, Lambert and Ryan 1987). In earnings response coefficient applications of earnings capitalisation models, forecasted earnings are either derived from time-series properties of earnings (e.g. Beaver, Lambert and Morse, 1980; Kormendi and Lipe, 1987; Collins and Kothari, 1989) or analysts' forecasts (e.g. Dechow, Hutton and Sloan, 1999). The reinvestment effect on earnings is explained by the assumption that future investments do not yield above-normal rates of returns, which corresponds to anticipating a 100% dividend-payout ratio (e.g. Kothari, 1992; Kothari and Zimmerman, 1995). In the earnings response coefficient literature, the marginal effect of growth opportunities is captured through proxy measures such as the market-to-book ratio or analysts' high forecasted earnings growth (e.g. Barth, Elliott and Finn, 1999; Charitou, Clubb and Andreou, 2001; Collins and Kothari, 1989).

4.3.3 The Residual Income Valuation Models

Residual income valuation is defined as "the method of estimating firm value based on expected future accounting numbers" (Myers, 1999: 1).The Ohlson (1995) and Feltham and Ohlson (1995) residual income valuation models (referred to hereafter as RIVM) have been widely used and discussed in accounting literature (e.g. Ali, Hwang and Trombley, 2003; Beaver, 1999; Dechow, Hutton and Sloan, 1999; Jiang and Lee, 2005; Lo and Lys, 2000;

Lundholm and O'Keefe, 2001; Myers, 1999; Richardson and Tinaikar, 2004). The residual income valuation model derives from a dividend-discounting model and expresses equity market value as the sum of current book value and the discounted present value of expected abnormal earnings. It is emphasised by Ohlson (1995) and other researchers (e.g. Bernard, 1995; Biddle, Bowen and Wallace, 1997) that residual income valuation has a long history that can be traced back to the 18th century[37]. Nevertheless, Ohlson (1995) and Feltham and Ohlson (1995) have the undeniable merit of successfully evoking the concept of residual income valuation and advocating the concept to the extent that it has had a major influence on empirical accounting research.

The applications of residual income valuation model include studies employing forecasted numbers (e.g. Abarbanell and Bernard, 2000; Aboody, Hughes and Liu, 2002; Baginski and Wahlen, 2003; Bernard, 1995; Frankel and Lee, 1998; Gebhardt, Lee and Swaminathan, 2001; Liu, Nissim and Thomas, 2002) and studies employing historical numbers for equity valuation (e.g. Collins, Maydew and Weiss, 1997; Francis and Schipper, 1999). Such studies typically focus on whether book value of equities and earnings could explain differences in market value of equities across different firms and periods. The forecasted model estimates the stock price based on book value and residual income whereas the historical model estimates the stock price based on book value and actual historical earnings.

The Ohlson (1995) model postulates a time-series structure on the abnormal earnings process that has an impact on value. The linear information dynamics in the Ohlson model determines an autoregressive, time-series decay in the current period's abnormal earnings and incorporates ''information other than abnormal earnings'' into the valuation model (Ohlson, 1995: 668). The autoregressive process in abnormal earnings captures the notion that the persistence of

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[37] Previous research on the concept of residual income valuation comprises the works of Edwards and Bell (1961), Hamilton (1777), Marshall (1890), Peasnell (1981, 1982), Preinreich (1938) and Stewart (1991).

monopoly rents must affect residual income (Myers, 1999). In other words, competition will eventually compel returns toward the cost of capital and subsequently, firms experiencing below-normal rates of returns will exit. The other information variable advocates the idea that transaction-based, historical-cost earnings (accounting conservatism) fails to reflect the information implicit in market value of a firm's equity (Beaver, Lambert and Morse, 1980).

The Feltham and Ohlson (1995) model is developed on the same foundations as the Ohlson (1995) model excluding the autoregressive time-series process. The Feltham-Ohlson RIVM is akin to the dividend-discounting model in that firm value is expressed as a function of current and forecasted accounting numbers in preference to forecasted dividends or net cash flows. The model assumes that forecasted abnormal earnings reflect the existence of other information and can follow any process. Based on this property, analysts' forecasts can be used in the applications of the Feltham-Ohlson model. The use of analysts' forecasts is seen as an appealing feature of the model compared to the dividend-discounting model (see Lee, 1999). Another appealing feature of residual income valuation models, as emphasised in the literature, is that the model's implementation is not affected by the management's choice of accounting method (Bernard, 1995). However, this feature results in a number of consequences, which have been the subject of much debate among accounting researchers[38].

4.3.4 The Ohlson (1995) Model

The Ohlson (1995) and Feltham and Ohlson (1995) papers have received notable wide acceptance in accounting research. Various accounting researchers such as Bernard (1995), Lundholm (1995) and Dechow, Hutton and Sloan (1999) emphasise the significance of these models for accounting, in particular, valuation research. For instance, Bernard (1995: 733) underlines their significance by noting:

[38] For a detailed review, see Kothari (2001).

> *The Ohlson (1995) and Feltham and Ohlson (1995) studies stand among the most important developments in capital markets research in the last several years. The studies provide a foundation for redefining the appropriate objective of research on the relation between financial statement data and firm value.*

In Ohlson (1995) model, firm value is expressed as a linear function of the book value of equity and the present value of expected future abnormal earnings. The model makes the assumption that the capital markets are perfect although imperfect product markets are permitted for a finite number of periods. The assumption of linear information dynamics allows the firm value to be represented as a linear function of equity book value, net income, dividends, and other information *(v term)*. In his paper, Ohlson (1995) demonstrates that limiting assumptions relating to the persistence of abnormal earnings leads to two extreme cases: balance sheet-based and earnings-based valuation models. The Ohlson model facilitates equity valuation that is based on current accounting data (earnings and equity book value) rather than permanent earnings or the value of assets and liabilities. Therefore, the model can be applied regardless of an informational link between accounting numbers and economic measures such as the permanent earnings.

Ohlson's (1995) equity valuation model has found a large-scale implementation since it parameterises the links between firms' book values, earnings, net dividends and other information and equity market values. The model combines the dividend discount model with clean surplus accounting and linear information dynamics and assumes that there is market information symmetry and market efficiency (Ohlson, 1995, 2001). Akin to other models, the Ohlson model is built upon simplifying assumptions that allow prudent representations of the complex reality (Barth, Beaver and Landsman, 2001). Advocating this idea, the model assumes clean surplus accounting (change in book value of equity is equal to earnings less dividends plus or minus capital transactions). Although the model is criticised for not specifying an optimal accounting system, this criticism is not seen as a weakness which prevents its use in assessing the value relevance of accounting numbers (Holthausen and Watts, 2001).

The Ohlson model is widely used as the valuation method in numerous studies that examine the value relevance of accounting information in different contexts. These studies mostly argue that the inclusion of both earnings and book value in the valuation model results in more explanatory power than the inclusion of either accounting number alone although the results vary depending on the prevailing accounting systems[39]. Nevertheless, in majority of the studies, there is an important part of the variance that needs to be examined. From a value relevance perspective, researchers incorporate different variables into the Ohlson model as the "other information variable" which represents information on value-relevant events. This stream of research, therefore, promotes further investigation into determining variables other than accounting earnings and equity book value that can yield better estimates of firm value.

This research focuses on the Ohlson (1995) model for a number of reasons. Firstly, the Ohlson model allows firm market value to be represented as a linear function of equity book value, net income, dividends, and other information (*v term*). In other words, current accounting information can be used to estimate equity market value regardless of a logical relationship between summary accounting numbers and economic measures such as permanent earnings[40]. Secondly, the other information variable (*v term)* is an appealing feature for incorporating non-physical, non-financial forms of capital (assets) into the model and testing their significance in firm valuation. Through the use of other information variable, these forms, which are not reflected in financial statements, can be taken into consideration and examined to explore whether they provide relevant information for firm value[41]. As emphasised previously, the

[39] See Pirie and Smith (2005) for a detailed review.
[40] See Burgstahler and Dichev (1997) for a study of earnings, adaptation and equity value.
[41] In the Ohlson model, the impact of such assets on firm value may be under or overestimated.

other information variable advocates the idea that transaction-based, historical-cost earnings (accounting conservatism) fails to reflect the information embedded in equity market value. Thirdly, the clean surplus framework presented in the Ohlson model provides a rational framework for integrating traditional concepts of income measurement into neo-classical economics based approach to financial reporting. This implies that, despite referring to accounting income as a feasible proxy for economic income, the model also concerns the development of capital asset pricing in the economic theory. Hence, it yields a model of financial reporting embracing several insights from information economics and positive accounting theory.

4.3.5 Criticisms of the Ohlson (1995) Model

Despite having gained huge popularity in accounting research, residual income valuation models and the Ohlson (1995) model in particular, have been criticised for a number of limitations they impose. Criticisms toward Ohlson model include, but are not limited to, issues around the model's valuation anchors, other information variable (*v term*), dirty surplus accounting opposed to clean surplus accounting and empirical implementations of the model.

The first criticism concerns the model's formal linkage between current accounting information and firm value. Although this characteristic is perceived as a merit of the Ohlson Model, some researchers argue that the major function of equity valuation is forecasting, therefore, historical accounting numbers may not be sufficient for forecasting the stream of expected returns[42]. From this perspective, the fundamental analysis is considered more useful since it requires the use of broader information set to make better forecasts. In other words, reported financial statement numbers can be of more importance for equity valuation if they are used in association with other information. Firm valuation entails combining information derived from

[42] See Lee (1999).

a number of disciplines such as accounting, finance, economics, marketing, and corporate strategy (Lee, 1999). Advocating this argument, Verrecchia (1998: 113) criticises a derivation of the RIVM by noting: "a very simple idea...an idea, however, with no economic context". Despite potential benefits of communicating firm value in terms of cash flows and non-cash information, Verrecchia (1998) challenges the Ohlson model as to how knowledge of the cash and non-cash information is acquired.

The second criticism relates to the "other information variable" as presented in the model. The term *v* denotes the information that relates to all value-relevant events that have not yet been reflected in financial statements. Despite being well acknowledged, empirical applications of the Ohlson model grasp the crucial role of other information variable in firm valuation. Early applications of the Ohlson model typically set the v term to zero since the variable is interpreted as unspecified (Hand and Landsman, 1998). In his critique of empirical applications of RIVM; Ohlson (1998) demonstrates that, when "*v* term" is omitted from the model, market value of firm equity can be expressed as a linear function of equity book value, current net income, net dividends and one period-ahead forecasted net income[43].

It is emphasised that not restricting *v* term to be zero (in other words, omitting v term) reverses the signs of the coefficients on current net income, dividends and net capital outflows. Therefore, omitting the "*v* term" from an empirical refinement of the Ohlson model is likely to result in highly misspecified conclusions on the coefficients of current net income and net dividends. In particular, Hand and Landsman's (1998) analysis of two assumptions about the *v* term observes three major anomalies[44] which lead them to argue that the impact of

[43] Ohlson (1998), Appendix I.
[44] These anomalies include: 1) if *v* term is assumed to be zero, the mean coefficient estimate on dividends is found to be reliably positive when it is predicted to be negative, 2) the mean coefficient estimates on current period net income and net capital stock outflows are found to be positive and negative when they are predicted to be negative and positive respectively, and 3) current dividends are positively related to future abnormal earnings when they should be unrelated (Hand and Landsman, 1998: 4).

information other than summary accounting numbers reported in financial statements may be more limited in determining prices. Thus, their findings evoke the question of whether the current accounting system reflects the economic information hidden in equity market values in a timelier way than it is generally perceived.

The third criticism revolves around the "clean surplus accounting" assumption of the Ohlson model. It is worth noting that clean surplus relation (referred to hereafter as CSR) comprises only operating and financial items of the income statement whereas dirty surplus relation includes extraordinary items to operating and financial activities. While the Ohlson model assumes a clean surplus relation; in practice, the clean surplus relation can be violated.

Johnson, Reither and Swieringa (1995) and Frankel and Lee (1999) provide reviews on dirty surplus items in the US GAAP whereas the work of O'Hanlon and Pope (1999) and Lo and Lys (2000) explore UK accounting regulations on dirty surplus accounting. As a consequence of this violation, reported net income may be "dirty", which may result in the possibility of omitted variable bias in the model (Hand and Landsman, 1998). The work of Lo and Lys (2000) provides insights into how allowing for dirty surplus affects the Ohlson model. They conclude that the explanatory power of regression (R^2) and the coefficients of the included variables will be biased by the use of dirty surplus earnings; and therefore the model will be rejected.

Concerns relating to dirty surplus accounting practices are discussed by a number of researchers who argue that such practices may lead to measurement errors in accounting-based valuation models (Isidro, O'Hanlon and Young, 2004, 2006; Linsmeier et al., 1997). Furthermore, it is argued that cross-regime differences in dirty surplus accounting may yield cross-country differences in the implementation of such models (Frankel and Lee, 1999). Such concerns are taken into consideration by standard-setters who endeavour to eliminate dirty surplus flows or require a more transparent reporting of dirty surplus flows in statements of comprehensive income. Contrary to this view, O'Hanlon and Pope (1996, 1999) maintain that dirty surplus accounting practices produce more value-relevant income numbers by eliminating value-irrelevant flows from reported earnings, therefore yield more useful information for equity valuation purposes. Nevertheless, there is no strong evidence on the value relevance of dirty surplus accounting flows in accounting literature (Lin, 2006).This thesis assumes a clean surplus relation in its extension of the Ohlson Model (1995).

The last criticism relates to empirical implementations of the Ohlson model. Akin to all linear valuation models, the Ohlson model is based on Miller-Modigliani (MM) assumptions. These assumptions are criticised for their challenging nature in the reality of corporate taxes, bankruptcy costs, debt tax-shield substitutes, asymmetric information and signalling (Callen and Morel, 2001). Recalling Verrecchia's (1998) comment on the simplicity of the RIVM, none of the linear valuation models is expected to provide meaningful estimates since they do not account for all possible factors, which may likely to have an impact on market value of firms.

Similarly, the assumption on the linear information dynamics (referred to hereafter as LID) has been questioned. The model assumes *unbiased accounting*, which implies that abnormal earnings typically equate to zero. Under the condition that accounting systems are biased (e.g. systems are conservative), average abnormal earnings are expected to be non-zero (i.e. positive). In this case, future growth in equity book value needs to be taken into account as an additional component. This problem is resolved by Feltham and Ohlson (1995, 1996) who make adjustments to the original LID assumptions through which information on future abnormal earnings is reflected in current book value of equity. The LID assumptions are tested by several studies in empirical accounting literature. Examples include Dechow, Hutton and Sloan (1999), Hand and Landsman (1998), and Myers (1999) which provide insights into the empirical applications of linear information dynamics. However, it is argued that, despite being derived from economic concepts such as the dividend irrelevance, LID assumptions are only two of many other methods that allow historical accounting numbers to convey information on future forecasts (Lee, 1999).

Despite its criticisms, the Ohlson (1995) model provides a sound theoretical framework and is used to examine the value relevance of information on firms' non-physical, non-financial capital, namely social and human capital, in this thesis. In particular, Ohlson's argument on the crucial role of other information beyond equity book value and current earnings lends itself well to a powerful motivation for this analysis since board social and human capital are not yet in financial statements, and can be used as a proxy for other information in the model. This thesis maintains that, in today's knowledge and information-based economy, social and human capital measures may successfully capture the information, which is fully reflected in market prices, but are not yet disclosed in financial statements. Therefore, social and human capital possessed at board level are expected to influence market prices through firms' future earnings and therefore, have significant explanatory power for market value of firms.

4.4 CONCLUDING REMARKS

This chapter outlines the accounting regulations and practices for intangibles based on the UK GAAP and IFRS. Firstly, the chapter examines the role of intangibles following the rise of a knowledge-based economy over the last three decades. Secondly, it goes on to revise current accounting standards and practices in accordance with UK GAAP and IFRS. Thirdly, the chapter reviews the market-based accounting research and focuses on the Ohlson (1995) model as an appropriate model to examine the role of information on social and human capital in firm valuation. Finally, criticisms of the Ohlson model are discussed. The following chapter focuses on hypotheses development and presents a number of hypotheses based on extant research on the directorships in executive labour market and the demand for social and human capital, and on the impact of social and human capital on the market value of firms.

CHAPTER FIVE

HYPOTHESES DEVELOPMENT

5. 1 INTRODUCTION

Preceding chapters (Chapters Two and Three) discussed the concept of social and human capital, the characteristics of the executive labour market and the demand for social and human capital in the UK context. A review of the existing literature demonstrates that scholars in various disciplines continue to explore how firms extract economic benefits from their human capital resources (Armstrong and Shimizu, 2007; Coff and Kryscynski, 2011) and the relational networks in which they are embedded (Borgatti and Li, 2009; Borgatti, Mehra, Brass and Labianca, 2009). Exploring the economic advantages of social and human capital simultaneously, despite being not new, has so far followed an individual perspective (e.g. Felicio et al., 2002; Olroyd and Morris 2012; Seibert, Kraimer, and Liden, 2001). Current research calls for the need to focus on the interaction between social capital and human capital and responding to the question of who captures the value created by these forms (Nyberg and Wright, 2015).

The accessibility of information and the production and protection of knowledge have been significantly influenced by the developments in information technology. As global markets evolve, the need for the skilled (high human capital) directors who are able to foresee the developments in their respective industry/sector and provide strategic leadership to the firm has increased for firms whose ultimate purpose is creating wealth for their shareholders. Hence, director human and social capital are seen as important elements that contribute to firm performance through the provision of extensive experience and knowledge as well as the access to information and reduced costs of contracting and coordination (Schoorman et al., 1981).

In this chapter, a number of hypotheses will be developed based on extant research on the directorships in executive labour market and the demand for social and human capital, and on the impact of social and human capital on firms' market value. Firstly, hypotheses on the demand for social and human capital at the individual level will be presented. Secondly, the chapter presents the hypotheses on the demand for social and human capital at the firm level. Thirdly, hypotheses relating to the association between board social and human capital and firm market value are developed. Finally, the chapter concludes with a summary of the hypotheses on the demand for social and human capital and on the relationship between social and human capital and the market value of firms.

5.2 THE DEMAND FOR SOCIAL AND HUMAN CAPITAL AT INDIVIDUAL LEVEL

The market for corporate directors has long been referred to as an important labour market for executives (Davis, 1993). When there is a vacancy on the board, firms enter this labour market in search of a director who fulfils the requirements for relevant skills and experience. To appoint a director, the firm may look for executives of the focal firm, current or retired executives from other listed firms, community leaders such as politicians and academics, or individuals with specialised expertise (Hillman, Cannella, & Paetzold, 2000). The firm's decision largely depends on the negotiations between the CEO and the board (Hermalin & Weisbach, 1988, 1998). Consequently, negotiation process leads to a bifurcated market "in which both active and passive board members can thrive in a labour market for directors that is segmented by orientation toward management" (Westphal & Zajac, 1995: 509).

Research on the executive labour market acknowledges a number of benefits that motivate directors (individuals) to serve on boards (Withers, Hillman and Cannella, 2012). Early research on directors' motivations reveals that individuals accepted board appointments because they were keen to learn and gain contacts (Lorsch & MacIver, 1989; Mace, 1986). In a broader context, early research also posits that individuals are motivated by economic incentives, prestige, and career objectives when making decisions to join boards (Mace, 1986; Zajac, 1988). Similarly, acquisition of power and influence inherent in board roles are other factors affecting corporate elite's decision of accepting a board appointment (Davis, Yoo and Baker, 2003; Useem, 1979). Furthermore, directors benefit from their elite ties in the form of future board and executive appointments (Useem, 1984) as well as informational benefits arising from their experience on board service (Haunschild, 1993; Haunschild and Beckman, 1998). Board service is visibly important to corporate directors as they often put significant effort to acquire board seats (Westphal & Stern, 2006, 2007). Based on extant research, it can be concluded that directors serve on corporate boards for a variety of reasons (Boivie et al. 2015). Given that board service is important to corporate directors, one would expect a director with high levels of human and social capital to be appointed (or have been appointed) to more corporate boards. The following associations are hypothesised to test for the demand for social and human capital at the individual level. All hypotheses presented in this chapter are stated in the alternate form. Two-tailed tests will be used to determine the significance of findings. Hence:

Hypothesis 1: There is a positive association between director social and human capital and the number of current board seats held.

Hypothesis 2: There is a positive association between director social and human capital and the number of past board seats held.

5.3 THE DEMAND FOR SOCIAL AND HUMAN CAPITAL AT FIRM LEVEL

The provision of social and human capital is referred to as one of the determinants of director selection (Withers, Hillman and Cannella, 2012). Potential directors bring their expertise, skills, experience, and relationships to the boards which reflect their human and social capital.

Different firms have different demands for monitoring and advising, subject to the costs and benefits of such services (Adams 2003, Demsetz and Lehn, 1985; Gillan, Hartzell and Starks, 2011). From a resource dependence theory perspective, directors must provide critical resources to a firm or help the firm secure these resources through their external ties in order to advise and counsel the management according to the firm's environment (Pfeffer, 1973; Pfeffer and Salancik 1978; Hillman et al. 2000, 2008, 2009). Prior research also provides empirical evidence that directors' human capital affects firm behaviour (Dalziel et al., 2011).

Fama (1980) and Fama and Jensen (1983) argue that the market for outside directorships provide incentives for outside directors to develop their reputation as good monitors. In other words, managers of high performing firms are more likely to acquire positions as outside directors in other boards as they are assumed to have the relevant skills and experience to direct and assess managerial behaviour. Fama and Jensen's view advocates that that a board with a more reputable outside director, with high stocks of human capital, monitor more effectively than other boards as they possess significant reputation capital as well as extensive knowledge and experience regarding the firm's external environment.

In existing literature, there are no clear predictions on firms' demand for well-connected directors. As discussed in the preceding chapters, prior research in organisational sociology, economics and finance highlights the potential benefits and costs associated with being well-networked. Firms are likely to have a high demand for well-connected directors for a number of reasons, which are outlined in section 3.3 of Chapter Three.

Failure to recognise and explicitly incorporate the concept of social capital as an input into business operations may limit the understanding of how firms use social capital to generate economic benefits. A study by Johnson, Suarez and Lundy (2002) finds that firms' demand for social capital is partly determined by their endowments of social capital. Hence, firms with greater connectedness are expected to demonstrate more willingness in extending their networks and reinforcing their existing ties in their networks.

Consistent with this notion, more recent investigations of overall board connectedness provide empirical evidence for higher abnormal stock returns (Larcker, So and Wang, 2013) and better financial reporting quality (Omer, Shelley and Tice, 2014) suggesting that the costs of multiple directorships are outweighed by the benefits of acquiring information, resources or learning from other firms. Based on extant literature, firms' demand for well-connected directors is expected to be greater than its supply (directors' investments in establishing links in the network). To date, firms' demand for social and human capital has not been studied empirically in the UK context. The following associations are hypothesised to test for the demand for social and human capital at the firm level. Hence:

Hypothesis 3: There is a positive association between a firm's earnings and its social and human capital.

Hypothesis 4: There is a positive association between a firm's stock returns and its social and human capital.

5.4 THE IMPACT OF SOCIAL AND HUMAN CAPITAL ON FIRM VALUE

This section draws on the theoretical frameworks introduced in previous chapters and presents hypotheses which are developed based on extant theoretical perspectives and empirical evidence provided in prior literature. The preceding chapter highlighted the decreasing relevance of financial information to equity valuation in recent years (Certo, 2003; Lev and Zarowin, 1999). Hence, this thesis adopts an interdisciplinary approach, using theoretical insights from sociology, management and accounting, and explores whether measures of social and human capital possessed at board level help to explain the differences between the book value and market value of firms. The following section starts with hypotheses related to organisational social capital and discusses existing theoretical views and empirical evidence supporting proposed hypotheses. Then, the chapter goes on to present hypotheses on the organisational human capital and provides empirical evidence justifying the rationale for anticipated relationships.

5.4.1 Social Capital Theory

Social Capital as a Consequence of Interlocking Directorates

Following extant research on the impacts of social networking at multiple levels (individual, organisational, or national), this research focuses on the impact of interlocking corporate directorates as a source of organisational social capital (indicated by board directors' social capital) on the market value of firms. This study seeks to examine whether firms benefit from network advantages derived by their directors through board interlocks and to understand how interlocking directorate ties evolve over a ten-year period (2001-2010).

This research employs social network analysis (SNA) as a means of analysing the structure and pattern of the relationships and ties which are regarded as the source of social capital (Tichy, Tushman and Fombrun, 1979). Since 1930s, the applications of social network techniques have long been found in studies examining corporate power and interlocking directorships (Scott, 2011). A social network perspective allows for the identification of the causes and consequences of networks in which individuals and/or organisations participate and seeks to determine the scope of opportunities and constraints they may confront as a result of their locations within the networks (Borgatti et al., 2009).

Furthermore, SNA provides a theoretical framework for collecting and analysing data on personal and organisational ties as sources of social capital, a construct which has proven difficult to measure directly. Despite its limitation to focus only on the structural aspect of social capital, the use of SNA enables the quantification of individual and organisational level social capital and therefore, their inclusion in the Ohlson (1995) model for data analysis.

This thesis employs chosen methodology acknowledging that interlocking directorships are an effective way for firms to develop external relationships and to acquire a variety of benefits from such relationships through directors serving on the same boards. However, prior literature has maintained that not all directorships provide the same level of network benefits for each firm (Geletkanycz, Boyd and Finkelstein, 2001). It is argued that some directorships are rather more valuable than others (Young and Tsai, 2008). For instance, an interlocking directorship on the General Electric board may be particularly beneficial as a result of the firm's size and other board members, who are likely to hold several directorships on other prominent boards (Geletkanycz, Boyd and Finkelstein, 2001). Similarly, a directorship on Procter & Gamble board may be more useful as a result of the firm's high connectivity in the overall network (Chu and Davis, 2011).

Since directorate ties differ according to the level of network benefits they provide for various firms, it is difficult to capture the impact (value) of such ties by using merely one network measure for board directors of an observed firm. Prior literature on social network theory supports this idea by maintaining that social capital benefits derive not only from the characteristics of an actor's ties, but also his/her overall location and structural position (Burt, 1992, 1997a; Portes, 1998). As emphasised in the preceding chapter on theories of human and social capital, a desirable structural position is identified as "having a sparse ego-network or being located along the shortest path between otherwise unconnected actors" (Borgatti and Foster, 2003: 1004).

There are two groups of network measures which are widely used to capture an actor's (a director's) overall network position, namely structural hole and centrality measures. These measures allow us to identify whether a director has a sparse network from which he/she can derive information and control benefits (Burt, 1992, 2002), or is more centrally embedded in the overall network where he/she can enjoy superior access to other directors, resources, and information (Pfeffer, 1991). This analysis employs four centrality measures (degree, closeness, betweenness, and eigenvector centrality) and two structural hole measures (effective size and network constraint) to capture social capital possessed at the organisational level. The rationale behind employing four different centrality measures lies in fact that each centrality measure captures a different aspect of an actor's network advantages. This is emphasised by Wasserman and Faust (1994: 218) who note that:

> *"One should not utilise any single centrality measure. Each has its virtues and utility".*

Therefore, this analysis endeavours to explore which network positions possessed by board directors are the most advantageous for firms as there has been little empirical research in this area (Horton, Millo and Serafeim, 2012; Larcker, So and Wang, 2013). The following section goes on to explain the network measures used in this thesis and concludes with the hypothesis (es) relating to the association between organisational social capital and firm market value.

Centrality Measures

The concept of centrality comprises a variety of aspects regarding the "importance" or "visibility" of actors within a network (Wasserman and Faust, 1994). The works of Hubbell (1965), Freeman (1979), Knoke and Burt (1983), Friedkin (1991), Faust and Wasserman (1992), and Wasserman and Faust (1994) provide different insights into the interpretation of the concept and the use of centrality measures in various contexts. The motivations behind the use of centrality concept in one-mode dyadic networks can be summarised in four points (Faust, 1997: 160). These motivations are: (1) actors are central if they are active in the network, (2) actors are central if they can contact others through efficient (short) paths, (3) actors are central if they have the potential to mediate flows of resources or information between other actors, and (4) actors are central if they have ties to other actors who are themselves central. These motivations relate to four centrality measures respectively: degree centrality, closeness centrality, betweenness centrality, and eigenvector centrality.

Degree centrality

Degree centrality is regarded as one of the simplest and well-known measures of centrality (Borgatti and Everett, 2006). Degree centrality is the first of Freeman's (1977, 1979) centrality measures and is the function of an actor's degree. The degree of an actor is simply defined as the number of alters to whom the actor is adjacent, and therefore is directly tied (Freeman, 1979). Deriving from this definition, actors with high degrees are considered the most active since they possess more direct ties to other actors within the network. Hence, degree measures the level of activity. The intuitive rationale for degree centrality is that high centrality index indicates high level of activity, and therefore a very active actor in the network.

Proctor and Loomis (1951) and Shaw (1954) were the first researchers to introduce the idea that an actor's centrality should be measured by using the degree of the actor. Similarly, many other researchers[45] (Czepiel, 1974; Faucheux and Moscovici, 1960; Garrison, 1960; Glanzer and Glaser, 1957; Mackenzie, 1964, 1966; Rogers, 1974) regarded actor centrality in the same way and they referred to centrality as degree. Freeman (1979) later discussed that the concept of degree centrality was found so appealing that the foundations of the concept were not elaborated in detail. In his analysis, Freeman refined the concept in the context of communication, and argued that actor (point) degree centrality responds to "the visibility or the potential for activity in communication of such points" (Freeman, 1979: 219).

Considering communication in a social network, an actor with high degree has direct contact with many other actors, and therefore is in a position to be perceived as an important channel of information. In this sense, the actor is prominent to the extent to which he/she is in the

[45] A review of early researchers on degree centrality can be found in Freeman (1979).

mainstream of information flow in the network. Hence, in the concept of degree centrality, prominence is linked to the level of actor's activity, in other words, the actor's degree (Wasserman and Faust, 1994). In the same manner, an actor with low degree has direct contact with few other actors, and therefore is in a position to be perceived as peripheral. Since the actor occupies a position with few direct ties, his level of activity in communication is expected to be lower than other actors in the networks. Therefore, actors with low degree can be seen as less important in respect of their connectivity, which reduces their opportunities regarding information control and access to resources (Rowley, 1997).

Degree centrality is simply measured as the number of direct ties incident upon a given node (Marsden, 2002). Based on the work of Nieminen (1974), Freeman (1979) defines actor degree centrality (C_D) by the following equation:

$$C_D(p_k) = \sum_{i=1}^{n} a(p_i, p_k) \tag{1}$$

Where g represents network size and a represents adjacency,

$a(p_i, p_k) = 1$ if and only if p_i and p_k are connected by a line

0 otherwise.

Degree centrality is a straightforward index of the degree to which p_k is the focal point of activity. $C_D(p_k)$ is large if actor p_k is adjacent to, or in direct contact with, a large number of other actors; and small if p_k occupies a position in which the actor possesses less direct ties to other actors. $C_D(p_k)$ = 0 for an actor who is entirely isolated from contact with any other actor.

One problem associated with actor degree centrality measure $C_D(p_k)$ is that it is contingent on the size of the network from which the measure is calculated (Freeman, 1979). Therefore, the measure may be irrelevant in some applications, particularly when there is variation among the network sizes of actors. Some firms are larger (have more directorships) than others, therefore using a normalised measure is more rational. Although the measure is useful to calculate an actor's total amount of activity, it is appealing to have a measure which is independent of the network size. Removing the effect of network size from the measure allows researchers to compare the relative centrality of actors from different networks. At a maximum, an actor can be adjacent to $n-1$ other actors in a network. Hence, Freeman's (1979) proposed a standardisation of degree centrality measure as:

$$C'_D(p_{\boldsymbol{k}}) = \frac{\sum_{i=1}^{n} a(p_i, p_k)}{n-1} \tag{2}$$

is the proportion of other actors that are adjacent to $p_{\boldsymbol{k}}$. $C'_D(p_{\boldsymbol{k}})$ is independent of the network size, and therefore can be compared across networks of different sizes. $C_D(p_k)$ and $C'_D(p_{\boldsymbol{k}})$ are degree-based measures of actor centrality, Freeman (1979: 221) emphasises the importance of an actor's degree as "an index of its potential communication activity".

Since a director's degree centrality is simply the number of ties he/she has with other directors in the network, high degree centrality represents well-connectivity as a result of having a large number of connections within the network. Being connected to many others may facilitate obtaining access to different sources of information and resources, which is previously argued to influence firms' strategic decisions (Haunschild and Beckman, 1998). Renneboog and Zhao (2011) suggest that CEOs with many direct contacts in adjacent firms are endowed with more managerial power on the board. However, it is emphasised that being very active in the network does not provide sufficient justification for a strong position in terms of information benefits within the network. Therefore, different centrality measures should be used to explore the advantages of a director's structural position in the overall network (Brass and Burkhardt, 1993; Wasserman and Faust, 1994).

Closeness Centrality

The second centrality measure is Freeman's (1979) closeness centrality which is classified as a distance (length) measure. Closeness centrality is defined as the total geodesic distance from a given node to all other nodes (Freeman, 1979). Closeness centrality is an inverse measure of centrality since greater closeness centrality implies that the ego is more distanced to all other actors in his/her network, and therefore is less central. However, this terminological issue can be solved by using a normalised version of closeness which yields a measure of closeness instead of farness (Borgatti and Everett, 2006). Closeness centrality (normalised) is deemed to be positively linked to social capital since being less distanced to all other actors increases the probability of acquiring timely information in a network (Borgatti, Jones and Everett, 1998).

Closeness-based centrality measures, which determine how close an actor is to other actors within the network, were developed by Bavelas (1950), Harary (1959), Beauchamp (1965), Sabidussi (1966), Moxley and Moxley (1974), and Rogers (1974). Freeman (1979) noted that the simplest measure of closeness-based centrality is that of Sabidussi (1966). Sabidussi (1966) proposed that the centrality of an actor should be measured by summing the geodesic distances from an actor to all other actors in the network. However, in this case, actor centrality is expected to decrease as the length of geodesics increase. Therefore, the sum of geodesic distances is weighted inversely to attain Sabidussi's index. Actor closeness centrality is a measure which depends not only on direct ties, but also on indirect ties of the actor.

To calculate actor (point) closeness centrality (C_c), $d(p_i, p_k)$ is assumed to be the number of lines (edges) in the geodesic linking actors p_i *and* p_k. The total distance that k is from other actors is $\sum_{i=1}^{n} d(p_i, p_k)$, where the sum is taken over all $k \neq i$. Therefore, Sabidussi's (1966) index of actor closeness (C_C) is expressed as:

$$C_C(p_k) = \left[\sum_{i=1}^{n} d(p_i, p_k)\right]^{-1}$$

(3)

In this formula, the subscript C represents "closeness". As previously noted, the index yields the inverse of the sum of the distances from actor k to all other actors. The index can be equal to $(n-1)^{-1}$ at a maximum, which occurs when the actor is adjacent to all other actors in the network. At a minimum, the index takes the value of 0 in its limit, which arises "whenever one or more actors are not reachable from the actor in question" (Wasserman and Faust, 1994: 185). Freeman (1979) acknowledges that, in an unconnected graph, every actor is at an infinite distance from at least one other actor, and therefore Sabidussi's (1966) index is only meaningful for a connected graph.

As emphasised above, the maximum value that this index can yield is contingent on n. Since the index is dependent on the number of actors in the network from which it is computed, it is difficult to compare values derived from networks of different sizes (Freeman, 1979). Beauchamp (1965) solved this problem by suggesting the standardisation of indices so that the maximum value equals unity. To standardise this index, $C_C(n_i)$ is simply multiplied by $(n-1)$. Thus:

$$C'_C(p_k) = \frac{n-1}{\left[\sum_{i=1}^{n} d(p_i, p_k)\right]}$$

$$= (n-1)C_C(p_k)$$

(4)

The standardised index ranges between 0 and 1, and is the inverse average distance between actor k and all other actors. $C'_C(p_k)$ is the direct measure of distance-based actor centrality. Hence, the index equals unity when the actor is adjacent to all other actors, which is when the actor is maximally close to all other actors. The value of index decreases as the average distance between actor k and other actors increases.

Firms can derive a number of advantages from interlocking directorate networks in respect of acquiring information. Timely access to information may be a competitive advantage in dynamic business environments where the creation of more innovative, more entrepreneurial, and more rewarding solutions is reinforced by exclusive access to such information (Burt, 1992, 2001, 2002). Firms may also benefit from director networks in developing more effective corporate strategies (Renneboog and Zhao, 2011). Therefore, board directors who are well-connected, and of higher information value are assumed to have higher levels of social capital. A director's connectivity concerning information benefits can be measured by two centrality measures, namely (normalised) closeness and betweenness centrality[46]. Directors with high closeness and betweenness centrality indices are more likely to receive the information in a timelier way when it is identified and transmitted along the paths in the network (Freeman, 1977, 1979).

Betweenness Centrality

Betweenness centrality, the third centrality measure developed by Freeman (1979, 1980), measures the centrality of an actor based on his/her betweenness in the network. Betweenness centrality is defined as "the number of times that an ego falls along the shortest path between two other actors" (Borgatti, Jones and Everett, 1998: 31). Actors with high betweenness are considered as possessing a favourable position since other actors are dependent on him/her to make connections with others. Therefore, betweenness centrality measures the extent to which an actor has power over other actors' access to different regions of the network (Freeman 1979).

[46] A detailed description of the betweenness centrality concept is provided in the following section.

From this perspective, betweenness centrality is positively associated with social capital since information and control benefits are most harnessed by actors with high betweenness.

Early centrality researchers emphasise the strategic meaning of locations on geodesics (Wasserman and Faust, 1994). For instance, Bavelas (1948) and Shaw (1954) maintain that actors who are located on many geodesics are in fact central to the network. Similarly, Shimbel (1953) and Cohn and Marriott (1958) suggest that actors with such locations are strategically important in the network. However, a measure of betweenness was not developed until the work of Anthonisse (1971), and subsequently Freeman (1977) and Pitts (1979) proposed the examination of actors' locations on geodesics. Anthonisse (1971) and Freeman (1977) are the first researchers to quantify the idea that an actor is central to the degree to which he/she falls on the shortest path between other actors and therefore, has control over the path of communication (Freeman, Borgatti and White, 1991). From this point of view, betweenness centrality measures the degree to which an actor can act as an intermediary or broker to other actors (Brandes, 2008; Geletkanycz, Boyd and Finkelstein, 2001) since actors located on many geodesics have control over the flow of information and resources.

To calculate actor betweenness centrality (C_B), it is assumed that g_{ij} is the number of geodesics linking two actors (p_i *and* p_j). If all geodesics are equally likely to be selected for the path, the probability of the communication using any one of them is simply $1/\,g_{ij}$. The probability that a distinct actor, k, is involved in the communication between two actors is also considered. In this case, $g_{ij}\,(p_k)$ is the number of geodesics linking the two actors that include actor p_k. Freeman makes the assumption that geodesics are equally likely to be chosen for this path, and then estimates this probability by $g_{ij}\ (p_k)\ /\ g_{ij}$. The actor betweenness centrality (C_B) for p_k is, therefore, the sum of these estimated probabilities over all pairs of actors excluding the kth actor:

$$C_B(p_k) = \sum_{i}^{n} \sum_{< j}^{n} g_{\mathrm{ij}}(p_k)/g_{\mathrm{ij}}$$

(5)

Where k is different from i and j.

Hence, actor betweenness index, the sum of probabilities, measures the extent to how "between" an actor is. The index is equal to the value of 0 when p_k falls on no geodesics. The maximum value of the index is calculated by $(n-1)(n-2)/2$,which is equal to the number of pairs of actors excluding p_k. The maximum value is attained when the kth actor falls on all geodesics. Akin to closeness centrality index, the value of betweenness centrality index is contingent on the number of actors in the network. Therefore, the index is standardised to allow the comparison of indices that are calculated from networks of various sizes:

$$C'_B(p_k) = 2C_B(p_k)/(n^2 - 3n + 2)$$

(6)

Standardised betweenness index can be compared to other indices calculated from different networks and relations, and can attain values ranging between 0 and 1. Betwenness centrality index $C'_B(p_k)$ differs from closeness centrality index $C'_C(p_k)$ in that it can even be meaningful in an unconnected graph (Freeman, 1977). This feature is considered as an advantage of betweenness index for researchers conducting network analysis (Wasserman and Faust, 1994).

Betweenness centrality measures the degree to which a board director occupies a desired position by falling on the shortest distance paths between other directors in the overall network. Directors with high betweenness are assumed to have power in the network since a large number of other directors are dependent on him/her to make connections with others (Brass, 1984). In corporate networks, betweenness centrality has been used to measure the extent to which a director or CEO can act as an intermediary or broker in the network, in other words to determine whether he/she is in a position to have control over information and resource exchange (Brandes, 2008; Geletkanycz, Boyd and Finkelstein, 2001; Rowley, 1997). Therefore, betweenness is a measure of the frequency with which a director falls on the geodesic paths between pairs of other directors (Freeman, 1979). Directors with high betweenness centrality indices can be brokers or gatekeepers in the network since they facilitate the flow of information and resources between less central directors (Scott, 1991).

Eigenvector Centrality

Eigenvector centrality, the fourth of the widely used centrality measures, was developed by Bonacich (1972, 1987) to measure the extent to which an ego is connected to other important actors in the network. In other words, eigenvector centrality measures an actor's importance in relation to the centrality of his/her neighbours in the network. Therefore, it is referred to as a measure of power and prestige in the literature (Larcker, So and Wang, 2013). Eigenvector centrality is seen as a good network measure since it concerns the entire pattern of connections[47] in a network (Bonacich, 2007). Actors with high eigenvector centrality are deemed to create more opportunities for accumulation of resources through their ties with well-connected actors. Despite its advantages, Bonacich[48] has also acknowledged that there exist a number of problems posed by the use of eigenvector centrality in certain types of networks, which implies the need for using the index with caution in SNA.

Eigenvector centrality derives from the idea that an actor's centrality should be proportional to the strength of the actor's ties to other actors, and the centrality of these other actors within the network (Bonacich, 1972; Faust, 1997; Mizruchi, 1982; Mizruchi et al., 1986). Bonacich's (1972) initial motivation for developing eigenvector centrality index was to measure

[47] Eigenvector centrality differs from closeness and betweenness centrality in that it weights all contacts according to their own centrality in a network (Bonacich, 1972).
[48] For a review, see Bonacich (2007).

popularity, which is linked to relative standing or status measures suggested by Katz (1953) and Hubbell (1965). Subsequently, various scholars have proposed using the index as a measure of the degree to which an actor holds a position to have influence over other actors in the network (Fernandez and McAdam, 1988; Friedkin, 1991; Mizruchi and Bunting, 1981). Since the index was comprised in the studies of network influence, Friedkin (1991) referred to eigenvector index as a measure of "total effects centrality".

Bonacich (1972) proposed that the eigenvector of the largest eigenvalue of an adjacency matrix could be considered as a good measure of network centrality. The eigenvector differs from degree in that the measure weights contacts according to their own centralities. Eigenvector centrality is referred to as a weighted sum of not only direct connections but also indirect connections of every length (Bonacich, 2007). Therefore, the eigenvector measure concerns the entire pattern in the network.

Eigenvector centrality has been extended to beta-centrality $c(\beta)$, which allows assessing the power in negatively connected bargaining networks[49], and to networks with negative as well as positive ties, where a negative connection to a high status actor reduces the actor's status but a negative connection to a disliked actor increases the status of the actor (Bonacich and Lloyd, 2004). Although the concept has been widely used and extended by several researchers in different fields (e.g. Brundes and Cornelsen, 2003; Richards and Seary, 2000; Ruhnau, 2000), it has been particularly influential in interlocking directorate research, where eigenvector centrality is referred to as the standard measure of centrality[50].

To calculate eigenvector centrality of an actor (x), A is assumed to be a matrix of relationships (adjacency matrix) and i and j are vertices. A is generally symmetric although this is not a

[49] Bonacich (1987) explains that such networks arise when an actor's own power is reduced by connection to other actors with many alternative exchange partners. In other words, each actor's status is reduced by the high status of others to whom the actor is connected.

[50] Early studies that used eigenvector centrality include Mariolis (1975), Mintz and Schwartz (1981a, 1981b), Mizruchi and Bunting (1981); Mizruchi (1982); Rosenthal et al. (1985) and Roy (1983).

requirement for calculating the index (Bonacich, 1987). The main diagonal elements of matrix A are zeros. The centrality of actor i (x) is expressed by the following equation (Bonacich, 2007):

$$\lambda x_i = \sum_{j=1}^{n} a_{ij} x_j , \quad i = 1, \ldots, n$$

(7)

Where λ is a constant used to ensure that the equations have a nonzero solution. In matrix notation, this standard eigenvector-eigenvalue problem is expressed by the equation:

$$Ax = \lambda x$$

(8)

Where A is a n x n sociomatrix, λ is its related eigenvalue, and x is a vector of centrality scores (the eigenvector corresponding to the largest eigenvalue). Equation (7) and (8) express eigenvector centrality x in two equivalent ways: as a sum and as a matrix equation. a_{ij} = 1 if vertices i and j are connected by an edge and a_{ij}= 0 if they are not. The centrality of an actor is proportional to the sum of the centralities of the other actors to which he/she is connected. λ is the largest eigenvalue[51] of A and n is the number of vertices.

A director's eigenvector centrality represents the extent to which he/she is relatively important as a consequence of being connected to more central directors in the overall network (Bonacich, 1972, 1987). Eigenvector centrality is a recursive measure of degree, the sum of a director's direct ties to other directors in the network, weighted by the centralities of such connections (Hochberg, Ljungqvist and Lu, 2007). A director's eigenvector centrality score is more positively affected by his/her ties to high-scoring directors than equal ties to low-scoring

[51] Bonacich (1987: 1172) notes that "all eigenvectors of R give solutions consistent with eq. (1) and (2). They are all possible centrality measures. However, if R is symmetric, each eigenvector is a factor of R, and the associated eigenvalue measures the accuracy with which it can reproduce R".

directors (Milakovic, Alfarano and Lux, 2010). Therefore, the concept of eigenvector centrality is based on the idea that the quality of connection is crucial to determining an actor's prominence or power in a network. Deriving from Bonacich's (1972) seminal work, board directors who are connected to well-networked directors are expected to be endowed with status and influence in corporate networks (Ljungqvist, Marston and Wilhelm, 2009).

Structural Hole Measures

Burt (1992, 2001) demonstrates a number of benefits derived from network positions where ego has connections to alters, who otherwise are disconnected from each other. In this case, ego can act as a broker between alters and obtain access to the knowledge and resources of alters for his/her own advantage. Within interlocking directorate networks, these brokers would be board directors who provide a link between rather disconnected directors and can be of great importance to firm value creation through the information and control benefits they harness across non-redundant connections in their network. Two fundamental measures were developed by Burt (1992, 1997a, 1997bF) to identify an ego's ability to bridge structural holes. These measures are the effective size of an ego's network and ego's aggregate network constraint.

Effective Network Size

Effective size is defined as "the number of alters, weighted by strength of tie, that an ego is directly connected to, minus a *redundancy* factor" (Borgatti, Jones and Everett, 1998: 31). Effective size is regarded as a measure of information benefits derived from spanning a structural hole and can never take a value greater than the degree of a network (van Liere, Koppius and Vervest, 2008). Higher effective size indicates that alters have few ties to one another and therefore, the ego enjoys more social capital (network) benefits through spanning many structural holes (Burt, 1992). As effective size of an ego's network increases, it widens ego's exclusive access to a set of diverse knowledge and resources (Anderson, 2008). From this perspective, effective network size is deemed to have a positive association with social capital since an ego increases his/her opportunities for information and control benefits through having non-redundant connections.

As aforementioned, effective size is the number of alters to whom an ego is connected minus the redundancy of links between alters. Burt (1992) defines the effective size (efsize) of an actor's ego network as:

$$\sum_{j}\left[1-\sum_{q} p_{iq} m_{jq}\right] q \neq i, j$$

(9)

Where:

$$p_{iq}=\frac{\left(z_{iq}+z_{qi}\right)}{\sum_{j}\left(z_{ij}+z_{ji}\right)}, \quad i \neq j$$

(10)

And

$$m_{jq}=\frac{\left(z_{jq}+z_{qj}\right)}{max_{k}\left(z_{jk}+z_{kj}\right)}, j \neq k$$

(11)

And Z is the data, the matrix of network ties. Where p_{iq} reflects node z_i's network time and energy invested in a relationship with z_q while m_{jq} indicates the strength of the relationship between z_j and z_q. A contact with z_j is redundant for z_i to the extent that the summation inside the brackets is large; redundant contacts reduce the effective size of an egocentric network

(Marsden, 2002). Strong relationships m_{jq} between alter nodes z_j and z_q are within z_i's egocentric network thus lower its effective size.

In his examination of Burt's redundancy measures, Borgatti (1997: 38) demonstrates that the effective size of an ego network is "the actual size minus the average degree of the alters". Borgatti (1997) explains that the average degree of any network is closely related to network density. Therefore, the average degree is equal to the density times (n-1), where n is the number of nodes in the network. Burt's redundancy measure is considered as identical to ego network density, scaled by a factor of (n-1) (Borgatti, 1997). Hence, the redundancy of any ego network is expressed by the following formula:

$$redundancy = \frac{2t}{n} \tag{12}$$

Where t is the number of ties in the network (excluding ties to ego) and n is the number of nodes (excluding ego). Thus, Borgatti (1997) provides a simplification of Burt's original formulae and defines effective size as:

$$efsize = n - \frac{2t}{n} \tag{13}$$

Therefore, effective size is an unstandardised network measure which takes a minimum value of 1 and a maximum value of the network size minus one (van Liere, Koppius and Vervest, 2008). Burt's effective size captures the degree to which a board director holds a bridging position since it is a measure of the number of structural holes a director spans in his/her ego network. High effective size indicates that a board director's ties possess few ties to one another and the director acquires social capital benefits from spanning many structural holes among his/her non-redundant ties.

Aggregate Network Constraint

The second structural hole measure, network constraint, is an index which measures how much an ego is constrained by his/her alters in a network. Burt (2002: 209) refers to network constraint as "the extent to which a person's contacts are redundant". It is regarded as a measure of the control benefits derived from bridging structural holes. For instance, when an ego is highly dependent on his/her alters; he/she is highly constrained, and therefore exerts little autonomy and control over his/her activities. More network constraint, as emphasised by Burt (1997a, 1997b), indicates fewer structural holes. Thus, network constraint is negatively linked to social capital since structural holes are important sources of social capital benefits (Burt, 1992, 1997a, 1997b).

Network constraint is a function of network size, network density, and network hierarchy (Burt 1997a, 1997b). Network constraint is generally a negative function of network size, which means that larger networks are less constraining (Burt, 1992). Network density and network hierarchy have a positive correlation with network constraint since network constraint increases when ego's network consists of strongly interconnected contacts, and when the majority of contacts are tied to a leading single contact. Therefore, network constraint is used to measure the extent to which relations are directly or indirectly concentrated in a single contact (Burt, 1997a). The constraint of a tie on ego is known as *dyadic constraint*. The higher the constraint, the fewer structural holes, and therefore means fewer opportunities for ego to broker (De Nooy, Mrvar and Batagelj, 2005). As emphasised by Burt (2001: 39), higher constraint indicates more network closure. In this case, information within the network is transmitted between groups, and therefore is shared by all contacts. Hence, actors with lower aggregate network constraint scores are deemed to harness more social capital advantages in the network (Richardson, 2009; Burt, 2001).

Burt's (1992: 55) original formula for computing an ego's network constraint (c) is given as:

$$c_{ij} = \left(p_{ij} + \sum_{q} p_{iq}\, p_{qj} \right)^2, q \neq j, i \tag{14}$$

The index starts with a measure of the extent to which all of director i's network is directly or indirectly invested in his/her relationship in contact j. Therefore, p_{ij} is the proportion of i's relations invested in contact j. The sum $\sum_q p_{iq} p_{qj}$ is the portion of i's relations invested in contacts q who are in turn invested in contact j. The total shown in parentheses indicates the proportion of i's relations that are directly or indirectly invested in the connection with contact j. The sum of squared proportions, $\sum_j c_{ij}$, yields the network constraint index C. Constraint scores are then multiplied by 100 to allow the comparison of social capital effects per point of constraint (Burt, 1997a).

Based on extant research on centrality and structural hole measures as a measure of social capital, this thesis examines whether there is a significant association between organisational social capital and firm market value. Hence:

Hypothesis 5: There is a positive (*negative*) association between organisational social capital measured as directors' network centrality or effective network size (*aggregate constraint*) and the market value of firms.

5.4.2 Human Capital Theory

Based on the central tenets of human capital theory, this research aims to examine whether human capital possessed by board directors have a significant impact on market value of firms. Since the human capital embodied in professionals is developed through education and personal experience (Dimov and Shepherd, 2005), this thesis employs six different proxies to capture the overall impact of human capital on firms' market value. Human capital proxies comprise *highest degree, professional qualifications, elite education, director age, prior board experience, and organisational tenure.* In the remainder of this chapter, these proxy measures are discussed in further detail, and a summary of extant research leading to proposed hypotheses is provided.

Highest Degree

Investments in education and training play an important role in the accumulation of human capital at both individual and organisational level (Becker, 1975). Education provides individuals with knowledge, skills and abilities as well as valuable contacts that may enable them to obtain access to unique information and resources (Arenius and DeClercq, 2005; Shane, 2003). In the management literature, individuals' educational levels have been associated with the possession of cognitive skills and abilities (Hambrick and Mason, 1984; Rajagopalan and Datta, 1996; Smith, Collins and Clark, 2005). Individuals with high educational attainment are considered as being more capable of acquiring, processing and transmitting information and generating more creative ideas for their organisations (Bantel and Jackson, 1989; Gradstein and Justman, 2000; Wincent, Anokhin and Örtqvist, 2010). Extant research has also argued that CEOs or executives with higher levels of education are likely to possess greater propensity to receive new ideas and undergo change (Boeker, 1997; Datta and Rajagopalan, 1998; Datta, Rajagopalan and Zhang, 2003; Wiersema and Bantel, 1992). Educated directors are more likely to enhance firm value through increasing innovation (Dalziel, Gentry and Bowerman, 2011) and innovative performance (Wincent, Anokhin and Örtqvist, 2010).

Consistent with theoretical implications on education, empirical studies widely referred to individuals' educational achievements as a proxy for human capital stocks of an organisation. While the impact of board human capital on firm performance is relatively under researched

(Nicholson and Kiel, 2004; Kor and Sundaramurthy, 2009), there has been extensive theoretical and empirical investigation examining the links between CEO (Carpenter, Sanders and Gregersen, 2001; Castanias and Helfat, 1991, 2001; Finkelstein and Hambrick, 1996) and top management team (TMT) human capital and organisational outcomes (Cohen and Dean, 2005; Dimov and Shepherd, 2005; Kor, 2003). Highly educated CEOs or top management members are perceived as contributing to organisational legitimacy (Cohen and Dean, 2005), organisational innovation (Bantel and Jackson, 1989; Hambrick and Mason, 1984; Thomas, Litschert and Ramaswamy, 1991), firm survival (Bruderl, Preisendorfer and Ziegler, 1992; Cooper, Gimeno-Gascon and Woo, 1994; Gimeno et al. 1997; Pennings, Lee and Van Witteloostuijn, 1998), firm growth (Norburn and Birley, 1988) and strategic change (Datta, Rajagopalan and Zhang, 2003). Firm survival, firm growth, organisational innovation and legitimacy can possibly be seen as factors leading to a higher firm value in the market.

In human capital literature, years of schooling (Wiersema and Bantel, 1992; Young and Tsai, 2008) and highest educational degree (Westphal and Zajac, 1995) are the most frequently used proxies for educational level. This study chooses highest educational degree to measure the impact of directors' education on firm value as this measure offers more useful insights by allowing an investigation of the differences among three educational levels (Bachelor, Master's and PhD degrees). Prior research argues that, through education, individuals acquire knowledge, skills and abilities as well as valuable contacts that may enable them to obtain access to unique information and diverse resources (Arenius and DeClercq, 2005; Shane, 2003). Therefore, this thesis predicts a positive relationship between directors' highest degree and firm value. Following prior research on the impacts of education level, this thesis explores whether highest degree achieved by board directors have a significant impact on the market value of firms.

Professional Qualifications

Professional qualifications have been referred to as a further indicator of specific human capital developed through educational specialisation. Prior literature has acknowledged that individuals holding qualifications from externally recognised and validated professional bodies are highly valued, particularly in dynamic and competitive business environments (Storey, Watson and Wynarczyk, 1995; Watson et al. 1994). From specific human capital perspective, individuals who have undergone professional training are expected to possess a greater knowledge base, advanced skills and capabilities, and professional expertise which are likely to enhance their performance in related tasks.

In accounting literature, executives with professional qualifications are deemed to improve the quality of internal control systems and enhance investors' confidence in corporate financial reporting (Li, Sun and Ettredge, 2010). There is empirical evidence supporting a positive and significant relationship between the existence of qualified directors on firm boards and the market reaction to "good news" (Cai, Keasey and Short, 2006). It is also argued that share price reactions are sensitive to a number of board characteristics including professional qualifications (Yermack, 2006). Although studies on corporate boards have widely emphasised the importance of board expertise as one of the key antecedents of effective board performance (Hillman, Cannella and Paetzold, 2000; Minichilli, Zattoni and Zona, 2009; Payne, Benson and Finegold, 2009; Ruigrok, Peck and Keller, 2006), the relationship between qualified board members and performance outcomes still remains a challenging open question.

Based on prior literature on human capital, this research maintains that board directors holding professional qualifications in business-related disciplines[52] such as accounting, finance,

[52] Professional qualifications awarded in other fields such as biology, chemistry, engineering and medical sciences are excluded from the list based on the argument that possession of professional knowledge and competence in business-related disciplines is more likely to enhance the governing performance of board directors.

management, and marketing are more likely to contribute to firm value positively since they are considered as possessing more professional knowledge and competence, which may increase their governing performance through exercising effective control strategies and more efficient monitoring. In line with this argument, this thesis examines whether board directors holding professional qualifications such as ACA, CFA, and CIMA[53] have a significant impact on firms' market value.

Elite Education

Human capital theory posits that individuals who have educational backgrounds from high status institutions are able to derive additional benefits from having studied at such institutions (Becker, 1964). Scholars have long argued that educational credentials have a distinct impact on individuals' earnings (James et al., 1989; Kingston and Smart, 1990; Solomon, 1975; Trusheim and Crouse, 1981) and status attainment (Karabel and McClelland, 1987; Tinto, 1980; Useem and Karabel, 1986) since such credentials reflect stocks of human, social, and cultural capital (Lee and Brinton, 1996).

Educational attainment from elite institutions is deemed to contribute to an individual's human capital in three different aspects (Long et al., 1998; Useem and Karabel, 1986). The first aspect relates to the quality of an individual's knowledge base that the individual develops through his/her education at a prestigious institution (also referred to as scholastic capital). The second aspect comprises elite social networks that an individual develops and maintains through his/her personal contacts who are also members of such elite institutions (Kim, 2005; Terjesen, Sealy and Singh, 2009; Yoo and Lee, 2009). The final aspect concerns how educational attainment from an elite institution is perceived on the basis of reputation and prestige (Useem and Karabel 1986).

[53] A list of professional qualifications that meet specific criteria is provided in Appendix I.

Considering UK higher education environment, there are few institutions that have distinct recognition as the most prestigious universities on a national scale: University of Oxford and University of Cambridge (Kirchmaier and Kollo, 2006; Marginson, 2006, 2008; Singh, Terjesen and Vinnicombe, 2008). Graduates of these universities are distinguished by university credentials and, in addition to bestowed human and social capital, they are regarded as deriving further benefits from such credentials (Thelin, 1976). Educational attainment from such institutions is deemed to confer prestige that augments individuals' credibility and can be of great importance to organisational success through higher levels of intellectual capacity and tacit knowledge (Hitt et al., 2001), the provision of diverse resources (Hillman and Dalziel, 2003) and enhanced organisational legitimacy (Certo, 2003; Cohen and Dean, 2005). Director prestige conveyed through attending elite institutions is likely to act as a powerful indicator to the market of the competency and value of the board of directors, and therefore is expected to enhance firm market value.

Director Age

Human capital research has employed age as a proxy measure for individuals' human capital since increased age is associated with increased experience, and therefore higher stocks of human capital (Becker, 1964; Conyon, Peck and Sadler, 2001; Fisher and Govindarajan, 1992). It is argued that an individual's age is an important factor in decision-making since it affects the entire process from beginning to the end (Kirchner, 1958). For instance, Taylor (1975) find that individuals at an older age spend more time on making decisions, search for more information and are more hesitant about their decisions and therefore, are keener to review them. In the same manner, prior research demonstrates that, as individuals get older, they are more inclined to prefer established routines (Carlsson and Karlsson, 1970; Chown, 1960) and are less inclined to confront the system of formal rules and authority in effect (Child, 1974), which is likely to have a negative impact on firm value.

Consistent with early research on managerial age, upper echelons literature has argued that executive age, as well as other characteristics, influences how a firm's situation is perceived and how pertinent decisions are made (e.g. Guthrie and Datta, 1997; Hambrick and Mason, 1984; Tihanyi et al., 2000). Studies on TMTs have viewed age as a proxy for director and/or CEO experience, and also as an indicator for directors' and/or CEO's propensity to take risks and undergo change (Wiersema and Bantel, 1992). It has long been argued that younger executives have greater propensity for risk-taking than their older counterparts who tend to exhibit more importance on their career and financial stability (Child, 1974; Hart and Mellons, 1970). Furthermore, older executives are deemed to have greater commitment to status quo (Hambrick and Mason, 1984; Stevens, Beyer and Trice, 1978) which leads to reluctance for any organisational change. Hence, prior research has established that managerial youth is linked to corporate change and growth (Herrmann and Datta, 2005; Wiersema and Bantel, 1992), which are important factors that may lead to higher market valuations.

In addition to propensity for change and risk-taking, executive age has also been linked to information gathering and processing capacity. Prior research maintained that increased managerial age is likely to decrease the amount of physical and mental energy devoted to firm decisions (Child, 1974). Older executives are deemed to possess fewer abilities to learn new ideas and behaviours and to integrate information in decision-making (Chown, 1960). On the other hand, it is argued that older executives are associated with rationality in decision-making (Goll and Rasheed, 2005) since they tend to search for more information and provide a more accurate analysis of related information than their younger counterparts (Taylor, 1975). While increased managerial age is considered as an indicator of advanced experience (Anderson, Mansi and Reeb, 2004; Cornett et al., 2003) and rational decision-making (Goll and Rasheed, 2005), empirical studies have demonstrated that director age affects firm growth and strategic change in a negative way by limiting firms' capacity to renew and expand (Child, 1974;

Hambrick and Mason, 1984; Wiersema and Bantel, 1992). This may suggest that the association between director age and firm value can be nonlinear. Further analyses will be performed to address this possibility.

Following prior research on managerial age as an indicator of advanced experience (Anderson, Mansi and Reeb, 2004; Cornett et al., 2003), this thesis maintains that older board directors are more likely to contribute to firm value through higher levels of experience and rational decision-making skills they bring to firm boards. Despite the lack of a clear and significant relationship between director age and firm value, this thesis explores whether director age has a significant impact on the market value of firms.

Prior Board Experience

Human capital theory posits that post-school investments such as work experience enhance individuals' human capital through the accumulation of cognitive abilities and knowledge (Becker, 1964; Mincer, 1974). Previous work experience is deemed to provide individuals with a range of business-related skills and abilities which may enable them to increase productive and efficient activity (Ballot, Fakhfakh and Taymaz, 2001; Parker, 2006), to monitor diverse functions (Cooper, Gimeno-Gascon and Woo, 1994) and to solve complex problems (Davidsson and Honig, 2003). Furthermore, prior work experience in a particular context provides individuals with access to diverse social networks (Certo, 2003; Hillman and Dalziel, 2003; Kim, Aldrich and Keister, 2006), tacit knowledge required for understanding current dynamics in an industry or sector (Arthur, 1994; King and Zeithaml, 2003; Kor and Sundaramurthy, 2009), and familiarity and internal knowledge that nourish group functioning and decision-making (Fischer and Pollock, 2004; Westphal and Bednar, 2005).

Extant research has operationalised prior work experience (broad labour market experience) by using a number of indicators. Most frequently used indicator is the number of years of prior work experience (Bruderl, Preisendorfer and Ziegler, 1992; Colombo, Delmastro and Grilli, 2004; Davidsson and Honig, 2003; Evans and Leighton, 1989). Although prior work experience is mostly referred to as the number of years that an individual has been in employment, this component has also been associated with individuals' achievement levels. Therefore, two further indicators have been proposed to operationalise work experience as an indicator of general human capital. These indicators include the number of jobs previously held (Addison and Portugal, 2002; Gimeno et al., 1997; Veum, 1995), and the number of years of previous managerial or supervisory experience (Davidsson and Honig, 2003; Kim, Aldrich and Keister, 2006). Similarly, these indicators have been employed[54] in various analyses to represent specific human capital (Colombo and Grilli, 2010; Kor and Misangyi, 2008; Tian, Haleblian and Rajagopalan, 2011).

A recent study by Unger et al. (2011) have argued that human capital endows individuals with higher performance when it is applied and effectively adopted to the specific tasks that are assigned to such individuals. They emphasise that the process, in which human capital is transferred to specific tasks, will be easier if human capital embedded in individuals relate to their current tasks. Transfer of any work experience to other firms could arguably be easier if old and new job descriptions were similar to each other. Therefore, task-specific (task-related) human capital represents "some of the human capital an individual acquires on the job *(which)* is specific to the tasks being performed, as opposed to being specific to the firm" (Gibbons and Waldman, 2004: 203).

Based on prior research on specific human capital, this thesis operationalise prior board experience as the number of quoted boards a director sat in the past. In the context of firm boards, this thesis argues that prior board experiences of directors can be of great importance

[54] In human capital literature, the number of previously held positions (e.g. managerial or board positions) and the number of years of specific work experience (e.g. industry, firm or task-specific) are used as proxies of specific human capital.

as an indicator of task-specific human capital and could leverage the performance at individual and organisational level. Hence, it is hypothesised that board members with prior board experience will have a positive impact on firm value. Following human capital literature on prior work experience, this thesis includes *prior board experience* variable to explore whether board directors' previous board experiences have a significant impact on firm value.

Organisational Tenure

According to human capital theory, individuals develop firm-specific human capital throughout the period they have worked in an organisation. While firm (organisational) tenure is regarded as a key indicator for firm-specific human capital, which denotes an individual's accumulated knowledge of a particular organisation and its operations (Becker, 1975; Hatch and Dyer, 2004; Kesner, 1988; Pennings, Lee and Van Witteloostuijn, 1998, Weiss, 1995), research on top management teams has investigated the effects of organisational tenure from a group dynamics perspective (e.g. Finkelstein and Hambrick, 1990; Grimm and Smith, 1991; Hambrick and Mason, 1984; Wiersema and Bantel, 1992). Prior research on organisational tenures of TMTs demonstrates that the length of a director's or TMT's tenure may affect organisational processes and decisions in both positive and negative ways (Goll and Rasheed, 2005).

With regard to positive effects of organisational tenure, it is argued that organisational members (directors) with long tenures accumulate knowledge concerning each other's skills, limitations, and idiosyncratic skills (Kor, 2006; Penrose, 1959), develop internal social capital with other organisational members, and therefore enable the development of interpersonal trust, shared norms, language and routines which are deemed to improve group-functioning (Hambrick and D'Aveni, 1992; Sundaramurthy and Lewis, 2003; Westphal, 1999; Zenger and Lawrence, 1989). Furthermore, individuals with long organisational tenures are expected to have developed a better grasp of organisational procedures and policies (Hambrick and Mason,

1984) as well as its external environment, which is perceived as a valuable resource for implementation of firm's strategic decisions (Bergh, 2001; Cannella and Hambrick, 1993).

On the contrary, prior research on TMTs suggests that executives with long organisational tenures are less to likely to make changes in a firm's strategies and configurations (Gabarro, 1987; Finkelstein and Hambrick, 1990; Wiersema and Bantel, 1992), collect and process new information (Miller, 1991), adopt a risk-taker approach (Hambrick and Fukutomi, 1991) and have willingness to develop new ideas and directions (Miller, 1993). It is also argued that long-tenured executives are associated with status quo (Bantel and Jackson, 1989), strategic inertia (Boeker, 1997) and risk aversion (Herrmann and Datta, 2005). The underlying reason stems from the fact that long-tenured executives are more likely to have greater commitment to company history, procedure and processes (Katz, 1982; March and March, 1977), to engage in previous company strategies (Hambrick, Geletkanycz and Fredrickson, 1993), and to depend on routine information sources and past experience (Finkelstein and Hambrick, 1996). Miller (1991) noted that CEOs with long organisational tenure tend to become "stale in the saddle" since they fail to make crucial organisational changes to adapt to the external environment.

It has been previously emphasised that this thesis focuses on human capital of board directors and firm board as the focal unit of analysis. Prior literature has extensively used measures of heterogeneity across board members to operationalise human capital. This study attempts to explore the direct impact of human capital measures. Based on extant research on the link between organisational tenure and human capital, it is hypothesised that board directors with long organisational tenures contribute to firm value through their accumulated knowledge regarding firms and their operations (Kosnik, 1990; Musteen, Datta and Kemmerer, 2010), which is fundamental to achieving service tasks. Following prior studies on firm-specific human capital, this thesis explores whether organisational tenure of board directors have a significant impact on the market value of firms. Thus:

Hypothesis 6: There is a positive association between organisational human capital indicated by director age, professional expertise, elite education and organisational tenure and the market value of firms.

5.5 CONCLUDING REMARKS

This chapter develops a number of hypotheses based on extant research on executive labour market and the demand for social and human capital, and on the impact of social and human capital on firms' market value. Firstly, hypotheses on the demand for social and human capital at the individual level are presented. Secondly, the chapter presents the hypotheses on the demand for director social and human capital at the firm level. Thirdly, hypotheses relating to the association between board social and human capital and firm market value are developed. The following chapter focuses on the research design of this study and describes the key aspects of the Ohlson model. Furthermore, it examines the empirical specifications of 'other information' (*v* term) and identifies a benchmark model.

CHAPTER SIX

THE OHLSON (1995) MODEL AND EMPIRICAL SPECIFICATIONS OF 'OTHER INFORMATION'

6.1 INTRODUCTION

This research extends the Ohlson (1995) model to examine the impact of social and human capital, possessed at the firm level, on the market value of firms. Since its publication in 1995, the Ohlson model has received wide acceptance among financial accounting scholars as an accounting-based equity valuation model. Several researchers have paid a great deal of attention to the work of Ohlson (1995) in the fields of accounting and finance (e.g. Barth and Clinch, 2009; Collins, Maydew and Weiss, 1997; Dechow, Hutton and Sloan, 1999; Ely and Waymire, 1999; Francis and Schipper, 1999; Gregory, Saleh and Tucker, 2005; Hand and Landsman, 1998; Ota, 2002; Pirie and Smith, 2005; Stober, 1999). The model has had a great influence[55] on subsequent empirical work since it establishes a robust theoretical association between current accounting numbers and equity market value (Lo and Lys, 2000).

This thesis particularly focuses on assessing the explanatory power of "other information – *v*", which is proxied by a set of human and social capital measures developed based on extant literature[56], for the market value of firm equity over three traditional accounting measures, namely book value of equity, earnings and dividends. As discussed in section 4.3.4 of Chapter Four, the term *v* relates to information that denotes value-relevant events that are expected to have an impact on a firm's market value through its future abnormal earnings, yet are not disclosed in the financial statements. This research aims to examine to what extent social and human capital possessed at firm level could assist in determining market prices[57]. Under the

[55] See Section 4.3.5 of Chapter Four for a critical review of the limitations of the Ohlson (1995) model.
[56] See Chapter Two and Chapter Five for a discussion of the measures of board social and human capital.
[57] A detail discussion of the gap between the book values and market values is provided in Chapter Four.

Ohlson (1995) valuation framework, the value relevance of information on social and human capital, being the v term, is tested using a sample of FTSE All Share constituents over a period of 10 years (2001-2010). A detailed discussion of the sample and time period selection is included in Chapter Seven.

6.2 ACCOUNTING-BASED EQUITY VALUATION MODELS

A review of literature on market-based accounting research demonstrates that much of the theoretical research on valuation models stems from Ohlson's seminal work in 1995. The Ohlson (1995) model (OM) has found rapid acceptance and has been extended in subsequent empirical work examining the relationship between market value of a firm's equity and its accounting information (Gregory, Saleh and Tucker, 2005; Morel, 1999; Morel, 2003). Furthermore, the criticisms[58] on accounting regulations' ability to timely recognise the information, which has already been reflected in market prices, stimulate further applications of the model since the value-relevance of traditional accounting measures, particularly for firms with a high level of unrecognised intangible assets, is often questioned (Amir and Lev, 1996; Collins, Maydew and Weiss, 1997; Dontoh, Radhakrishnan and Ronen, 2004; Francis and Schipper 1999; Filip and Raffournier, 2010).

Ohlson's work comprises two major models: the residual income valuation model (RIVM) and the linear information dynamics model (LIM). The RIVM is considered as an application of the Dividend Discount Model, and it expresses the economic value of equity in terms of the book value of firm equity and abnormal earnings whereas the LIM focuses on the mechanism of abnormal earnings and establishes an association between existing information and future abnormal earnings. The Ohlson (1995) model relies on three main assumptions, which

[58] See Basu (1997) and Lev (1989).

comprise dividend discounting, clean surplus accounting, and modified auto-regressive AR(1) linear information dynamics.

Since the development of the RIVM is attributed to prior research efforts[59] of early academics such as Preinreich (1938), Edwards and Bell (1961) and Peasnell (1982), several researchers argue that Ohlson's actual contribution to accounting-based valuation theory is his modelling of linear information dynamics, which stochastically links current abnormal earnings and other information (v) to future abnormal earnings (Hand and Landsman, 1998; Lo and Lys, 2000; Ota, 2002). Ohlson (1995) expands upon the RIVM by setting assumptions concerning the evolution of residual income through time. These assumptions are expressed in a system of equations which are referred to as the linear information model (LIM). Furthermore, Ohlson (1995) assumes unbiased accounting for the implementation of his model[60].

Prior research on the explanatory and predictive power of the Ohlson (1995) model followed two alternative approaches to implementing Ohlson's valuation framework (McCrae and Nilsson, 2001). The first approach predicts the value of equity based exclusively on an RIVM specification. Examples of this approach include Claus and Thomas (1999), Dichev (1997), Frankel and Lee (1998). The second approach includes a variable to incorporate non-accounting-related expectations about future abnormal earnings and develops the linear information dynamics of expectation formation from both current abnormal earnings and non-accounting information as approximating first-order, autoregressive processes (Dechow, Hutton and Sloan, 1999). There is extensive research on the comparison of different valuation models. Studies examining the performance of different valuation models include Courteau,

[59] Lo and Lys (2000) and Palepu, Bernard and Healy (1996) provide historical information on the residual income model.
[60] Feltham and Ohlson (1995) further explore the implementation of the RIVM in a conservative accounting setting.

Kao and Richardson (2001), Francis, Olsson and Oswald (2000), Liu, Nissim and Thomas (2002), Lundholm and O'Keefe (2001), Penman and Sougiannis (1998), and Penman (2001).

Before the Ohlson (1995) model is explored in greater depth, next section goes on to discuss the residual income valuation model to provide a better understanding of how Ohlson (1995) expands upon the RIVM to develop his influential model.

6.3 THE RESIDUAL INCOME VALUATION MODEL (RIVM)

The RIVM and the Ohlson (1995) model both rely on the Dividend Discount Model (DDM), which is based on one main hypothesis: the value of a firm's equity at time *t* equals to the present value of expected future dividends. Under the assumptions that the markets are efficient and the firm is going concern with an indefinite life, the following equation is a general version of the Dividend Discount Model:

$$P_t = \sum_{\tau=1}^{\infty} {R_f}^{-\tau}\ E_t\,(d_{t+\tau})$$

(PVED)

(15)

Where
P_t = market value, or price, of the firm's equity at date *t*,
d_t = net dividends paid at date t,
R_f = 1+ the risk- free rate (r-the risk-free rate),
$E_t[.]$ = expectation operator based on the information at date *t*.

The RIVM is derived from the DDM by making two additional assumptions[61]. Firstly, it is assumed that a clean surplus relation (CSR) holds. This entails accounting earnings to include all changes in the book value of equity excluding the transactions with the owners. Peasnell

[61] The validity of its assumptions are critiqued in Section 4.3.5 of Chapter Four in a detailed discussion of the model's limitations.

(1982) links dividends to fundamental accounting measures, namely book value of equity and earnings by the formula below:

$$b_t = b_{t-1} + x_t - d_t$$

(CSR)

(16)

Where
b_t = net book value of equity at date *t*
x_t= accounting earnings (or net income) for period (*t-1, t)*
d_t = dividends (or net cash payments) at date *t*.

Equation (16) is referred to as the Clean Surplus Relation in Ohlson (1995).

Book value of equity (at the beginning of period t) multiplied by the cost of equity capital is deemed to be the "normal earnings" of the firm. Therefore, "abnormal earnings" (or the residual income) is determined by the following formula:

$$x_t^a = x_t - rb_{t-1}$$

(RI)
(17)

Where
x_t^a = abnormal earnings for period *t*,
x_t = accounting earnings (or net income) for period *t*,
r = cost of capital,
b_{t-1} = book value of equity at the end of period *t-1*.

Secondly, Ohlson (1995) requires a regularity condition which states that the book value of equity grows at a rate less than R:

$$R^{-\tau} E_t\ (b_{t+\tau}) \xrightarrow{\tau \to \infty} 0.$$

(18)

Using the clean surplus relation and definition of abnormal earnings expressed in the equations (16) and (17), dividends can be determined by the following equation:

$$d_t = x_t^a + (1+r) b_{t-1} - b_t$$

(19)

Based on two assumptions described earlier, first equation (PVED) can be restated as:

$$P_{t=} b_t + \sum_{\tau=1}^{\infty} R^{-\tau}\, E_t(x_{t+\tau}^a)$$

(RIVM)

(20)

This equation yields the residual income valuation model, which expresses the market value (or price) of a firm's equity as the sum of the book value (of equity) and the present value of future abnormal earnings. It is essential to note that the clean surplus relation is not a firm requirement for accounting variables at their current values. The RIVM requires the clean surplus relation to hold when future values are estimated. From an accounting perspective, one issue relating to the RIVM is identified as failing to relate current accounting figures to equity value (McCrae and Nilsson, 2001). The variables on the right-hand side of the Equation (20) relate to expected future values rather than past realisations. Ohlson's (1995) analytical extension of the RIVM provides a solution to this limitation.

6.4 THE OHLSON (1995) MODEL

Despite its wide influence among researchers in respect of the theoretical link it provides between the market value of firms and accounting information, the RIVM is criticised for being neither implementable nor testable (Lo and Lys, 2000). Ohlson (1995) transforms the RIVM by making a final assumption in respect of abnormal earnings information dynamics. This assumption implies certain restrictions on the general version of the Dividend Discount Model which expresses firm value as the present value of expected dividends (Dechow, Hutton and Sloan, 1999). Despite having the same theoretical foundation, which fundamentally involves determining firm value by discounting expected dividends, Ohlson's (1995) information dynamics model assumes that abnormal earnings follow an auto-regressive process. The time-series behaviour of abnormal earnings is expressed by two following equations:

$$x^a_{t+1} = \omega x^a_t + v_t + \varepsilon_{1,t+1} \tag{21a}$$

$$v_{t+1} = \gamma v_t + \varepsilon_{2,t+1} \tag{21b}$$

Where

v_t = information which is useful for estimating future abnormal earnings (other than current abnormal earnings),

$\omega, \gamma =$ constant persistence parameters that are non-negative and less than one: $(0 \leq \omega, \gamma < 1)$,

$\varepsilon_{1,t}$ = the mean zero disturbance terms.

Based on the information dynamics specified by the equations (21a) and (21b), Ohlson demonstrates that the RIVM can be rewritten as a linear function of current book value, current abnormal earnings, and other information variable:

$$P_t = b_t + \alpha_1 x^a_t + \alpha_2 v_t \tag{22}$$

Where the coefficient on abnormal earnings: $\alpha_1 = \omega/(R - \omega)$,

the coefficient on other information: $\alpha_2 = R/(R - \omega)(R - \gamma)$, R is equal to the one plus the risk free rate.

Using the clean surplus relation and definition of abnormal earnings demonstrated in equations (16) and (17), the market value of equity can be expressed in terms of current book value, current earnings, current dividends and other value-relevant information. The valuation function is rearranged as the equation below:

$$P_t = (1-k)b_t + k(\varphi x_t - d_t) + \alpha_2 v_t \tag{23}$$

Where
b_t = net book value of equity at date *t*,
x_t= accounting earnings (or net income) for period (*t-1, t)*,
d_t = dividends (or net cash payments) at date *t*,
the coefficient $k = \alpha_1 r = r\omega/(R-\omega)$,
the coefficient $\varphi = R/(R-1) = R/r$.

It is worth emphasising that Ohlson's (1995) linear information dynamics model (LIM) expressed in the form of equation (23) determines the value of equity by using contemporaneous accounting data and information (Lo and Lys, 2000).

In the Ohlson model, ω and γ are assumed to take a value between 0 and 1. Dechow, Hutton and Sloan (1999) and McCrae and Nilsson (2001) provide some empirical support for Ohlson's information dynamics, in other words for persistence parameters. If the coefficients on book value and earnings are rearranged by using the equations above, the Ohlson (1995) model can be expressed as:

$$P_t = (1-\alpha_1 r)b_t + \alpha_1 r\left(\frac{x_t(1+r)}{r} - d_t\right) + \alpha_2 v_t \tag{24}$$

If it is assumed that dividends are equal to zero, market value of a firm's equity is a linear function of book value of equity, earnings and other information (*v* term). Alternatively, a model based on growth rates in book values and earnings can be derived by omitting Ohlson's

(1995) linear information dynamics (Rees, 1997). This approach is often adopted in value relevance research to derive a valuation model in which the strict linearity assumptions of the Ohlson (1995) model are relaxed through estimating constituents of book values and earnings, and allowing for industry effects (Barth, Beaver and Landsman, 2001). In a general framework, value relevance literature is concerned with the examination of whether the coefficient of the accounting amount being studied is significantly different from zero, and with the predicted sign (Shen and Stark, 2013).

Studies in the UK control for variables other than book value and earnings and draw inferences on the value relevance of the accounting amount if there is correlation or partial correlation between the accounting amount studied and market value in the presence of the control variables specified. Hence, such a modification of the Ohlson (1995) model allows more widespread assessment of to what extent firms' intangibles and various activities enabling the creation of intangibles are value-relevant[62].

The equation (24) can simply be rearranged to derive the model below:

$$P_t = (1 - \alpha_1 r)b_t + a_1(1 + r)x_t - \alpha_1 r d_t + \alpha_2 v_t \tag{25}$$

Several studies that examine the value relevance of dividends in developed markets find that dividends have a positive impact on firm market value (e.g. Akbar and Stark, 2003b; Hand and Landsman, 2005; Rees, 1997). In the UK, Rees (1997) examines the value relevance of dividends, capital structure and capital expenditure during the period from 1987 to 1995. His findings demonstrate that earnings distributed as dividends have a greater impact on value than do earnings retained within the firm. Rees (1997) emphasises that the inclusion of dividends in the valuation model enhances the explanatory power of the model. Akbar and Stark (2003b)

[62] Examples of value-relevance research include Barth, Beaver and Landsman (1992, 1998 and 2001).

also report a positive and significant relationship between dividends and firm value. Their findings suggest that deflators have no impact on the value relevance of dividends in the UK. Furthermore, in a study of US firms, Hand and Landsman (2005) find that dividends have information content, and this information is greatest when earnings are transitory. Hence, following prior empirical research, dividends are incorporated into the model.

Following the Ohlson (1995) model, the market value of a firm's equity is expressed as a linear function of the book value of equity, earnings and dividends together with a constant term to capture the effects of omitted variables. This leads to the empirical specification in Equation (26) below:

$$MV_{it} = \alpha_0 + \alpha_1 BV_{it} + \alpha_2 E_{it} + \alpha_3 D_{it} + \varepsilon_{it} \tag{26}$$

Where MV_{it}, BV_{it}, E_{it}, and D_{it} are the market value of equity, the book value of equity, earnings (net income of the firm) and dividends respectively, and ε_{it} is a random variable, for firm i at time t.

In the UK, prior research has identified a number of accounting variables beyond book value, earnings and dividends that significantly contribute to explaining the market value of firms. These include research and development expenditures, capital contributions and capital expenditures (e.g. Akbar and Stark, 2003b; Dedman, Mouselli, Shen and Stark, 2009; Dedman, Kungwal and Stark, 2012; Green, Stark, and Thomas 1996; Rees, 1997). Hence, an extended model for estimating market value is specified as follows:

$$MV_{it} = \alpha_0 + \alpha_1 BV_{it} + \alpha_2 E_{it} + \alpha_3 D_{it} + \alpha_4 RD_{it} + \alpha_5 CC_{it} + \alpha_6 CE_{it} + \varepsilon_{it} \tag{27}$$

where, RD_{it}, CC_{it} and CE_{it} are research and development expenditures, capital contributions and capital expenditures, respectively, for firm i at time t.

6.5 EMPIRICAL SPECIFICATIONS OF ‘OTHER INFORMATION’

6.5.1 The Role of Other Information (*v* term) in Explaining Market Prices

The previous chapter discussed how residual income valuation models are developed and used to estimate the value of firms’ equity. In particular, Ohlson (1995) model is built upon the standard valuation model of dividend-discounting and advanced by the assumptions of clean surplus relation and dynamic linear information model (LIM) to develop an accounting-based (residual income) valuation model which estimates the market value of a firm’s equity by using contemporaneous accounting data (e.g. book value and earnings) and other information. In his paper, Ohlson (1995) indicates that “v_t should be thought of as summarizing value-relevant events that have yet to have an impact on the financial statements” and “one thinks of v_t as capturing all non-accounting information used in the prediction of future abnormal earnings”. Until 1998, almost all empirical research motivated by Ohlson (1995) set v term to zero (e.g. Collins, Maydew, and Weiss 1997; Collins, Pincus, and Xie 1999; Francis and Schipper 1999; Guenther and Trombley 1994; Stober 1999). The very few papers which did not set v aside follow an intuitive manner rather than an empirical manner in exploring the v term (e.g. Amir and Lev 1996; Ittner and Larcker 1998; Myers 1999).

Research on Ohlson (1995) model discusses that incorporating the value-relevant information beyond book value and earnings is crucial as those accounting numbers are transaction-based and deemed insufficient for firm valuation (Hand, 2001; Wang, Alam, and Makar, 2005). From an empirical perspective, Begley and Feltham (2002) emphasise that not including any value-relevant information in the empirical setting may lead to estimation and inference errors due to the existence of a potential omitted variable. Following earlier work, there have been several attempts to develop proxies for the v term. Empirical attempts to capture ‘other information’ in equity valuation models focus on two fundamental proxies: analysts’ earnings forecasts and a multiple of last year’s ‘other information’.

First proxy for other information is an adjusted version of the one year-ahead consensus analyst forecasts (see Agarwal, Taffler and Brown, 2011; Bryan and Tiras 2007; Dechow, Hutton, and Sloan 1999; Frankel and Lee 1998; Hand and Landsman 2005; Hope and Kang 2005; Liu and Thomas 2000; Mui-Siang Tan and Lim, 2007; Ohlson 2001). This stems from a linear information dynamics system in which the two variables included within the system are residual income and 'other information'. As a consequence, one year-ahead abnormal earnings are predicted by current abnormal earnings and current 'other information'. If it is assumed that the multiplier of current abnormal earnings in the predictive equation for one year-ahead abnormal earnings can be successfully estimated; and that the expectation of next year's earnings can be estimated in an unbiased manner by the one year-ahead consensus analyst forecast, then an estimate of a multiple of current 'other information' can be obtained from the abnormal earnings prediction equation. Such an estimate then can be used in predicting market value in value relevance tests (e.g. Hand and Landsman 2005).

The alternative proxy is a multiple of last year's 'other information'. Studies such as Akbar and Stark (2003b) and Barth, Beaver, Hand and Landsman (2005) take advantage of the fact that linear information dynamics systems give rise to linear valuation functions. This leads to market value being expressed as a linear function of the accounting variables in the system. Hence, if the coefficients of the accounting variables can be appropriately estimated, then an estimate of a multiple of last year's 'other information' can be obtained by deducting the linear function of the accounting variables from the market value. Given that 'other information' predicts itself, a multiple of last year's value can be treated as a noisy proxy of the current value in the regressions of current market value on the variables in the linear information dynamics system.

In addition to these two main proxies, prior valuation research has used various proxies to operationalise 'other information'. These proxies include environmental performance (Hassel, Nilsson, and Nyquist, 2005), value added intellectual coefficient (Swartz, Swartz, and Firer, 2006), negative tone in the news (Hsu and Wang, 2013) and compliance (with IFRS mandatory disclosure requirements) score (Tsalavoutas and Dionysiou, 2014). Since providing a detailed examination of all 'other information" proxies in extant valuation research is beyond the remit of this thesis, the chapter goes on to explore the empirical specifications of the valuation models with two fundamental proxies of other information.

6.5.2 Measurement of Other Information

Estimating Other Information by Using One Year-ahead Consensus Analyst Forecast

If we assume a linear information dynamics (LID) system to estimate market value, the system will include *n* accounting variables labelled AV_{it}, i = 1 to n at time *t*, and an 'other information' variable, denoted OI. The accounting variables could include a number of components of book value and earnings. One of the accounting variables is dividends and AV_1 is the component of earnings that corresponds to the aspect of earnings forecast by analysts. Hence, the linear information dynamics system can be represented by the set of equations below[63] (Kungwal, Shen and Stark, 2013, p.5):

$$\begin{gathered}
\mathrm{AV_{1t}} = \theta_{11}\mathrm{AV_{1t-1}} + \theta_{12}\mathrm{AV_{2t-1}} + \cdots + \theta_{1n}\mathrm{AV_{nt-1}} + \theta_{1n+1}\mathrm{OI_{t-1}} + \varepsilon_{1t} \\
\mathrm{AV_{2t}} = \theta_{21}\mathrm{AV_{1t-1}} + \theta_{22}\mathrm{AV_{2t-1}} + \cdots + \theta_{2n}\mathrm{AV_{nt-1}} + \theta_{2n+1}\mathrm{OI_{t-1}} + \varepsilon_{2t} \\
\cdots\cdots \\
\mathrm{AV_{nt}} = \theta_{n1}\mathrm{AV_{1t-1}} + \theta_{n2}\mathrm{AV_{2t-1}} + \cdots + \theta_{nn}\mathrm{AV_{nt-1}} + \theta_{nn+1}\mathrm{OI_{t-1}} + \varepsilon_{nt} \\
OI_t = \theta_{n+1n+1}OI_{t-1} + \varepsilon_{n+1t}
\end{gathered} \tag{28}$$

[63] Constraints may be placed on the size of the θij's reflecting, for example, the clean surplus relationship and an assumption of dividend irrelevance. Following Kungwal, Shen and Stark (2013), it is assumed that such constraints are irrelevant. The scale of OI_t is arbitrarily such that θ_{1n+1}= 1

Following Ohlson (1989), a linear valuation function can be deduced from the equation system above:

$$\mathrm{MV_t} = \alpha_1 \mathrm{AV_{1t}} + \alpha_2 \mathrm{AV_{2t}} + \cdots + \alpha_n \mathrm{AV_{nt}} + \alpha_{n+1} \mathrm{OI_t}$$

(29)

where the α_j's j = 1 to n+1 are functions of the $\theta'_{1j}s$ and the cost of capital.

From equation system (XIV) and equation (XV) above, two alternative methods of estimating OI_t. can be deduced. Recalling that AV_1 is denoted as the component of earnings that analysts forecast, if the one year-ahead consensus analyst forecast, denoted by FE_t, is an unbiased expectation of AV_{1t+1} then:

$$\mathrm{FE_t} = \mathrm{E}(\mathrm{AV_{1t+1}})$$

(30)

and, hence, following the first equation of equation system (XIV):

$$\mathrm{OI_t} = \mathrm{FE_t} - [\theta_{11} \mathrm{AV_{1t}} + \theta_{12} \mathrm{AV_{2t}} + \cdots + \theta_{1n} \mathrm{AV_{nt}}]$$

(31)

If the θ_{1i}, i = 1 to n, can be estimated, then adjusting the one year-ahead consensus analyst forecast, using equation (31), can produce an estimate of OI. With the scaling of 'other information', it represents the component of one year-ahead earnings that cannot be forecasted using accounting variables alone. Further, equation (31) can be incorporated into equation (29) to produce the valuation equation below:

$$\mathrm{MV_t} = (\alpha_1 - \theta_{11})\mathrm{AV_{1t}} + (\alpha_2 - \theta_{12})\mathrm{AV_{2t}} + \cdots + (\alpha_n - \theta_{1n})\mathrm{AV_{nt}} + \alpha_{n+1}\mathrm{FE_t}$$

(32)

Equations (29) and (32) are identical in their approaches to estimating the market value. It is worth noting that, if specific properties of the valuation coefficients of the accounting variables are of concern, equation (32) will produce biased coefficients unless the OI is the consensus analysts' forecast (Kungwal, Shen and Stark 2013).

The method of estimating 'other information' in equation (31) is implemented by Dechow, Hutton and Sloan (1999), however, it is given concrete empirical content in Ohlson (2001). In both studies, there is only one accounting variable – abnormal clean surplus earnings. Dechow, Hutton and Sloan (1999) use cross-sectional regressions of actual abnormal clean surplus earnings on the one year lag value to estimate the coefficient of abnormal clean surplus earnings in the linear information dynamics system. This coefficient is then used in producing observations for 'other information' and producing estimates of the overall system dynamics.

It is important to note that this method of estimating other information makes the assumption that 'other information' is single-dimensional. If other information had more than one dimension, consensus forecasts would have to be available for all of the accounting variables in the system. This is due to the fact that the linear combination of the 'other information' components in the valuation equation is not automatically identical to their linear combinations embedded in the linear information dynamics system (Akbar and Stark, 2003b).

Estimating Other Information by Using a Multiple of Last Year's 'Other Information'

Akbar and Stark (2003b) and Barth et al. (2005) develop a different proxy for current 'other information'. Similar to the first method of estimating other information, this proxy is also dependent upon the assumption that 'other information' is single-dimensional. In this method, the only estimator of OI_t is specified as $OI_{t-1.}$ Therefore, if other information at time t is unobservable, then other information at time t-1 can be used as a noisy proxy. A multiple of OI_{t-1} can be approximated by using the model below:

$$\mathrm{MV_{t-1}} = \alpha_1 \mathrm{AV_{1t-1}} + \alpha_2 \mathrm{AV_{2t-1}} + \cdots + \alpha_n \mathrm{AV_{nt-1}} + \alpha_{n+1} \mathrm{OI_{t-1}}$$

$$\alpha_{n+1} \mathrm{OI_{t-1}} = \mathrm{MV_{t-1}} - [\alpha_1 \mathrm{AV_{1t-1}} + \alpha_2 \mathrm{AV_{2t-1}} + \cdots + \alpha_n \mathrm{AV_{nt-1}}]$$

(33)

In essence, this approximation refers to the market valuation error at time t-1 if appropriate coefficients can be estimated for the accounting variables in the valuation equation. Based on the relationship specified in Equation (33), $\mathrm{OI_t}$ can be estimated as a multiple of $\alpha_{n+1}\mathrm{OI_{t-1}}$ plus an error term.

To perform the model specified in Equation (33), one year of observations need to be lost in order to acquire a proxy for $\mathrm{OI_{t-1}}$. This will mean restricting each annual year t cross-section to only include those firms for which necessary information exists to estimate $\mathrm{OI_{t-1}}$.

6.5.3 Which proxy is the best?

Kungwal, Shen and Stark (2013) discuss the advantages and disadvantages of both methods of estimating "other information" at great length in their empirical study. They note that both measures pose two general problems. First, estimation of both measures depends on a well-specified set of accounting variables. In the absence of a well-specified system, the impact of omitted variables as well as 'other information' will be reflected in both measures. Hence, they will not be pure proxies of 'other information'. Further, the changes in the explanatory power will reflect how well the measures help counteract the effects of the omitted variables in the valuation equation. Second, the use of both measures is based on the assumption that 'other information' is single-dimensioned. If it is not, neither of the measures will be valid (despite increasing the explanatory power of the model). These two problems will be revisited in the following chapter in the discussion of the operationalisation of the SHC and the benchmark model.

Looking at the specific problems arising from the use of each measure, there are three major drawbacks associated with estimating 'other information' using consensus analyst forecasts. The first drawback relates the issue of data loss. In the UK, there are no forecasts available for almost half of firm-year observations on relevant databases. Kungwal, Shen and Stark (2013) emphasise that setting the availability of a forecast as a selection criterion may lead to a sample selection bias due to the type of firms having forecasts associated with them.

The second drawback is associated with the issue of what is actually being forecasted by the analysts. The method is expected to succeed as long as forecasted component of earnings is a linear combination of some or all of the earnings components being modelled in the LID system (Kungwal, Shen and Stark, 2013). In the absence of a linear combination, the risk of creating an errors-in-variables problem may arise. This may, in turn, lead to possibly biased coefficients for the accounting variables in the system.

Thirdly, it is assumed that consensus analyst forecasts are unbiased. However, there is extant research which suggests otherwise[64]. Using biased forecasts introduces further potential for an errors-in-variables problem which leads to biased coefficients for accounting variables.

There are also disadvantages associated with the use of last year's valuation error as a proxy for 'other information' (Kungwal, Shen and Stark, 2013). First of all, this method of estimating other information requires the prior year's accounting and market data to be available. Compared to the use of an analyst forecast, the scope of data loss is likely to be less in the use of last year's valuation error. However, introducing the availability of prior year's accounting data as a selection criterion is likely to induce bias in the sample selection process.

The second drawback relates to the possibility of biased coefficients for the 'other information'. As the last year's valuation error is a noisy estimate of this year's valuation error, this will

[64] See Das, Levine and Sivaramakrishnan (1998), Gu and Wu (2003), Hong and Kubik (2003), Hilary and Hsu (2013), Ke and Yu (2006), Lim (2001).

introduce an errors-in-variables problem (Greene, 1993). This problem should not bias the coefficients of the accounting variables as long as the error is not systematically correlated with those in the system. This may specifically pose a problem if the coefficient of the 'other information' is of interest to the researcher.

The final drawback is associated with the issue of multicollinearity in the market value estimations. As the proxy for current 'other information' is last year's value, the last year's 'other information' is one of the variables that help predict some or all of the current accounting variables (through the LID system). Hence, the last year's "other information" is expected to partially correlate with some or all of the current values of accounting variables, which poses a multicollinearity problem in the market value estimations.

The investigation of advantages and disadvantages of the two fundamental methods of estimating 'other information' reveals that, despite their merits, both methods suffer from a number of distinct problems. This thesis dismisses the first method (estimating other information by using one year-ahead consensus analyst forecast) due to the limitations on access to required datasets (via I/B/E/S). The second method (estimating other information by using last year's valuation error) is adopted in empirical analyses and a comparison of the results for different proxies of 'other information' is provided in Chapter Eight.

6.6 BENCHMARK MODEL

Following a detailed examination of the Ohlson (1995) Model and measurement of 'other information', a benchmark model is specified to examine the role of social and human capital in explaining the market value of firms in the UK. In Akbar and Stark (2003a) and Dedman et al. (2009), 'other information' is added to valuation models with an expectation of increased effectiveness. Therefore, Equations (26) and (27) can be extended to include estimates of 'other information', OI_{it}, and SHC (social and human capital) index as a proxy for OI resulting in the following equations below:

$$MV_{it} = \alpha_0 + \alpha_1 BV_{it} + \alpha_2 E_{it} + \alpha_3 D_{it} + \beta OI_{it} + \varepsilon_{it} \tag{34}$$

$$MV_{it} = \alpha_0 + \alpha_1 BV_{it} + \alpha_2 E_{it} + \alpha_3 D_{it} + \alpha_4 RD_{it} + \alpha_5 CC_{it} + \alpha_6 CE_{it} + \alpha_7 OI_{it} + \varepsilon_{it} \tag{35}$$

$$MV_{it} = \alpha_0 + \alpha_1 BV_{it} + \alpha_2 E_{it} + \alpha_3 D_{it} + \alpha_4 RD_{it} + \alpha_5 CC_{it} + \alpha_6 CE_{it} + \alpha_7 SHC_{it} + \varepsilon_{it} \tag{36}$$

(*Benchmark Model*)

Equation (35) forms the empirical accounting-based valuation model that will be used to explore the role of social and human capital in explaining the market value in this thesis. Sources of data, definitions of the variables and the details of the deflators used in estimating Equation (34)-(36) are provided in the following chapter.

6.7 CONCLUDING REMARKS

This chapter describes the key aspects of the research design focusing on the foundations of the Ohlson (1995) Model and its empirical specifications in the UK. The chapter starts with a rigorous theoretical examination of accounting-based equity valuation models and presents how the Ohlson Model is developed on the foundations of Residual Income Valuation Model. Next, the chapter concentrates on the role of 'other information' (*v* term) in explaining the market prices and examines different specifications of *v* term based on prior empirical research. Following the examination of empirical specifications of the *v* term, advantages and disadvantages associated with each estimation method are discussed. Finally, the chapter concludes with providing a benchmark model to examine the role of 'other information' in the context of this study. The following chapter provides the details of operationalisation of social and human capital measures and describes how a social and human capital (SHC) index is developed as a proxy for 'other information' in the benchmark model.

CHAPTER SEVEN

METHODOLOGY

7.1 INTRODUCTION

Previous chapters explored the relevant theories and discussed the theoretical and empirical streams of research relating to the aims and objectives of this thesis. This chapter provides insights into accounting research and illustrates the proposed methodology and the research design used to test hypothesised relationships presented in Chapter Five. The major themes in this chapter comprise accounting research, the sample and data, operational measures and research design.

7.2 ACCOUNTING RESEARCH

7.2.1 A Review of Research Methods in Accounting Research

In consideration of the research method and methodology in accounting, Ryans, Scapens, and Theobold (2002) provide a useful review for the researchers in this field. Despite the limitation that their work is over 10 years old, it is one of the most widely cited source on the research methods in accounting research. In their review, Ryans, Scapens, and Theobold (2002) acknowledge that accounting research experienced a period of rapid growth and development in the 1970s. During this period, research in accounting mostly comprised the application of financial economics to accounting problems, and, to a great extent, utilised the methods commonly used in economics. Despite the use of such methods, the methodology of accounting research was given little critical thought by researchers. At the end of 1970s, the American Accounting Association (AAA) commissioned a report titled *Empirical Research in Accounting: A Methodological Viewpoint* (Abdel-khalik and Ajinkya, 1979). This report provided a detailed review of the alternative methodological approaches to accounting research; however concluded that “ideal” method of accounting research should be the scientific method (as opposed to naturalistic methods). Before this period, studies in accounting literature rarely used positivism as a research paradigm and “the correct method for accounting research seemed self-evident” (Lukka and Kasanen, 1995:74).

Abdel-khalik and Ajinkya’s report (1979) maintained that scientific method begins with a well-formulated theory and is founded on a review of prior literature. Furthermore, they argue that the method is expressed in the form of a mathematical model. Subsequently, based on the theory, hypotheses which identify relationships between sets of dependent and independent variables are formulated. Following the formulation of hypotheses, data are collected by using a highly structured and predetermined design and then analysed by mathematical and statistical techniques. The final phase of this method is to generalise the results. Therefore, scientific approach is rooted in abstraction, reductionism, and statistical methods. Despite acknowledging that this approach may not be suitable in all areas of accounting research, Abdel-khalik and Ajinkya (1979) describe scientific method as the most desirable approach for researchers in accounting.

The conclusion of Abdel-khalik and Ajinkya’s (1979) report was challenged by scholars such as Tomkins and Groves (1983). Despite recognising the role of scientific methods, they argued that it should not be prioritised over other methods. Furthermore, they emphasised that different areas of accounting research may require a variety of methods to explore certain ideas. The fundamental aim of Tomkins and Groves’ (1983) paper was to underline the need for focusing on the nature of phenomenon being explored in order to select the most appropriate approach for a particular type of research. They maintained that the selection of an appropriate research methodology cannot be achieved devoid of any attention to ontological and epistemological assumptions which underpin the research in question. The alternative to scientific approach is naturalistic approach which is based on realism, holism, and analytical method.

In consideration of different methodological approaches, Tomkins and Groves (1983) draw on the six fold classification of the social world developed by Morgan and Smircich (1980). This classification provides the six fundamental ontological[65] assumptions, which can be linked to particular schools of thought in the social sciences, and has inferences for the methodological approaches that are used in accounting research. These ontological assumptions refer to reality as: 1) a concrete structure, 2) a concrete process, 3) a contextual field of information, 4) a symbolic discourse, 5) a social construction, 6) a projection of human imagination (Morgan and Smircich, 1980: 492). These assumptions range from the objective to the subjective, providing a basis for different research methods. Arising from these assumptions, accounting research comprises different research areas using different methods. Therefore, next section goes on to discuss the taxonomy of accounting research and identifies the category this study falls into.

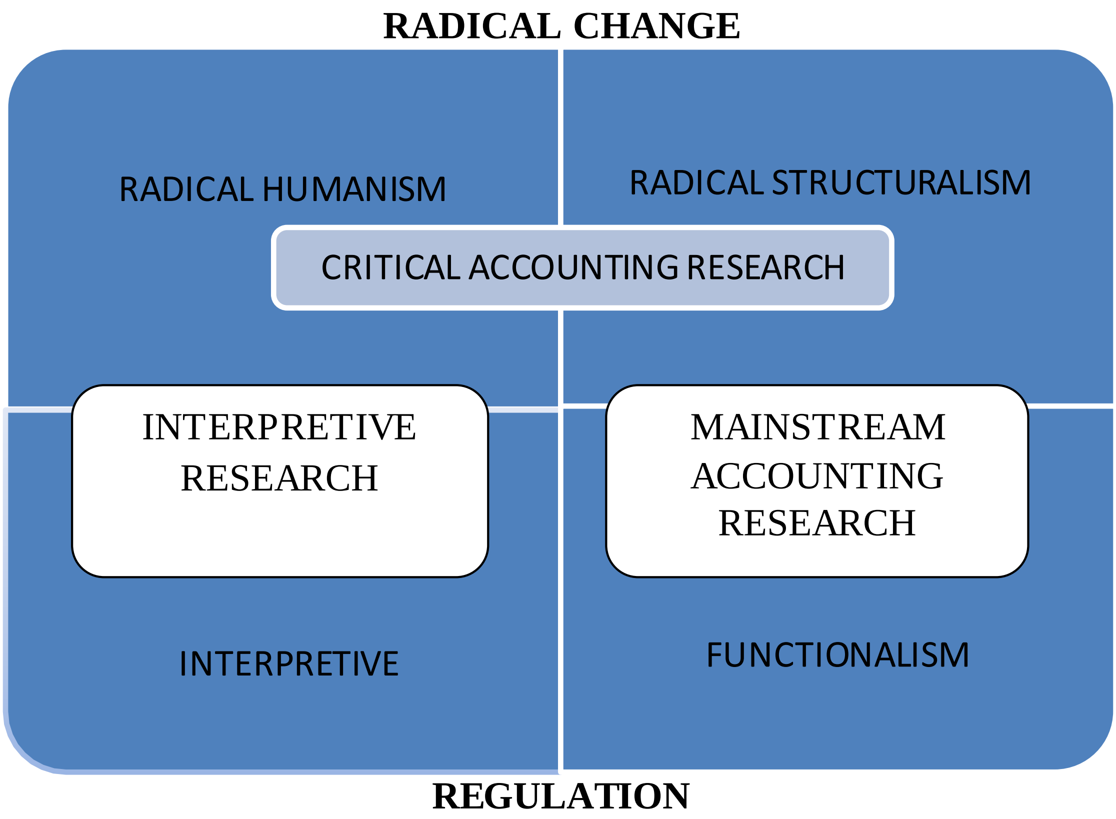
7.2.2 Taxonomy of Accounting Research

As outlined in the previous section, six ontological assumptions (Morgan and Smircich, 1980), ranging from the objective to the subjective, also provides a basis for different areas of accounting research. A subjective-objective continuum is used by Hopper and Powell (1985) to construct their taxonomy of accounting research. Hopper and Powell (1985) expand upon the earlier work of Burrell and Morgan (1979), which provides a classification of organisational research. In their classification, Burrell and Morgan (1979) draw on two independent dimensions: the nature of social sciences and the nature of society. The social science dimension comprises four distinct but related elements: assumptions about ontology, epistemology, human nature and methodology (Hopper and Powell, 1985: 431). Burrell and Morgan (1979) collapse these elements into the single subjective-objective continuum.

[65] Beliefs about physical and social reality.

Following their work, Hopper and Powell (1985) combine the four dimensions of ontology, epistemology, human nature and methodology into a single subjective-objective continuum which they used to represent a range of methods applied in the social sciences. In their taxonomy, Hopper and Powell (1985) also include a second dimension, which characterises a range of methods researchers adopt towards society. At one extreme, researchers are interested in exploring how society is held together; and consequently in understanding the "regulation" and the creation of order in society. At the other extreme, researchers are interested in analysing conflicts and inequalities in society, and subsequently in assessing the potential for "radical change". In between the two extremes, there are researchers with intermediate positions since these dimensions are continua, not dichotomies. Hopper and Powell (1985) offer a useful framework for classifying accounting research through acknowledging the importance of social context and the impact of "wider social and political collectivities" (Hopper and Powell, 1985: 450). Furthermore, their work is deemed authoritative in research on accounting methodology (Ahrens, 2008; Roslender, 2012). Hopper and Powell's taxonomy of accounting research is set out in Figure 7.1.

Figure 7.1: Hopper and Powell's taxonomy of accounting research



Based on this classification, accounting research is broadly classified into three categories, namely mainstream, interpretive and critical research. Hopper and Powell (1985) emphasise that classifying accounting research into three major categories is useful for understanding the nature and range of different types of research and methods used in these areas. This study falls into mainstream accounting research, which is principally concerned with the functioning of accounting. This thesis excludes the interpretive and the critical paradigms based on the motivation that interpretive and critical research evolve around the wider contexts of organisations and the societies in which accounting operates (Baker and Bettner, 1997) and attempt to describe and interpret of real world phenomena (Laughlin, 1995). The following section goes on to discuss mainstream accounting research and explains why this study is classified under this category.

7.2.3 Mainstream Accounting Research

As illustrated in Figure 7.1, Burrell and Morgan (1979) refers to the leading paradigm in the bottom-right quadrant as "functionalism". This paradigm combines an objectivist view with a concern for regulation. Functionalism is a term rooted in sociology that "regards society as a single system of interrelated elements, with each element of social life serving a specific function, and the role of the researcher being to discover the nature of those functions" (Ryans, Scapens and Theobald, 2002: 41). From this perspective, functionalism is similar to the majority of mainstream accounting research, which explores the functioning of accounting. This type of research has an objective view of society, refers to individual behaviour as deterministic, uses empirical observation, and adopts a positivist research methodology.

Chua (1986) provides a similar classification of accounting research and describes the fundamental assumptions of mainstream accounting research, interpretative research and critical theory. Chua (1986) summarises epistemological (beliefs about knowledge) position of mainstream accounting research as theory and observation being independent of each other, and quantitative methods of data collection being desirable to facilitate generalisations. In Chua's (1986) paper, the ontological assumption dominant in mainstream accounting research is physical realism. Empirical reality is objective and is presumed to be independent of the knower (the researcher). Human actors (such as researchers) are perceived as passive since they are not active makers of social reality. In mainstream accounting research, society and organisations are assumed to be stable, and control systems are established to manage any dysfunctional behaviour.

Furthermore, Chua (1986) comments on the relationship between the accounting theory and practice, and maintains that there is a means-end dichotomy dominant in mainstream accounting research. This indicates that accountants should only be concerned with providing the decision-maker with information in an efficient and effective way rather than making judgements about the needs or goals of the decision-maker (Chua, 1986). This perception leads to the conclusion that accounting is value neutral, and existing structures are taken for granted. It is worth noting that there are several consequences arising from the dominant assumptions in mainstream accounting research, which may be seen as the limitations of this stream[66].

7.2.4 Epistemological Approach

Epistemology is referred to as the theory of knowledge and justification. It deals with how we know what we know, what justifies us in believing what we believe, and what standards of evidence we should use in seeking truths about the world and human experience (Audi, 2010). In Plato's dialogue Theaetetus, Socrates considers a number of theories as to what knowledge is, the last being that knowledge is true belief that has been *"given an account of"*(Peters, 2009). An epistemological issue involves the question of what is (or should be) regarded as acceptable knowledge in a discipline (Bryman and Bell, 2003). Epistemological considerations are of fundamental significance for any type of research as they inform the methodologies regarding the nature of knowledge, or determine what is considered as a fact and where knowledge is to be sought (Sarantakos, 2005). Methodology as a research strategy translates ontological and epistemological principals into the guidelines that demonstrate how research has to be conducted (Cook and Fonow, 1990: 72).

Positivism is referred to as "an epistemological position that advocates the application of the methods of the natural sciences to the study of social reality and beyond" (Bryman, 2012: 28). The positivist approach in its modern sense was developed by the philosopher Auguste Comte during the early 19th century although its fundamental concepts can be traced back to the philosophers of the Enlightenment. Positivism maintains that knowledge should be based on real facts, not abstractions, thus knowledge is established on observations and experiments as

[66] For a review, see Chua (1986).

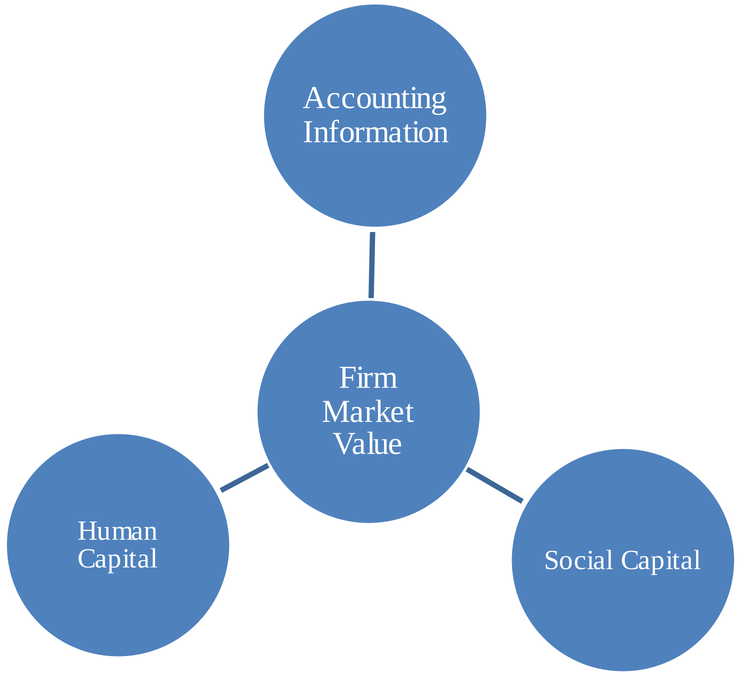
opposed to the phenomenological paradigm of searching for the inner meaning or the essence of things (Robson, 2002). According to positivism, "there is only one logic of science, to which any intellectual activity aspiring to the title of 'science' must conform (Keat and Urry, 1975: 25). Positivism is associated with various social theories and acts as a linkage to structural-functional, rational choice and exchange-theory framework. Positivism has also become the basis of mainstream accounting research, which attempts to build a coherent, comprehensive, and hierarchical scientific system to test hypothesised relationships deduced from specific theories (Lukka and Kasanen, 1995).

Positivistic research uses a hypothetico-deductive method and follows a set of specific procedures: first, a formally expressed general statement which attempts to test theory is introduced; second, the purpose of the theory is to generate hypotheses that can be tested and allows explanations of laws to be assessed (deductive principal); third, a careful operationalisation of constructs is achieved; fourth, constructs are measured; fifth, hypotheses are tested and finally, the theory is verified (Jankowicz, 2000). Positivism is referred to as a link between the theory and the research, and endeavours to test theory in order to increase predictive understanding of phenomena.

This study adopts a deductive approach as the research design follows a specific order as described above. A deductive approach is chosen over an inductive approach based on the rationale that this thesis aims to test hypothesised relationships between social capital, human capital and firm market value deduced from relevant theories. Based on the literature reviews presented in the preceding chapters of this thesis, this thesis presents a number of hypotheses relating to the relationship between organisational social and human capital and firms' market value. Subsequently, data on accounting, social and human capital measures are collected. Next, hypotheses are tested through relevant statistical analyses to examine whether the theory is verified. Hypothesis testing is concerned with validating or disconfirming existing theory.

Finally, a conceptual and analytical framework derived from the existing theory is used to explain the empirical findings. Figure 7.2 below summarises the design of this research.

Figure 7.2: Research Design



Consistent with the specific order of a deductive approach, next section describes the sample and data. Details of operationalization of social and human capital measures are also provided in the remainder of this chapter.

7.3 METHOD

7.3.1 Sample and Data

This thesis employs a sample of UK firms listed on FTSE All Share index for a period of 10 years (2001-2010). This study explores the role of organisational social and human capital in determining the market value of firms during the period from 2001 to 2010. This time frame has been chosen to reflect the most recent activity[67] across the UK firms in the sample. Furthermore, this time frame includes both the boom and bust periods such as dot-com boom (early 2000s) and 2007-08 financial crisis, which allows further investigation of various associations between the social and human capital measures and firms' market value. Finally, this thesis aims to contribute to extant UK studies (e.g. Horton, Millo and Serafeim, 2012) on the impact of board connectivity by extending the time frame subject to analysis.

This study uses a sample of UK firms which are constituents of FTSE All Share index. This research is centred on the UK data for a number of reasons. Firstly, the UK is the fifth leading economy in the world[68], which makes this analysis interesting since extant studies on human and social capital have often focused on a single industry in the largest economies such as the US (Kor and Sundaramurthy, 2009; Soh, 2010; Tian, Haleblian and Rajagopalan, 2011; Yoo et al., 2009) and China (Cao, Simsek and Jansen, 2012; Wu, 2008, Wu et al., 2012), or examined their impacts in a particular context such as director selection (Johnson et al., 2011), entrepreneurial orientation (Cao, Simsek and Jansen, 2012), auditor choice and audit fees (Johansen and Pettersson, 2013) and partner selection (Shipilov, Li and Greve, 2011). Secondly, to date, there has been no attempt to explore the value relevance of social and human capital possessed at organisational level in a joint context. Previous research on board capital highlights that simultaneous analyses (beyond value relevance analyses) of social and human

[67] At the time of acquiring network data on the UK firms.
[68] The information is based on International Monetary Fund World Economic Outlook (April 2017).

capital have been limited (Kor and Sundaramurthy, 2009; Tian, Haleblian, and Rajagopalan, 2011). Hence, this study addresses this gap in board of directors research by examining the value relevance of social and human capital measures for a sample of UK firms over a period of 10 years. Thirdly, the role of non-physical, non-financial forms of capital, namely social and human capital, in determining firm market value has not been subject to empirical examination in the UK context after the recent financial crisis. This analysis allows us to develop a better understanding of the relationship between firms' possession of social and human capital and firm market value during times of certainty and uncertainty.

Accounting data for the UK firms were obtained from Thomson Reuters Datastream professional which is one of the largest financial and economics databases in the world. All accounting and stock market data were cross checked against data disclosed in companies' annual reports for consistency. Raw data for social and human capital measures were acquired from BoardEx database which provides detailed biographic information regarding directors on firm boards, and allows the identification of their personal ties. BoardEx provides a snapshot of interlocking directorate ties at a specific point in time.

Following steps were taken to compute network metrics and generate human capital variables. Firstly, using the raw data on the UK director network (obtained from the BoardEx database), the network of FTSE All Share directors is identified using the unique equity index identifiers. Secondly, connections in the FTSE All Share director network during the period between 2001 and 2010 are extracted based on the information on the time period in which the connection was established and ended. Thirdly, only director connections through firm boards are identified and classified according to the year. All connections with unknown years are excluded. Fourthly, data on historical and current connections are merged by years. Fifthly, interlocking directorate ties are transferred into Pajek and Ucinet network analysis tools to generate network maps, which are utilised to compute positional metrics, namely centrality and structural hole measures.

For human capital variables, firstly, data on UK director characteristics are classified based on the annual report year. Secondly, data on director employment and characteristics are merged using the unique director identifiers. Thirdly, using the data on director education, director qualifications are analysed and classified to generate variables on the highest degree, elite education and professional qualifications. Fourthly, data on education (with variables generated through the analysis of the data) are merged with the data on director employment and characteristics. Finally, data on network measures are merged with the data on human capital measures to obtain director level data on social and human capital. As described in the following section, all network and human capital measures are aggregated and divided by the board size to obtain organisational level measures. Organisational level measures are subsequently merged with the accounting data at the firm level (for the period 2001-2010) and used in the proposed model(s).

7.3.2 Measures

Dependent Variable

The main purpose of this study to explore whether board social and human capital have significant explanatory power for the market value of firms. Therefore, dependent variable in the model is *the market value* for the firms listed on FTSE All Share index. Market value on Datastream is the share price multiplied by the number of ordinary shares in issue for each constituent. Data on market value were acquired using data item *Market Value (MV).*

Independent Variables

Independent variables can be classified into three major groups; namely accounting, human capital, and social capital variables. All variables are described in detail in the following sections. Table 7.1 provides a summary of descriptions relating to dependent and independent variables (see Appendix I).

- Insert Table 7.1 about here -

Accounting variables

Data on accounting variables for estimation are collected from Worldscope, and market data are retrieved from Datastream. The definition of the variables are presented as follows:

1) Market value (MVi_t – Datastream item MV) - the market value for firm *i* for year *t*, is measured six months after its balance sheet date during that calendar year for financial years ending in all calendar years up until 2007, and four months after the balance sheet date for subsequent years. The rationale for measuring the market value with the specified lags after the balance sheet date is to reflect the maximum time that listed firms had to publish accounts following the end of their financial year in order to ensure that the accounting data are reflected in their market prices. Opening market value (OMV) is measured twelve months prior to market value;

2) Book value (BV_{it}) – book value for firm *i* at year *t*, is measured as the sum of preferred stock and common shareholders' equity for the financial year ending in year *t* (Worldscope item – WC03995 – total shareholder's equity);

3) Earnings (E_{it}) – earnings for firm *i* at year *t*, are measured as the net income of the company for the financial year ending in year *t* (Worldscope item – WC01651- net income available to common);

4) Dividends (D_{it}) – dividends for firm *i* at year *t*, are measured as the total cash common dividends paid on the company's common stock during year t (Worldscope item – WC05376 – common dividends cash);

5) Research and Development expenditure ($R\&D_{it}$) – research and development expenditures for firm *i* at year *t*, are measured as R&D expenses recognised in the income statement at year *t* (Worldscope item – WC01201- research and development expense);

6) Capital contributions (CC_{it}) – capital contributions for firm *i* at year *t*, are measured as the negative of the amount the firm received from the sale of common and/or preferred stock at year t (Worldscope item – WC04251 – net proceeds from sales/issue of common and preferred);

7) Capital expenditures (CE_{it}) – capital expenditures for firm *i* at year *t*, are measured as the funds used to acquire fixed assets other than those associated with acquisitions at year *t* (Worldscope item – WC04601- capital expenditures – additions to fixed assets);

8) Sales (S_{it}) – sales for firm *i* at year *t*, is measured by gross sales and other operating revenue less discounts, returns and allowances at year t (Worldscope item – WC01001, net sales or revenues);

9) Number of shares ($NoSHARES_{it}$) – number of shares for firm *i* at year *t*, is measured by common shares outstanding (Worldscope item – WC05301 – common shares outstanding).

Due to the potential distorting role of the deflator choice, models (34) – (36) are estimated using four deflators previously employed in valuation literature[69]:

1) Number of shares outstanding,

2) Sales,

3) Opening market value,

4) Closing book value.

[69] This study follows Akbar and Stark (2003b) and Dedman et al. (2009) in its choice of deflators.

Social Capital Variables

Social capital variables comprise centrality measures *degree centrality* (DEGCEN), *closeness centrality* (CLOSCEN), *betweenness centrality* (BETCEN), and *eigenvector centrality* (EIGCEN); and structural hole measures *effective size* (EFSIZE) and *network constraint* (AGGCON). All social capital variables were firstly measured at director (individual) level. Subsequently, all variables were aggregated to firm (organisational) level through dividing a firm's total score for each variable by its board size. Therefore, for all network measures, average scores (measures) were used in regression analyses.

The first centrality measure, *degree centrality* (DEGCEN) indicates a director's level of activity. It is simply measured as the number of direct ties incident upon a given director (see Equations No. 1 and 2). *Closeness centrality* (CLOSCEN), the second centrality measure, determines how close a director is to other directors within the network. *Closeness centrality* is measured as the total geodesic distance from a given director to all other directors in the network (see Equations No. 3 and 4). The third measure, *betweenness centrality* (BETCEN) evaluates the extent to which an actor has power over other actors' access to different regions of the network (Freeman, 1979). It is measured as the sum of estimated probabilities over all pairs of directors excluding the *i*th director (refer to Equations No. 5 and 6). The last centrality measure in this analysis, *eigenvector centrality* (EIGCEN), measures the extent to which a director is connected to other important actors in the network (Bonacich, 1972, 1987). It is measured as the eigenvector of the largest eigenvalue of an adjacency matrix; therefore eigenvector centrality is a weighted sum of not only direct connections but also indirect connections of every length (see Equations No. 7 and 8). Degree, closeness, and betweenness centrality measures were computed by using network analysis tool *Pajek* and eigenvector centrality was calculated by using *Ucinet* network analysis software.

Effective size (EFSIZE), the first structural hole measure, is a network measure of the number of structural holes a director spans in his/her ego network. It is measured as the number of alters to whom an ego is connected minus the redundancy of links between alters (see Equations No. 9-11) Effective size captures the degree to which a board director holds a bridging position in the network (Burt, 1992, 1997a). The second structural hole measure, network constraint (AGGCON), is an index which measures how much a director is constrained by his/her alters (connections) in the network (Burt 1992). It is measured as the sum of squared proportions of *director i's* relations that are directly or indirectly invested in the connection with contact *j* (see Equation No. 14). Effective size was calculated by using *Ucinet* network analysis software, and aggregate network constraint was computed by using *Pajek* network analysis tool.

Human capital variables

Human capital variables include *Highest Degree (HIGHDEG), professional qualifications* (PROF), *elite education* (ELITE), *director age* (AGE), *prior board experience* (BRDEXP), and *organisational tenure* (ORGTEN). All human capital variables were firstly created (measured) at director (individual) level. Subsequently, all variables were aggregated to firm (organisational) level through dividing a firm's total score for each variable by the size of its board. Therefore, average score (measure) for each variable was used in regression analyses (Soda, Usai and Zaheer 2004).

As elaborated in section 5.4.2, highest degree attained by a board director is an indicator of general human capital. *Highest degree* takes the value 1 if a director holds a bachelor's degree (e.g. BA, BS, BSc), and zero otherwise. A list of bachelor degrees that meet the qualifying criteria is provided in the Table 7.2.

- Insert Table 7.2 about here -

Highest degree (MASTER) takes the value 2 if a board director holds a master's degree (e.g. MA, MSc, MBA), and zero otherwise. A list of master's degrees that meet the qualifying criteria is provided in Table 7.3.

- Insert Table 7.3 about here -

Finally, highest degree variable is given the value 3 if a director holds a doctorate degree (e.g. DBA, DM, PhD), and zero otherwise. A list of doctorate degrees that meet the qualifying criteria is provided in Table 7.4.

- Insert Table 7.4 about here -

It is worth noting that it is conceivable, but rare to have a PhD or MSc degree without having completed an undergraduate degree. However, the database failed to disclose any information which could possibly shed light on this concern. All dummy variables were created based on available data on the degrees that directors completed in the past. Therefore, this limitation will be taken into consideration when interpreting the coefficients of educational variables.

For further analyses, dummy variables for science and non-science degrees were created. *Science degree* is a dummy variable which takes the value 1 if a board director has completed an undergraduate or postgraduate degree in a discipline which is classified under natural sciences, and zero otherwise. Second variable *non-science degree* takes the value 1 if a board director has completed an undergraduate or postgraduate degree in disciplines which are broadly classified outside natural sciences. It is worth noting that this distinction is a relatively crude breakdown of science and non-science degrees, and therefore can be referred to as a limitation in this analysis. Lists relating to science and non-science degrees that meet the qualifying criteria are provided in Table 7.5 and Table 7.6 respectively.

- Insert Table 7.5 and Table 7.6 about here -

Professional qualifications (PROF) is another dummy variable which indicates whether a board director holds a business-related professional qualification. This variable is given the value 1 if the director holds a professional qualification (e.g. ACA, CFA, CPA), and zero otherwise. This decision is made based on the following criteria: a) the director holds a business-related professional qualification, or b) the director is a fellow or member of an institution which awards professional qualifications. A list of professional qualifications which meet the criteria is provided in Table 7.7. In addition to professional qualifications, directors who are members or fellows of professional bodies are also regarded as possessing a professional qualification. A list of qualified institutions is provided in Table 7.8.

- Insert Table 7.7 and Table 7.8 about here -

Another human capital measure, *elite education*, (ELITE) is a dummy variable which indicates whether a board director has achieved educational attainment from University of Oxford or University of Cambridge in the UK. The variable is coded 1 if the director holds an undergraduate or postgraduate degree from one of the elite institutions specified, and zero otherwise. A list of elite institutions (including colleges within University of Oxford and University of Cambridge) is provided in Table 7.9.

- Insert Table 7.9 about here -

For sensitivity checks, this study also examines the impact of directors' educational attainment from different groups of UK universities on the market value of firms. These groups comprise Russell Group Universities, Pre-1992 Universities, Post-1992 Universities and Group 1994 Universities in the United Kingdom. Therefore, four dummy variables were created[70].

The first dummy variable *Russell* takes the value 1 if a board director holds an undergraduate or postgraduate degree from a Russell Group University, and zero otherwise. A list of Russell

[70] These variables were created based on the list of universities as of March 2012 for each group.

Group Universities is provided in Table 7.10. Russell Group Universities include University of Oxford and University of Cambridge (and colleges in both universities). This is chosen as a dummy variable because the self-selecting Russell Group Universities are all research active leading UK universities and are well known for their commitment to the highest levels of academic excellence.

- Insert Table 7.10 about here -

The second dummy variable *Pre-1992 Uni* takes the value 1 if a board director holds an undergraduate or postgraduate degree from a Pre-1992 University, and zero otherwise. A list of Pre-1992 Universities is provided in Table 7.11. The inclusion of this dummy variable is based on the perception that Pre-1992 Universities are prestigious and well-established universities in the UK.

- Insert Table 7.11 about here -

The third dummy variable *Post-1992 Uni* takes the value 1 if a board director holds an undergraduate or postgraduate degree from a Post-1992 University, and zero otherwise. A list of Post-1992 Universities is provided in Table 7.12. The inclusion of a dummy variable for Post-1992 Universities stems from the view that these modern universities with a post-1992 charter were formerly polytechnics or colleges of higher education which used to provide vocational training in the UK. Therefore, the impact of such educational credentials is further explored in this study. Variables representing Pre-1992 and Post-1992 Universities are included separately in the specified models.

- Insert Table 7.12 about here -

The fourth dummy variable *Group1994 Uni* takes the value 1 if a board director holds an undergraduate or postgraduate degree from a Group 1994 University, and zero otherwise. A list of Group 1994 Universities is provided in Table 4.13. A dummy variable is also created for

Group 1994 Universities as the 1994 Group represents the UK's leading research-intensive universities. Group 1994 Universities tend to have smaller student populations, which leads to the emergence of close-knit academic communities.

- Insert Table 7.13 about here -

Director age (AGE), another proxy for human capital, represents a director's age in years. *Prior board experience* (BRDEXP) which denotes a director's level of board experience. Prior board experience is measured as the number of quoted boards a director sat in the past. *Organisational tenure* (ORGTEN) is the last human capital variable, and represents the period of time a director has worked for an organisation. Thus, it is measured as the number of years that a director has held his/her position in a particular firm. All data relating to education, characteristics and employment of board directors were acquired from the BoardEx database, and dummy variables were created based on these data.

Control Variables

This research includes *board independence* (BRDIND) and *industry dummies* (IND) as the control variables in the benchmark model. *Board independence* (BRDIND) is measured as the percentage ratio of non-executive directors to all directors on a firm's board. Board independence is likely to have a positive impact on firm value since non-executive directors are deemed to be more impartial in assessing managerial performance, thus lead to more effective corporate governance (Boeker, 1992, Cadbury Report, 1992, para. 4.10-4.17; Guest, 2010; Young, 2000). However, several studies have demonstrated mixed evidence suggesting a negative or no relationship between board composition and firm performance (Bhagat and Black, 1997; Bozec, 2005; Vafeas and Theodorou, 1998).

Finally, this analysis includes *industry dummies* (IND) to control for industry-fixed effects on the market value of firms.

7.4 CONCLUDING REMARKS

This chapter describes the research approach followed in this study and explains the underlying factors determining the selection of the methodological approach adopted in this study. Next, the chapter describes the sample and data, and provides the details of how data on accounting, social and human capital measures were acquired and constructed to test related hypotheses in the proposed model. The following chapter provides the details of statistical analyses undertaken and presents the findings of this study.

CHAPTER EIGHT

ANALYSES AND RESULTS

8.1 INTRODUCTION

Previous chapter illustrated the proposed methodology and described the sample and data used for the analyses in this thesis. This chapter begins with outlining the preparation of variables for regression analyses and provides the descriptive statistics for accounting, social and human capital data (8.2). Following descriptive statistics, the chapter goes on to present the results relating to univariate analyses (8.3). After discussing the results for univariate analyses, section (8.4) and section (8.5) report the results relating to the baseline models and to hypothesised relationships on the demand of social and human capital and the impact they have on the market value of firms. Finally, the chapter concludes with a summary of the findings (8.6).

8.2 PREPARATION OF VARIABLES FOR REGRESSION ANALYSES AND DESCRIPTIVE STATISTICS

8.2.1 Accounting Variables

All accounting data for the sample (2001-2010) were merged by using the ISIN codes and all financial firms were excluded from the sample following prior studies in the literature. The top and bottom 1% of observations for each deflated variable were removed to mitigate the impact of outliers in the analyses. This deletion criterion is a procedure that is often employed by researchers in the field of market-based accounting research (e.g. Akbar and Stark, 2003b; Dedman et al., 2009; Shen and Stark 2013). The deletion procedure is carried out as follows. First, all observations are ranked annually according to the values of different deflated variables, and those observations are deleted that are identified in the top and bottom 1%. It is worth noting that there are a large number of observations with a value of zero for variables such as dividends, R&D expenditures, capital contributions and capital expenditures. For these variables, only the top 1% is deleted.

The accuracy of the data was checked against database errors. The maximum and minimum values for all variables were compared using the hard copies of data published in annual reports of companies under consideration. All accounting variables are expressed in British pounds. Some firms had their accounting data expressed in other currencies. Those observations were deleted from the sample. Because of the use of different deflators, the number of observations varies with the deflator employed. Descriptive statistics for deflated accounting variables are provided in Tables 8.1-8.4.

- Insert Table 8.1-8.4 about here-

As tabulated in Table 8.1, the mean values for market value per share and book value per share are £4.59 and £1.87 respectively. The mean values for earnings per share and dividends per share are 18 pence and 13 pence respectively. Minimum values relating to dividends per share and R&D expenditure per share both equate to zero.

Table 8.2 presents the descriptive statistics for accounting variables deflated by sales. Minimum values for market value and book value are 10 pence and 3 pence respectively whereas minimum values for dividends, R&D expenditure and capital expenditure are found as zero. Earnings have a mean value of 5 pence and a maximum value of 56 pence. Maximum value for the R&D expenditure is equal to £1.43.

Table 8.3 presents the descriptive statistics for accounting variables deflated by the opening market value. Minimum values for market value and book value are 21 pence and 4 pence respectively whereas mean values for these variables are £1.12 and 52 pence. Earnings have a mean value of 4 pence and a maximum value of 26 pence. Mean values for capital contributions and capital expenditure is 1 pence and 6 pence respectively.

Table 8.4 presents the descriptive statistics for accounting variables deflated by the closing book value. Minimum and maximum values for the market value are 32 pence and £26.62 respectively whereas minimum values for dividends, R&D expenditure and capital expenditure equate to zero. Earnings have a mean value of 11 pence and a maximum value of £1.07. Maximum value for the R&D expenditure is equal to 56 pence. Descriptive statistics presented here are close to those presented in Akbar and Stark (2003b) and Akbar, Shah and Stark (2011).

8.2.2 Social Capital Measures

All social capital variables (measured at director level) were aggregated at firm level (total measures), and then were divided by board size to acquire board level average measures. Descriptive statistics for board-level network measures for the pooled sample and in each annual cross-section are provided in Table 8.5 and Tables 8.5a-8.5j respectively.

- Insert Table 8.5 and Tables 8.5a-8.5j about here-

As tabulated in Table 8.5, mean values for board-level degree centrality, closeness centrality, betweenness centrality and eigenvector centrality are 0.006, 0.105, 0.002 and 0.314 respectively. Board effective size has a minimum value of 1 and a maximum value of 13.925. Minimum value of board aggregate constraint is 0.378 and it takes the value of 1.125 at maximum. A study by Lee (2010) demonstrates that aggregate network constraint can take values greater than 1. These summary statistics are reasonably close to the findings of a UK study by Horton, Millo and Serafeim (2012).

Descriptive statistics provided in Tables 8.5a-8.5j demonstrate that the mean values for network measures such as closeness centrality eigenvector centrality and effective size are in an increasing trend during the period leading up to 2007-08 financial crisis. It is observed that the maximum value for eigenvector centrality in Year 2007 is the highest across 10-year period. Descriptive statistics for board-level network measures for the pooled sample are also produced based on their industry classification. Summary statistics for the pooled sample classified by the industry are provided in Tables 8.6a-8.6i.

- Insert Table 8.6a-8.6i about here-

An analysis of the network measures based on the broad industry classification demonstrates that the highest mean value for eigenvector centrality belongs to Oil and Gas industry with a value of 1.103 whereas the highest mean value for aggregate constraint (0.457) is found for Technology firms. These figures suggest that directors in Oil and Gas firms possess ties to the most prominent actors in the network and directors in Technology firms have fewer structural holes, which lead to network closure and less opportunities for information brokerage (Burt, 1992). Summary statistics also reveal that firms in Utilities industry have the highest mean value for effective size with a value of 4.815.

8.2.3 Human Capital Measures

All human capital variables were aggregated at firm level, and then were divided by board size to acquire board level average measures. Descriptive statistics for board-level human capital measures for the pooled sample and in each annual cross-section are presented in Table 8.7 and Tables 8.7-8.7j respectively.

- Insert Table 8.7 and Tables 8.7a -8.7j about here-

Average board age is found as 55.15 years, which is in line with prior UK studies such as Dedman (2000) and Mcknight and Tomkins (2004). The mean values for prior board experience and quoted boards to date are 1.56 and 3.11 respectively. Minimum values for board organisational tenure and prior board experience are both zero while maximum values for the same variables are 18 years and 6.20 respectively. Extant literature includes no similar UK studies employing prior board experience as the number of boards a director sat in the past.

Prior board experience[71] is often constructed as a dummy variable which represents experience on different boards such as FTSE 100, minor and international boards (Singh, Terjesen and Vinnicombe, 2008).

The mean value for board organisational tenure is found as 3.73 years. This is consistent with the statistics provided in the study of Ferris, Jagannathan and Pritchard (2003). Busy board (the number of current boards) has a mean value of 1.95 and a maximum value of 5. Average board independence is 59.62 % percent. This is consistent with prior research by De Andres, Azofra and Lopez (2005) which reports an average of 70% independence (percentage of non-executive directors) for their sample consisting of 450 firms operating in Europe, Canada, the US and the UK.

Descriptive statistics provided in Tables 8.7a-8.7j demonstrate that boards became more independent during the period between 2001 and 2010. Average board independence increased from 53.91% to 64.05% as expected in the aftermath of corporate governance reforms. Average elite education score demonstrates a declining trend during 2001-2010 period. It is observed that the average score dropped from 0.14 to 0.10 during and after the financial crisis. This may be explained by the social distancing that directors experience as a control mechanism in the corporate elite (Westphal and Khanna, 2003). Another interesting finding relates to the average score for professional qualifications. The mean value for board professional qualifications demonstrates an increasing trend during the period between 2001 and 2010. The mean value increased from 0.30 to 0.34 over the 10-year period, which is in line with the arguments developed in prior studies on the link between the presence of qualified directors and firm performance[72].

[71] Prior board experience is measured as the number of boards a director sat in the past (excluding current boards).
[72] For example, see Minichilli, Zattoni and Zona (2009); Payne, Benson and Finegold (2009); Ruigrok, Peck and Keller (2006).

Further, descriptive statistics for board-level human capital measures for the pooled sample are produced based on their industry classification. Summary statistics for the pooled sample classified by the industry are provided in Tables 8.8a-8.8i.

- Insert Table 8.8a-8.8i about here-

An analysis of the human capital measures based on the broad industry classification demonstrates that the highest mean value for professional qualifications belongs to Industrial firms with a value of 0.38. In this segment, firms operate in sectors such as construction and materials, industrial transportation and support services. Health Care firms have the highest mean value for board independence whereas Utilities firms have boards with the highest mean value for elite education. It is also interesting to observe that the highest mean value for highest degree belongs to the firms operating in Oil and Gas industry.

8.2.4 Correlation Matrix

The relationships between the independent variables as well as the relationships between the dependent and independent variables were analysed using correlation coefficients for every potential pair of variables in this study. This allows the investigator to identify whether predictors are highly correlated (above 0.80 or 0.90) (Field 2005). The correlation matrix presents all correlation coefficients for these relationships. Due to the number of measures utilised in this study, correlation matrices for accounting, human capital and network measures are provided separately in 8.9a-8.9c[73]. Correlation coefficients for the pairs of market value per share and other accounting variables, book value per share, earnings per share and dividends per share, are 0.62, 0.62 and 0.61 respectively. As presented in correlation matrix, network measures are highly correlated. Hence, these measures are included in the main effect model(s) separately. Highest correlation coefficients relate to potential pairs of degree centrality,

[73] Correlation coefficients for every pair of variables are available upon request.

effective size and aggregate constraint. Coefficients relating to these potential pairs are above 0.7. With respect to human capital measures, correlation coefficients for the pairs of quoted boards to date and prior board experience, quoted boards to date and busy board (the number of current boards) are found as 0.91 and 0.78 respectively. Hence, these measures are included in the models with additional caution. Overall, correlation matrix demonstrates that human capital measures are not highly correlated.

For the purpose of this study, a more scientific approach was implemented to detect multicollinearity. Multicollinearity tests were run using variance inflation factor (VIF) scores and tolerance values to investigate the presence of multicollinearity between each of the independent variables (Brown, 1991). An acceptable threshold level of VIF is to be less than 10, and a tolerance value greater than 0.10 (Cohen et al., 2003; Hair et al., 1992). Results demonstrate that VIF scores including mean VIF and tolerance values are in the acceptable range. The mean VIF scores for the main effects models are below 2. The highest VIF scores and the lowest tolerance values are found for book values, dividends and capital expenditures. However, VIF scores relating to these variables are still less than 3, and tolerance value range from 0.38 and 0.58.

8.3 UNIVARIATE ANALYSES

In this section, a number of univariate analyses have been undertaken to explore the relationships between the dependent variable (market value) and network and human capital measures. The rationale behind undertaking a number of univariate analyses is to explore the possible relationships between the dependent variable and independent variables used in this study. Hence, panel regressions were run to analyse the relationship between market value, network and human capital measures. All regressions were run with firm-fixed effects and standard errors were clustered at the firm level.

8.3.1 Univariate Analyses – Market Value Per Share as the Dependent Variable

Table 8.10 tabulates the results of the regressions run to explore the relationship between the dependent variable (market value per share) and network measures. Results demonstrate that one of the centrality measures (closeness centrality) and two structural hole measures (effective size and aggregate constraint) are associated with firm market value at 1% significance level. While closeness centrality and effective size have a positive association with market value, aggregate constraint is negatively associated.

- Insert Table 8.10 about here-

Tables 8.11 and 8.12 tabulate the results relating to the relationship between the dependent variable (market value per share) and human capital measures. It is found that board age, organisational tenure and professional qualifications are positively associated with market value. The strongest association is observed for board age at 1% significance level. Results also demonstrate that directors' possession of non-science degree is positively associated with market value at 10% significance level.

- Insert Tables 8.11 and 8.12 about here-

8.3.2 Univariate Analyses – Market Value Deflated by Net Sales or Revenues as the Dependent Variable

Table 8.13 tabulates the results of the regressions which explore the relationship between the dependent variable (market value deflated by net sales or revenues) and network measures. No significant association is found between the dependent variable and network measures when the market value is deflated by net sales or revenues.

- Insert Table 8.13 about here-

Tables 8.14 and 8.15 tabulate the results relating to the relationship between the dependent variable (market value deflated by net sales or revenues) and human capital measures. Results demonstrate that there are only two human capital measures which are associated with the market value: professional qualifications and Russell group. Directors' possession of business-related professional qualifications is positively associated with the firm market value (at 1% significance level). Furthermore, presence of Russell Group graduates on the board is found to have a positive association with the market value at 10% significance level.

- Insert Tables 8.14 and 8.15 about here-

8.3.3 Univariate Analyses – Market Value Deflated by the Opening Market Value as the Dependent Variable

Table 8.16 tabulates the results of the univariate analyses which explore the relationship between the dependent variable (market value deflated by the opening market value) and network measures. It is found that closeness centrality is associated with firm market value at 10% significance level. No significant association is established between other network measures and the dependent variable.

- Insert Table 8.16 about here-

Tables 8.17 and 8.18 tabulate the results relating to the relationship between the dependent variable (market value deflated by the opening market value) and human capital measures. Only one of the human capital measures, professional qualifications, is found to be associated with the dependent variable and this association is significant at 5% significance level.

- Insert Tables 8.17 and 8.18 about here-

8.3.4 Univariate Analyses – Market Value Deflated by the Closing Book Value as the Dependent Variable

Table 8.19 tabulates the results of the univariate analyses which explore the relationship between the dependent variable (market value deflated by the closing book value) and network measures. No significant association is found between the dependent variable and network measures when it is deflated by the closing book value.

- Insert Table 8.19 about here-

Tables 8.20 and 8.21 tabulate the results relating to the relationship between the dependent variable (market value deflated by the closing market value) and human capital measures. No significant association is found between the dependent variable and human capital measures as demonstrated in the relevant tables.

- Insert Tables 8.20 and 8.21 about here-

8.3.5 Univariate Analyses – Total Network Measures, Total Human Capital Measures and Market Value as the Dependent Variable

Following the univariate analyses exploring the relationship between the board-level network and human capital measures and market value (using 4 different deflators), more univariate analyses were undertaken to see whether there are any major differences in these associations when network and human-capital measures are aggregated at firm level (total measures).

Table 8.22 tabulates the results of the univariate analyses exploring the relationship between total network measures and market value deflated by the number of shares. Associations established in section 8.3.1 are confirmed in further univariate analyses as closeness centrality, effective size and aggregate constraint are found to be associated with firm market value. These associations are significant at 1% significance level in the context of closeness centrality and effective size, and at 10% significance level in the context of aggregate constraint.

- Insert Table 8.22 about here-

Tables 8.23 and 8.24 tabulate the results relating to the univariate analyses undertaken to explore the relationship between total human capital measures and market value per share. Analyses reveal that there are a number of human capital measures associated with firm market value when the measures are aggregated to obtain a firm-level measure. Age, professional qualifications, prior board experience and organisational tenure are all found to be positively associated with the market value at 1% significance level. Quoted boards to date, Cambridge and Russell Group scores are also found to have a significant association with firm market value at 10% and 5% levels.

- Insert Tables 8.23 and 8.24 about here-

Table 8.25 tabulates the results of the univariate analyses which explore the relationship between total network measures and market value deflated by net sales or revenues. No significant association is found between the dependent variable and network measures when the measures are aggregated at the firm level. Findings are consistent with the results presented in section 8.3.2.

- Insert Table 8.25 about here-

Tables 8.26 and 8.27 tabulate the results of the univariate analyses exploring the relationship between total human capital measures and market value deflated by net sales or revenues. Results demonstrate that only one total measure of human capital, professional qualifications, is positively associated with the firm market value at 5% significance level. This finding is consistent with the associations presented in section 8.3.2.

- Insert Tables 8.26 and 8.27 about here -

Table 8.28 presents the results of the univariate analyses which explore the relationship between total network measures and market value deflated by the opening market value. No significant association is found between the dependent variable and network measures when network measures are aggregated at the firm level. Further, none of the total human capital measures is found to be associated with the firm market value when it is deflated by the opening market value. Results of the univariate analyses exploring the relationship between total human capital measures and market value are presented in Tables 8.29 and 8.30.

- Insert Tables 8.28, 8.29 and 8.30 about here -

Finally, univariate analyses exploring the relationship between total network measures and market value (deflated by the closing book value) were undertaken. As tabulated in Table 8.31, there is no significant association between any of the total network measures and the dependent variable. This is consistent with the findings presented in section 8.3.4. Further, only one total human capital measure, Group 1994 score, is found to be associated with the market value when it is deflated by the closing book value. This association is negative and significant at 10% significance level. Results relating to the associations between the total human capital measures and firm market value are tabulated in Tables 8.32 and 8.33.

- Insert Tables 8.31, 8.32 and 8.33 about here-

8.4 RESULTS RELATING TO THE BASELINE MODELS

Following the discussion of the findings from the univariate analyses, this section presents the results relating to the baseline models derived from the Ohlson (1995) Model. Baseline models were run using panel regressions with and without firm-fixed effects, and standard errors were clustered at firm level. As discussed in Chapter Seven, 4 different deflators were used to mitigate several econometric issues arising from the scale effects.

8.4.1 Results of the Baseline Models – Number of Shares as the Deflator

Tables 8.34 and 8.35 tabulate the results of the baseline models in which the dependent variable is specified as the market value per share and independent variables included in the extended model(s) are book value, earnings, dividends, R&D expenditure, capital contributions, capital expenditure and lagged market value deflated by the number of shares. As tabulated in Table 8.34, in Models (1)-(4), book value, earnings, dividends and capital contributions are found to be associated with market value at different significant levels (varying from 1% to 10%). In Model (5), the inclusion of lagged market value leads to significant changes in the coefficients and significance of book value and dividends in explaining the market value of firms. In Model (5), the association between earnings and market value is still significant despite the inclusion of the lagged dependent variable. Overall R^2 is highest in Model (5) and range from 0.48 to 0.83.

- Insert Table 8.34 about here-

When the models were run with firm-fixed effects, in addition to the associations presented in table 8.34, R&D and capital expenditures are also found to be positively associated with the firm market value in Models (3) and (4). This association is stronger in the context of R&D expenditure. In Model (5), results demonstrate book value and dividends remain positively associated with the market value after the addition of the lagged market value in the model. Overall R^2 increases from 0.48 to 0.79 when the baseline model is extended in line with prior literature on value relevance. The sign and coefficients of the accounting variables discussed here are similar to those presented in prior studies (e.g. Akbar and Stark 2003b, Dedman et al., 2009).

- Insert Table 8.35 about here-

8.4.2 Results of the Baseline Models – Net Sales as the Deflator

Tables 8.36 and 8.37 tabulate the results of the baseline models in which the dependent variable independent variables are deflated by net sales. As tabulated in Table 8.36, in Models (1)-(3), book value, earnings and dividends are found to be associated with market value at 1% and 5% significance levels. In Model (4), R&D and capital expenditures are found to be positively associated with the firm market value. In Model (5), the inclusion of lagged market value leads to significant changes in the coefficient and significance of earnings whereas book value and dividends remain significant at 1% significance level. In Model (5), lagged market value has a coefficient of 0.607 and is significant at 1% significance level. Overall R^2 is highest in Model (5) with a value of 0.72.

- Insert Table 8.36 about here-

When the models were run with firm-fixed effects, coefficients of book value, earnings and dividends are lower in Models (1)-(3). Dividends remain positively associated with the market value following its inclusion in all models (at 1% and 5% significance levels). R&D expenditure is also found to be positively associated with the firm market value in Models (3) and (4). In Model (5), book value, dividends and lagged market value remain positively associated with firm market value with lower coefficients except the book value. Overall R^2 range from 0.42 to 0.64 in Models (1)-(5).

- Insert Table 8.37 about here-

8.4.3 Results of the Baseline Models – Opening Market Value as the Deflator

Results of the baseline models in which dependent and independent variables are deflated by the opening market value are tabulated in Tables 8.38 and 8.39. As tabulated in Table 8.38, the coefficients of book value and earnings are consistently positive and significant at 1% significance level. Capital contributions are also found to be negatively associated in all models at 1% significance level following its inclusion. The association between the market value and lagged market value remains significant when opening market value is used as the deflator in the models. However, this association is significant at 10% level as opposed to 1% level established in the first two sets of analyses.

- Insert Table 8.38 about here-

When the models were run with firm-fixed effects, in addition to the associations presented in table 8.38, dividends, R&D expenditure and capital contributions are also found to be associated with the firm market value in Models (2)-(5). Following the inclusion of the lagged market value in Model (5), the coefficient of capital expenditure increases from 0.240 to 0.770 and a positive association is observed at 5% significance level. No significant association is found between the lagged and current market value in Model (5). Overall R^2 is significantly lower than the R^2 values presented in earlier analyses with a value ranging from 0.05 to 0.04. Results of the baseline models with firm-fixed effects are presented in Table 8.39.

- Insert Table 8.39 about here-

8.4.4 Results of the Baseline Models – Closing Book Value as the Deflator

Results of the baseline models in which dependent and independent variables are deflated by the closing book value are tabulated in Tables 8.40 and 8.41. As tabulated in Table 8.40, the coefficients of earnings and dividends are consistently positive and significant at 1% significance level. Results also demonstrate that R&D expenditure and capital contributions are associated with firm market value with expected signs. Further, capital expenditure is found to be positively associated with market value in Model (4). Results relating to Model (5) provide evidence of a positive association between earnings, dividends and market value when the dependent and independent variables are deflated by the closing book value. Lagged market value is also positively associated with firm market value as tabulated in Table 8.40. Overall R^2 is highest for Model (5) with a value of 0.66 and lowest for Model (1) with a value of 0.26.

- Insert Table 8.40 about here-

When the models were run with firm-fixed effects, coefficients of earnings and dividends are consistently positive and significant at 1% level. Further, R&D and capital expenditures are found to be positively associated with firm market value following their inclusion in all models. Finally, in Model (5), a significant association is established between the lagged and current market value and this association is significant at 1% level. Overall R^2 range from 0.26 to 0.58.

- Insert Table 8.41 about here-

8.5 RESULTS RELATING TO THE MAIN EFFECTS MODELS

8.5.1 Factor Analysis

This study employs the factor analysis technique to summarise network and human capital data into a few dimensions by condensing a large number of variables into a smaller set of latent variables or factors. As discussed in Chapter Seven, several measures are used as a proxy for different dimensions of SHC. Hence, by undertaking a factor analysis, these measures can be loaded on to fewer factors and used as a proxy for "other information" in the Ohlson (1995) model. Results of the univariate analyses were used to firstly determine which variables may explain the variability across the observations the most in the sample. Secondly, a factor analysis was performed by using the principal component extraction method. Thirdly, the proportion of variability explained by different factors were examined and factors which will be used in subsequent analyses were selected. Finally, the choice of factors were evaluated by using the orthogonal varimax rotation. This procedure ensures that factors are not correlated to each other. Results of factor analysis are presented in Tables 8.42a-8.42d.

- Insert Tables 8.42a-8.42d about here-

As tabulated in Table 42d, social capital measures are loaded on to Factor 1. Closeness centrality, aggregate constraint and prior board experience have the highest factor loadings in Factor 1 following the rotation procedure. Hence, Factor 1 is referred to as “Network” index in the following analyses. Professional qualification score has the highest factor loading in Factor 2, and age and organisational tenure are the two human capital measures driving Factor 3. Factor 2 and Factor 3 will be referred to as “Expertise” and “Experience” indices in multivariate analyses of the relationship between SHC and firm market value.

8.5.2 Results of the Main Effects Model with SHC indices

Table 8.43 tabulate the results relating to multivariate analyses exploring the relationship between SHC indices and firm market value. In all models, earnings, dividends and R&D expenditure are associated with the market value. This association is significant at various levels (1%, 5%, 10% levels). Further, capital contributions is found to be negatively associated with firm market value when it is deflated by the number of shares and the opening market value. Capital expenditure is also associated with market value when the deflator is selected as the number of shares and the closing book value. Overall R^2 varies from 0.04 to 0.57.

- Insert Tables 8.43 about here-

Results relating to SHC indices vary across the models. Network index is found to be positively associated with firm value when the market value is deflated by the number of shares. This association is significant at 1% level. When the market value is deflated by the closing book value, only SHC index demonstrating an association with the market value is the expertise. This association is significant at 10% level. Results, to a great extent do not support the hypotheses and provide very limited evidence on the impact of SHC on firm value.

8.5.3 The Demand for Social and Human Capital

Tables 8.44 and 8.45 tabulate the results of the panel regressions relating to the demand for social and human capital. A unique identifier was created to have one observation per director-firm combination per year. Following the creation of the identifier, panel regressions with director-firm fixed effects were run to explore the demand for social and human capital at the individual level. Two measures, quoted current boards and quoted boards to date were used as dependent variables in these analyses.

- Insert Tables 8.44 and 8.45 about here-

Results demonstrate that network measures except eigenvector centrality have a significant impact on the number of current board seats held by the board directors. While centrality measures and effective size are positively associated with the number of current boards directors hold, aggregate constraint demonstrates a negative association. Organisation tenure and being a non-executive director are also found to increase the number of current boards directors serve on. When number of boards to date is selected as the dependent variable, the results continue to hold. Overall R^2 in both sets of analyses range from 0.09 to 0.33.

8.6 CONCLUDING REMARKS

This chapter outlined the preparation of variables for regression analyses and provided the descriptive statistics for accounting, social and human capital data. Following descriptive statistics, the chapter presented the results relating to univariate analyses which provide interesting insights into the social and human capital data. After discussing the results for univariate analyses, the remaining sections reported the results relating to the baseline models and to the hypothesised relationships on the demand of social and human capital and the impact they have on the market value of firms. Key findings, contributions, implications and limitations of the study are discussed in the following chapter. Finally, a number of recommendations are made for further research.

CHAPTER NINE

CONCLUSIONS, CONTRIBUTIONS AND DIRECTIONS FOR FUTURE RESEARCH

9.1 INTRODUCTION

This thesis explored the role of social and human capital in explaining the firm market value in the UK context. This chapter begins with a summary of the main findings in the context of research questions addressed in this study. This is followed by a discussion of the implications of the findings for both academic research and organisational practice. The chapter goes on to discuss the contributions and limitations of the study. Finally, the chapter concludes with a number of suggestions for further research.

9.2 KEY FINDINGS OF THE STUDY

This chapter summarises the findings of this study. It refers to the conceptual framework of the study and links its research objectives with the conclusions of the study. Specific research objectives are proposed in the first chapter of this thesis and a summary of the conceptual framework is presented. Following the literature review and methodology chapters, the results from various analyses are presented in Chapter Eight. Furthermore, this chapter comprises the main contributions of the thesis, the implications for academics and business practitioners and suggestions for future research.

The analyses and discussion presented in Chapter Eight provide insights into the key factors that influence the market value of firms in the UK. Results of this study are compared with prior studies and linked to relevant theories in social networks and board of directors literature. Tables illustrate the results from univariate and multiple regression analyses, which are used to explore the relationships between SHC measures and firm value and test the research hypotheses developed in Chapter Five. This study aims to explore the value relevance of organisational social and human capital by using a sample of FTSE All Share firms. An empirical examination of the hypotheses developed from the conceptual framework reveals a set of inconclusive results.

An analysis of descriptive statistics and further univariate analyses of SHC measures provide interesting insights. Average board independence increased from 53.91% to 64.05% following the corporate governance reforms in the UK. Average elite education score demonstrates a declining trend over a 10-year period between 2001 and 2010. Another interesting finding relates to presence of qualified directors in the corporate network. The mean value for board professional qualifications demonstrates an increasing trend during the period between 2001 and 2010. This finding supports the arguments on the signalling theory and need for financial expertise on firm boards.

Results from the univariate analyses demonstrate that one of the centrality measures (closeness centrality) and both structural hole measures (effective size and aggregate constraint) are strongly associated with the firm market value. While closeness centrality and effective size are found to increase the market value, aggregate constraint has a negative impact on the firm value as hypothesised in earlier chapters. Further, age, professional qualifications, prior board experience and organisational tenure are all found to be positively associated with the market value, however, these associations were not robust to the type of the deflator used in the analyses. It is worth noting that board-level and firm-level measures yield similar results in the context of univariate relationships. Hence, the use of average measures do not lead to any bias in the analyses performed in this thesis.

In the context of Ohlson (1995) model, SHC measures were condensed into 3 major factors by using the factor analysis technique. The rationale behind reducing the number of variables stems from the econometrical nature of the “other information”. Three different dimensions emerged as a result of the analyses: network, expertise and experience. These factors were then included in the baseline models to test the impact of SHC on firm market value. Only network and expertise dimensions are found to be significant in two models (when market value is deflated by the number of shares and by the closing book value). However, these associations are not consistent across different models. Finally, the demand for human and social capital was tested at the individual level by using the director-level data. Results demonstrate that network measures heavily influence the number of current board seats held by the directors as well as the number of boards they sat on in the past. These findings require further investigation to establish whether endogeneity is an issue.

9.3 NOVELTY AND CONTRIBUTIONS OF THE STUDY

The novelty of this thesis is based on an extensive review of two distinct strands of literature and the development of a theoretical framework that links two distinct but interrelated forms of non-physical, non-financial capital, namely social and human capital to the market value of UK firms through a residual income valuation framework. Previous studies in value relevance research neither focus on social and human capital nor examine the association between organisational social and human capital and market value. This study develops an integrative theoretical framework that combines theories from management literature with fundamentals of market-based accounting research, and aims to investigate the link between organisational social capital, organisational human capital and market value of firms.

Several contributions emerge from this research. The major theoretical contributions of this thesis are:

First, one of the distinctive contributions is the development of an integrative model which attempts to explore social and human capital possessed at the organisational level, and link both constructs to firm market value through a residual income valuation framework. In this study, an integrative model that combines human capital theory with social network theory is developed, and the impacts of these two distinct but interrelated forms of capital on the market value of firms are investigated. Majority of prior studies either focus on one form of non-physical, non-financial capital or examine the impact of such forms on different organisational and individual outcomes. This is the first study to the best of author's knowledge that simultaneously examines the impact of social and human capital on the market value of firms.

Second, another contribution this thesis makes is that it is the first study to examine various network measures for a sample of UK firms listed on FTSE All Share index for a period of 10 years (2001-2010). To the best of author's knowledge, this is the most recent time period examined for a sample of UK firms. An examination of this time period contributes to extant literature in two dimensions. Firstly, it provides valuable data with respect to the board interlocks within FTSE All Share network during a period of 10 years. Secondly, observed time span includes periods which are affected by two global financial crises: the dot-com bubble (2000) and the 2008 global financial crisis. Therefore, this opportunity led to an investigation of the links between organisational social and human capital, and firm market value during times of financial crisis and non-crisis.

Third, this study uses a multi-dimensional representation of organisational social and human capital in order to examine their impacts on the market value of firms. In this study, board of directors is considered as a social construction and aggregate measures of board members' social and human capital are used to represent organisational social and human capital. This is different from previous studies which refer to attributes of top management teams or CEOs as a proxy for firm-level social and human capital. This thesis also contributes to research on board of directors, which has received more interest over the last two decades (Withers, Hillman, and Cannella, 2012). Despite being explored from various perspectives, literature on corporate boards lacks a strong consensus as to what an optimum board should look like (Donnelly and Mulcahy, 2008; Johnson, Schnatterly, and Hill, 2013). Prior research has been conceptual and the link between characteristics of corporate boards and market value has received limited attention (Haynes and Hillman 2010; Horton, Millo, and Serafeim 2012; Johnson, Schnatterly, and Hill 2013). From this perspective, this thesis contributes to the sociology of markets and organisations by exploring the link between, organisational human capital, organisational social capital created and developed through interlocking directorate ties and firm market value.

Fourth, this study contributes to extant literature on the value relevance of intangibles. To the best of author's knowledge, the value relevance of social and human capital of this scope has not been examined in prior research. This thesis adds to existing literature by examining the value relevance of organisational social and human capital in the UK context. This study is a response to the call on the need for recognising the impact that intangibles have on firm performance (Davison 2010; Eckstein 2004; Lev 2001; Petty and Guthrie 2000; Zeghal and Maaloul, 2011). Hence, an examination of the link between two distinct but interrelated forms of non-financial capital and firms' market value sheds light on the extent to which information on the intangible dimension of firms is relevant for equity valuation.

9.4 IMPLICATIONS OF THE STUDY

The research findings of this study have several useful implications. In this section, specific implications for academics and business practitioners will be highlighted.

9.4.1 Implications for Academic Research

This study offers a number of implications for academic research.

First, this thesis explores the role of social and human capital in explaining the firm market value through a residual income valuation framework. Results of this study provide empirical evidence on the impact of two network measures, namely closeness centrality and aggregate network constraint, on the market value of firms. This study focused on the board interlocks and examined the impact of interlocking directorships on the firm value in the UK context. Further research could build on this study and examine the impact of different types of connections such as political, personal and family ties on the market value of firms.

Second, social and human capital are selected as the key constructs in this study based on the rationale that these forms have been subject to significant theoretical development and empirical attention in prior research. Value relevance literature could be advanced by examining whether other non-physical, non-financial forms of capital such as cultural and symbolic capital have a significant role in explaining firms' market value.

9.4.2 Implications for Business Practitioners

This study offers a few important implications for firms listed on FTSE All Share index. This thesis examines the extent to which social and human capital possessed at organisational level influence the market value of firms.

First, this study highlights the importance of network positions to firms' market value. Results demonstrate that firms with higher closeness centrality and lower aggregate constraint enjoy higher values in the market. This finding underlines the significance of possessing a high volume of connections and bridging positions in the network.

Network measures such as closeness centrality, eigenvector centrality and effective size demonstrate an increasing trend during the period leading up to 2007-08 financial crisis. It is observed that the maximum value for eigenvector centrality in Year 2007 is the highest across 10-year period. Results suggest that, in the periods leading up to the crisis, directors with higher stocks of social capital are more desired by firms as they are expected to contribute to organisational performance in various dimensions such as increasing board effectiveness, signalling organisational legitimacy, providing access to resources and other ties as well as demonstrating greater strategic leadership during times of uncertainty.

Third, organisational human capital is found to influence a firm's network position. Results demonstrate that majority of human capital measures are significantly linked to firms' network measures. This suggests that organisational human capital is a determinant of organisational social capital. Despite failing to provide empirical evidence on the direct impact of human capital on the firm market value, findings of this study suggest that human capital possessed at organisational level is a driver of the firm's position in the network.

Fourth, the presence of qualified directors is found to have a significant impact on the market value of firms. Boards' professional qualification score is associated with the firm value and this association is robust to the choice of deflators. Firms could benefit from this finding by ensuring that they have directors with financial expertise on their boards. Further qualitative research may be required to investigate how qualified directors influence board dynamics and contribute to the decision-making processes.

9.5 LIMITATIONS OF THE THESIS

This thesis needs to be examined in the light of its limitations. The limitations reported in this study relate to general limitations of theoretical or conceptual issues as well as its chosen methodology. The study should be interpreted under the following limitations:

- Literature on board social capital, empirical literature in particular, is not so extensive and most of the issues which are comparatively new to the research context may cause inconsistencies and drawbacks in the assumptions and findings.
- The sample consists of non-financial firms listed on FTSE All Share index operating in various industries, a fact which indicates that this study is not able to make generalisations at the industry level. The results are representative of medium and large-sized firms in the UK, and are not necessarily generalisable to specific sectors and to other countries.

- A number of constructs representing organisational social and human capital have been examined in order to give a holistic perspective rather than concentrating on one issue.
- This study focused on board of directors as being representative of human and social capital possessed at organisational level. Despite acknowledging that human and social capital possessed by an organisation's workforce may be equally significant in determining firm's financial and market performance, board of directors as "the very uppermost echelon of corporations" (Johnson, 2004: 39) are deemed to play a critical role of monitoring and advising management as well as assisting firms with resource dependence that in turn influences firms' financial performance (He and Huang, 2011; Hillman and Dalziel, 2003; Johnson, Daily and Ellstrand, 1996).
- Network and human capital measures are firstly aggregated, and then averaged to create variables at board level. Despite performing a factor analysis to create a SHC index at the firm level, this approach may also pose some limitations on the findings of this study.
- This study focuses on external organisational social capital and fails to account for internal organisational social capital in the analyses. The selected sample comprises firms listed on FTSE All Share index which disclose information on annual reports and whose market values are publicly available. Factors such as accessibility of boardrooms, longitudinal nature of the data analysed and difficulties in the measurement and interpretation of internal organisational social capital for a large sample influenced the decision of excluding internal dimension of organisational social capital in this study.
- This study employs quantitative methods, which highlight the limitations of the techniques used in order to assure reliability unlike qualitative research methods which provide explanations and further theorisation (Robson, 2002). The use of qualitative methods could provide insights into how board members interact with each other during the decision-making

processes and how those interactions influence the functioning of the board. This could be addressed in future research.

- In prior studies, organisational performance is referred to as an outcome of environmental, structural and managerial factors (Papadakis and Lioukas, 1996; Rajagopalan, Rasheed and Datta, 1993). Therefore, the lack of a strong relationship between organisational social and human capital and firms' market value should be interpreted with caution. These relationships may be contingent upon various environmental and structural circumstances or there could be confounding effects.
- Finally, this study adopted an extension of the Ohlson (1995) model to test the association between organisational social and human capital and market value of firms. The model itself poses a number of limitations[74], which should be taken into consideration when interpreting the findings of this study.

9.6 SUGGESTED AVENUES FOR FUTURE RESEARCH

Based on the findings of this study, this section presents various avenues for future research.

First, future research should examine the relationship between organisational social and human capital and firms' market value in different contexts. Researchers could explore this relationship in emerging and developing economies (e.g. Brazil, India, Russia, China and Turkey) to identify to what extent social and human capital possessed at the board level influence market value of firms. This will open up a promising research avenue on value-relevance of organisational social and human capital in different cultural or national settings.

Second, researchers could focus on the boards of directors as decision-making groups and explore the processes and factors that affect board effectiveness. Board processes include, but are not limited to, power, politics, learning and changing, and creativity and risk (Pettigrew

[74] Limitations of the Ohlson (1995) Model are discussed in detail in Chapter Four.

and McNulty, 1998; Pye and Pettigrew, 2005). It will be useful for executives to determine the factors that enhance board performance and, in turn, organisational performance.

Third, the lack of empirical research on simultaneous analyses of social and human capital at the board level suggests that further research may offer fruitful direction for future research. Furthermore, different measures of board characteristics could provide extant research with more interesting findings.

Fourth, the findings of this study are based on a quantitative longitudinal research design. Future research could use qualitative longitudinal methods as well as case studies to examine the validity of the findings. A qualitative research design could also offer useful insights into the functioning of boards and the interactions among board members.

Finally, another significant research direction is to examine the association between other dimensions of organisational social capital and firms' market value. This thesis focuses solely on the structural dimension of organisational social capital based on the rationale presented in the Chapter Two. Future research could investigate the value relevance of cognitive and relational dimensions of organisational social capital, which would make a useful contribution to social capital and value relevance literatures.

9.7 CONCLUDING REMARKS

This chapter presents the conclusions of the study which have been derived from the findings of univariate and multiple regression analyses as reported in Chapter Eight of this thesis. Furthermore, implications of the study for academics and practitioners are summarised with an aim to stimulate further interest in the investigation of determinants of firm market value. Finally, the chapter concludes with suggesting several avenues for further research that could provide useful insights into organisational social and human capital, and how they affect the market value of firms in different contexts.

APPENDIX I

List of Tables

Table 2.1: Definitions of Social Capital

External vs. Internal	Author	Definitions of Social Capital
External	Baker	"a resource that actors derive from specific social structures and then use to pursue their interests; it is created by changes in the relationship among actors" (1990: 619).
	Belliveau, O'Reilly and Wade	"an individual's personal network and elite institutional affiliations" (1996: 1572).
	Bourdieu	"the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition" (1985: 248).
		"made up of social obligations (connections) which is convertible, in certain conditions, into economic capital and may be institutionalized in the form of a title of nobility" (1985: 243).
	Bourdieu and Wacquant	"the sum of the resources, actual or virtual, that accrue to an individual or a group by virtue of possessing a durable network of more or less institutionalized relationships of mutual acquaintance and recognition" (1992: 119).
	Boxman, De Graaf and Flap	"the number of people who can be expected to provide support and the resources those people have at their disposal" (1991: 52).
	Burt	"friends, colleagues, and more general contacts through whom you receive opportunities to use your financial and human capital" (1992: 9).
		"the brokerage opportunities in a network" (1997b: 355).
	Knoke	"the process by which social actors create and mobilize their network connections within and between organizations to gain access to other social actors' resources" (1999: 18).
	Portes	"the ability of actors to secure benefits by virtue of membership in social networks or other social structures" (1998: 6).
Internal	Brehm and Rahn	"the web of cooperative relationships between citizens that facilitate resolution of collective action problems" (1997: 999).
	Coleman	"Social capital is defined by its function. It is not a single entity, but a variety of different entities having two characteristics in common: They all consist of some aspect of social structure, and they facilitate certain actions of individuals who are within the structure" (1990: 302).
	Fukuyama	"the ability of people to work together for common purposes in groups and organizations" (1995: 10).
		"Social capital can be defined simply as the existence of a certain set of informal values or norms shared among members of a group that permit cooperation among them" (1997).
	Inglehart	"a culture of trust and tolerance, in which extensive networks of voluntary associations emerge" (1997: 188).
	Portes and Sensenbrenner	"those expectations for action within a collectivity that affect the economic goals and goal-seeking behavior of its members, even if these expectations are not oriented toward the economic sphere" (1993: 1323).
	Putnam	"features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit" (1995: 67).
	Thomas	"those voluntary means and processes developed within civil society which promote development for the collective whole" (1996: 11).

Both	Adler and Kwon	"Social capital is the goodwill available to individuals or groups. Its source lies in the structure and content of the actor's social relations. Its effects flow from the information, influence, and solidarity it makes available to the actor" (2002: 23)
	Loury	"naturally occurring social relationships among persons which promote or assist the acquisition of skills and traits valued in the marketplace… an asset which may be as significant as financial bequests in accounting for the maintenance of inequality in our society" (1992: 100).
	Nahapiet and Ghoshal	"the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit. Social capital thus comprises both the network and the assets that may be mobilized through that network" (1998: 243).
	Pennar	"the web of social relationships that influences individual behavior and thereby affects economic growth" (1997: 154).
	Schiff	"the set of elements of the social structure that affects relations among people and are inputs or arguments of the production and/or utility function" (1992: 160).
	Woolcock	"the information, trust, and norms of reciprocity inhering in one's social networks" (1998: 153).

Adapted from Adler and Kwon (2002: 20).

Table 2.2: Framework for Conceptualising Inter-organisational Networks

Structure	**Function**	**Consequences**
Open Networks Members do not all know each other Inclusive – heterogeneous membership	Information arbitrage Negotiation power Control	Competitive advantage Differentiation in performance Value creation Maintenance costs
Closed Networks Members know each other Exclusive – homogeneous membership	Information diffusion Reciprocity Support Maintaining collective norms	Trust Sense of belonging Obligations Effective sanctions Exclusion

Adapted from Antcliff, Saundry and Stuart (2007).

Table 7.1: Dependent, Independent Variables, and Their Definitions

	DEFINITIONS
DEPENDENT VARIABLE	
MV	Market value of firm *i* at year *t*
INDEPENDENT VARIABLES	
Accounting Variables	
BV	Book value of firm *i* at year *t*
E	Net income of firm *i* at year *t*
DIV	Dividends of firm i at year t
R&D	R&D expenditure of firm *i* at year *t*
CC	Capital contributions of firm *i* at year *t*
CE	Capital expenditure of firm *i* at year *t*
Social Capital Variables	
DEGCEN	Average degree centrality score of a firm's board
CLOSCEN	Average closeness centrality score of a firm's board
BETCEN	Average betweenness centrality score of a firm's board
EIGCEN	Average eigenvector centrality score of a firm's board
EFSIZE	Average effective size of a firm's board
AGGCON	Average aggregate constraint score of a firm's board
Human Capital Variables	
HIGHDEG	Average highest degree score of a firm's board
PROF	Average professional qualifications score of a firm's board
ELITE	Average elite education score of a firm's board
AGE	Average director age of a firm's board
BRDEXP	Average prior board experience of a firm's board
ORGTEN	Average organisational tenure of a firm's board
Control Variables	
BRDIND	The proportion of non-executive directors on a firm's board
IND	Industry dummies

Table 7.2: List of Bachelor Degrees

AB
AB (High Hons)
AB (Hons)
AB (Summa Cum Laude)
AB (cum laude)
AB (magna cum laude)
AB Degree
B Acc(Hons)
BA
BA (Cum Laude)
BA (Distinction)
BA (Hons)
BA (magna cum laude)
BA (summa cum laude)
BA Accountancy & Economics
BA in Business and Industrial Administration
BA in Engineering and Applied Physics
BA in Political Science
BAS (Bachelor of Arts and Science)
BASc
BAppSc (Bachelor of Applied Science)
BBA
BBA (Cum Laude)
BBA (Hons)
BBA (magna cum laude)
BBA (summa cum laude)
BBS (Bachelor of Business Studies)
BBS (Hons)
BCA
BCL
BCh (Bachelor of Surgery)
BCom
BCom (Distinction)
BCom (Hons)
BComm
BComm (Hons)
BCompt (Hons)
BE
BE (Hons)
BEc
BEc (Hons)
BEcon
BEcon (Hons)
BEd
BEd (Hons)
BEng
BEng (Distinction)
BEng (Hons)

BFA (Bachelors of Fine Arts Program)
BJ
BM
BME
BPharm
BPhil
BPhil in Economics
BS
BS (Distinction)
BS (Hons)
BS (Phi Beta Kappa)
BS (cum laude)
BS (magna Cum Laude)
BS (summa Cum Laude)
BS in Mechanical Engineering
BSBA
BSBA (Hons)
BSBA (cum laude)
BSBA (magna cum laude)
BSE
BSE (summa cum laude)
BSEE
BSME
BSc
BSc (Distinction)
BSc (Eng)
BSc (Hons)
BSc (Hons) in Mathematics
BSc (Hons) in Mineral Project Appraisal
BSc (Tech)
BSc Chemistry
BSc in Chemistry
BSc in Economics
BSocSc (Bachelor of Social Sciences)
BTEC
BTech
BTech (Hons)
Baccalaureus Procurationis (BProc)
Bachelor of Accounting Science (BCompt)
Bachelor of Applied Arts and Sciences
Bachelor of Applied Science (BAS)
Bachelor of Business Science (Hons)
Bachelor of Dental Surgery (BDS)
Bachelor of Education
Bachelor of Jurisprudence
Bachelor of Laws
Bachelor of Social Science (BSocSc) (Hons)
Bachelor of Social Sciences (BSocSc)
Bachelor's Degree
Bachelor's Degree (Hons)

Bachelor's Degree (cum laude)
Bachelor's Degree (magna cum laude)
Bbus (Bachelor of Business)
Degree
Degree (Hons)
Degree (Hons) in Physics
Degree (Joint Hons)
Degree (summa cum laude)
Degree in Biochemistry
Degree in Ecoomics
Degree in Historical Science
Degree in History
Degree in Mathematics
Degree in Mining Engineering
LLB
LLB (Hons)
LLB (magna cum laude)
LLL
LLL (Hons)
MBBCh
MBBS
MBBS (Hons)
MBChB
SB

Table 7.3: List of Master's Degrees

DEA
Executive MBA
Executive Masters in Business Administration
International MBA
LLM
LLM (Hons)
LLM (cum laude)
LLM (magna cum laude)
MA
MA (Hons)
MA (cum laude)
MA in History
MA in Law
MA in Law and Economics
MASc
MBA
MBA (Cum Laude)
MBA (Distinction)
MBA (High Distinction)
MBA (Hons)
MBA (magna cum laude)
MBSc
MCT
MCom
MComm
ME
MEc
MEd
MEng
MEng (Hons)
MEngSc
MFA
MHA
MPA
MPH
MPS (Master of Professional Studies)
MPhil
MS
MS (Hons)
MSE
MSEE
MSW
MSc
MSc (Hons)
MSc (cum laude)
MSc in Finance
MSc in Mineral Project Appraisal
MTech

Master of Applied Finance
Master of Business Economics (MBE)
Master of Business Leadership (MBL)
Master of Economics
Master of Environmental Science (MESc)
Master of International Affairs
Master of Letters (MLitt)
Master of Management (MM)
Master of Theology (ThM)
Master's Degree (Hons)
Master's Degree (summa cum laude)
Masters (Hons)
Masters Degree
Masters Degree (Distinction)
Masters in Literature
Masters in Management Programme
Masters in Public and Private Management (MPPM)
Masters of International Management

Table 7.4: List of Doctorate Degrees

DBA
DBA (Hons)
DDS
DEng (Doctor of Engineering)
DM (Doctor of Management)
DMSc
DPM
DPhil
DSc
DSc (Hons)
DUniv
Doctor of Dental Medicine (DMD)
Doctor of Economics
Doctor of Education (DEd)
Doctor of Jurisprudence
Doctor of Law
Doctor of Letters
Doctor of Medicine and Master of Surgery (MDCM)
Doctor of Osteopathy (DO)
Doctor of Science
Doctorate
Doctorate (Hons)
Doctorate of Ministry
Dr Ing
Honorary Doctor of Business Administration
JD
JD (Cum Laude)
JD (Hons)
JD (magna Cum Laude)
LLD
LLD (Hons)
MD
MD (Hons)
MD (cum laude)
MD (magna cum laude)
PhD
PhD (Hons)
PhD (Magna Cum Laude)
PhD (cum laude)
PhD (summa cum laude)
PhD in Mathematics
PhD in Mechanical Engineering
PhD in Sociology
PharmD
SJD
ScD

Table 7.5: List of Science Degrees

BA in Engineering and Applied Physics
BCA
BCh (Bachelor of Surgery)
BE
BE (Hons)
BEng
BEng (Distinction)
BEng (Hons)
BM
BPharm
BS in Mechanical Engineering
BSE
BSE (summa cum laude)
BSEE
BSME
BSc (Eng)
BSc (Hons) in Mathematics
BSc (Tech)
BSc Chemistry
BSc in Chemistry
BTech
BTech (Hons)
Bachelor of Dental Surgery (BDS)
DDS
DEng (Doctor of Engineering)
DMSc
DPM
Degree (Hons) in Physics
Degree in Biochemistry
Degree in Mathematics
Degree in Mining Engineering
Doctor of Dental Medicine (DMD)
Doctor of Medicine and Master of Surgery (MDCM)
Doctor of Osteopathy (DO)
Dr Ing
MASc
MBBCh
MBBS
MBBS (Hons)
MBChB
MBSc
MCT
MD
MD (Hons)
MD (cum laude)
MD (magna cum laude)
ME
MEng

MEng (Hons)
MEngSc
MSE
MSEE
MTech
Master of Environmental Science (MESc)
PhD in Mathematics
PhD in Mechanical Engineering
PharmD
ScD

Table 7.6: List of Non-science Degrees

B Acc (Hons)
BA Accountancy & Economics
BA in Business and Industrial Administration
BA in Political Science
BAS (Bachelor of Arts and Science)
BBA
BBA (Cum Laude)
BBA (Hons)
BBA (magna cum laude)
BBA (summa cum laude)
BBS (Bachelor of Business Studies)
BBS (Hons)
BCL
BCom
BCom (Distinction)
BCom (Hons)
BComm
BComm (Hons)
BCompt (Hons)
BEc
BEc (Hons)
BEcon
BEcon (Hons)
BEd
BEd (Hons)
BFA (Bachelors of Fine Arts Program)
BJ
BPhil in Economics
BSBA
BSBA (Hons)
BSBA (cum laude)
BSBA (magna cum laude)
BSc in Economics
BSocSc (Bachelor of Social Sciences)
Bachelor of Accounting Science (BCompt)
Bachelor of Applied Arts and Sciences
Bachelor of Business Science (Hons)
Bachelor of Education
Bachelor of Jurisprudence
Bachelor of Laws
Bachelor of Social Science (BSocSc) (Hons)
Bachelor of Social Sciences (BSocSc)
Bbus (Bachelor of Business)
DBA
DBA (Hons)
DM (Doctor of Management)
Degree in Ecoomics
Degree in Historical Science

Degree in History
Doctor of Economics
Doctor of Education (DEd)
Doctor of Jurisprudence
Doctor of Law
Doctor of Letters
Doctorate of Ministry
Executive MBA
Executive Masters in Business Administration
Honorary Doctor of Business Administration
International MBA
JD
JD (Cum Laude)
JD (Hons)
JD (magna Cum Laude)
LLB
LLB (Hons)
LLB (magna cum laude)
LLD
LLD (Hons)
LLL
LLL (Hons)
LLM
LLM (Hons)
LLM (cum laude)
LLM (magna cum laude)
MA in History
MA in Law
MA in Law and Economics
MBA
MBA (Cum Laude)
MBA (Distinction)
MBA (High Distinction)
MBA (Hons)
MBA (magna cum laude)
MCom
MComm
MEc
MFA
MHA
MPA
MPH
MPS (Master of Professional Studies)
MSW
MSc in Finance
Master of Applied Finance
Master of Business Economics (MBE)
Master of Business Leadership (MBL)
Master of Economics
Master of International Affairs

Master of Letters (MLitt)
Master of Management (MM)
Master of Theology (ThM)
Masters in Literature
Masters in Management Programme
Masters in Public and Private Management (MPPM)
Masters of International Management
PhD in Sociology
SJD

Table 7.7: List of Professional Qualifications

ACA
CA
CFA
CMA
CPA
Certificate for Financial Advisors (CeFA)
Certified
Certified Accountant
Certified Diploma in Accounting & Finance (CDipAF)
Certified Finance and Treasury Professional
Certified Financial Planner
Certified Financial Planner (CFP)
Certified Financial Risk Manager (CFRM)
Certified General Accountant
Certified Internal Auditor
Certified Management Accountant
Certified Management Consultant
Certified Practising Accountant
Certified Public Accountant
Chartered Accountant
Chartered Banker
Chartered Certified Accountant
Chartered Director
Chartered Fellow
Chartered Financial Analyst
Chartered Financial Consultant
Chartered Financial Planner
Chartered Management Accountant
Chartered Management Consultant
Chartered Manager
Chartered Marketer
Chartered Public Finance Accountant (CPFA)
Corporate Finance Qualification (CF)
FCA
Fellow Chartered Accountant
ICAS
Insolvency Practitioner (IP)

Table 7.8: Directors with "Associate, Associate Member, Companion, Fellow, and Member" Titles from Listed Institutions are Regarded as Possessing a Professional Qualification

American Institute of Certified Management Accountants (AICMA)
Association of Chartered Accountants in the United States (ACAUS)
Association of Chartered Certified Accountants (ACCA USA)
Association of Chartered Certified Accountants (ACCA) (UK)
Australian Institute of Certified Public Accountants
Australian Institute of Chartered Accountants
Canadian Institute of Chartered Accountants (CICA)
Certified General Accountants Association of Canada (CGA)
Chartered Institute for Securities & Investment (CISI) (Securities & Investment Institute (SII) prior to 01/11/2009)
Chartered Institute of Bankers (CIB) (UK)
Chartered Institute of Bankers in Scotland (CIOBS)
Chartered Institute of Management Accountants (CIMA) (Hong Kong)
Chartered Institute of Management Accountants (CIMA) (Malaysia)
Chartered Institute of Management Accountants (CIMA) (Republic of Ireland)
Chartered Institute of Management Accountants (CIMA) (UK)
Chartered Institute of Marketing (CIM) (UK)
Chartered Institute of Public Finance and Accountancy (CIPFA)
Chartered Management Institute (CMI) (UK)
Hong Kong Institute of Certified Public Accountants (HKICPA) (Formerly known as Hong Kong Society of Accountants (HKSA))
Institute of Certified Management Accountants (ICMA)
Institute of Certified Public Accountants in Israel (ICPAI)
Institute of Chartered Accountants in England and Wales (ICAEW)
Institute of Chartered Accountants in Ireland (ICAI)
Institute of Chartered Accountants of Australia (ICAA)
Institute of Chartered Accountants of British Columbia
Institute of Chartered Accountants of India (ICAI)
Institute of Chartered Accountants of New Zealand
Institute of Chartered Accountants of Ontario (ICAO)
Institute of Chartered Accountants of Scotland (ICAS)
Institute of Chartered Accountants of South Africa
Institute of Chartered Bankers
Institute of Chartered Directors
South African Institute of Chartered Accountants (SAICA)

Table 7.9: List of Elite Institutions

All Souls College, Oxford University
Balliol College, Oxford University
Brasenose College, Oxford University
Christ Church College, Oxford University
Christ's College, Cambridge University
Churchill College, Cambridge University
Clare College, Cambridge University
Corpus Christi College, Cambridge University
Corpus Christi College, Oxford University
Darwin College, Cambridge University
Downing College, Cambridge University
Emmanuel College, Cambridge University
Exeter College, Oxford University
Girton College, Cambridge University
Gonville and Caius College, Cambridge University
Green College, Oxford University
Hertford College, Oxford University
Jesus College, Cambridge University
Jesus College, Oxford University
Judge Business School (Judge Institute of Management Studies prior to 09/2005), Cambridge University
Keble College, Oxford University
King's College Cambridge, University of Cambridge
Lady Margaret Hall, Oxford University
Lincoln College, Oxford University
Magdalen College, Oxford University
Magdalene College, Cambridge University
Mansfield College, Oxford University
Merton College, Oxford University
Murray Edwards College, Cambridge University (New Hall College, Cambridge University prior to 06/2008)
New College, Oxford University
Newnham College, Cambridge University
Nuffield College, Oxford University
Oriel College, Oxford University
Oxford University
Pembroke College, Cambridge University
Pembroke College, Oxford University
Peterhouse College, Cambridge University
Queen's College, Oxford University
Queens' College, Cambridge University
Robinson College, University of Cambridge
Said Business School, Oxford University
Selwyn College, Cambridge University
Sidney Sussex College, Cambridge University
Somerville College, Oxford University
St Anne's College, Oxford University
St Catharines College, Cambridge University

St Catherine's College, Oxford University
St Cross College, Oxford University
St Edmund Hall, Oxford University
St Hilda's College, Oxford University
St Hugh's College, Oxford University
St John's College, Oxford University
St John's College, University of Cambridge
St Peter's College, Oxford University
Templeton College, Oxford University
Trinity College, Cambridge University
Trinity College, Oxford University
Trinity Hall, Cambridge University
University College, Oxford University
University of Cambridge
Wadham College, Oxford University
Wolfson College, Cambridge University
Wolfson College, Oxford University
Worcester College, Oxford University

Table 7.10: List of Russell Group Universities

All Souls College, Oxford University
Balliol College, Oxford University
Brasenose College, Oxford University
Cardiff Business School
Cardiff University
Christ Church College, Oxford University
Christ's College, Cambridge University
Churchill College, Cambridge University
Clare College, Cambridge University
Corpus Christi College, Cambridge University
Corpus Christi College, Oxford University
Darwin College, Cambridge University
Downing College, Cambridge University
Emmanuel College, Cambridge University
Exeter College, Oxford University
Girton College, Cambridge University
Gonville and Caius College, Cambridge University
Hertford College, Oxford University
Imperial College Business School
Imperial College London (Department of Earth Science and Engineering)
Imperial College London (Faculty of Natural Sciences)
Imperial College London (The Imperial College of Science Technology and Medicine)
Jesus College, Cambridge University
Jesus College, Oxford University
Judge Business School (Judge Institute of Management Studies prior to 09/2005), Cambridge University
Keble College, Oxford University
King's College Cambridge, University of Cambridge
King's College London, University of London
Lady Margaret Hall, Oxford University
Lincoln College, Oxford University
London School of Economics (LSE)
Magdalen College, Oxford University
Magdalene College, Cambridge University
Mansfield College, Oxford University
Merton College, Oxford University
Murray Edwards College, Cambridge University (New Hall College, Cambridge University prior to 06/2008)
New College, Oxford University
Newcastle University (Formerly known as Newcastle Upon Tyne University)
Newnham College, Cambridge University
Nuffield College, Oxford University
Oriel College, Oxford University
Oxford University
Pembroke College, Cambridge University
Pembroke College, Oxford University
Peterhouse College, Cambridge University
Queen's College, Oxford University

Queen's University, Belfast
Queens' College, Cambridge University
Robinson College, University of Cambridge
Said Business School, Oxford University
Selwyn College, Cambridge University
Sidney Sussex College, Cambridge University
Somerville College, Oxford University
St Anne's College, Oxford University
St Catharines College, Cambridge University
St Catherine's College, Oxford University
St Cross College, Oxford University
St Edmund Hall, Oxford University
St Hilda's College, Oxford University
St Hugh's College, Oxford University
St John's College, Oxford University
St John's College, University of Cambridge
St Peter's College, Oxford University
Trinity College, Cambridge University
Trinity College, Oxford University
Trinity Hall, Cambridge University
University College London (UCL)
University College, Oxford University
University of Birmingham
University of Bristol
University of Cambridge
University of Edinburgh
University of Edinburgh Business School
University of Glasgow
University of Leeds
University of Liverpool
University of Manchester
University of Nottingham
University of Sheffield
University of Southampton
University of Warwick
Wadham College, Oxford University
Wolfson College, Cambridge University
Wolfson College, Oxford University
Worcester College, Oxford University

Table 7.11: List of Pre-1992 Universities

Aberystwyth University
All Souls College, Oxford University
Aston University
Balliol College, Oxford University
Bangor University
Brasenose College, Oxford University
Brunel University
Cardiff University
Cass Business School, City University London
Christ Church College, Oxford University
Christ's College, Cambridge University
Churchill College, Cambridge University
City University London (CUL)
Clare College, Cambridge University
Corpus Christi College, Cambridge University
Corpus Christi College, Oxford University
Cranfield University
Darwin College, Cambridge University
Downing College, Cambridge University
Durham University
Emmanuel College, Cambridge University
Exeter College, Oxford University
Girton College, Cambridge University
Gonville and Caius College, Cambridge University
Grey College, University of Durham
Heriot-Watt University
Hertford College, Oxford University
Hull University Business School
Jesus College, Cambridge University
Jesus College, Oxford University
Judge Business School (Judge Institute of Management Studies prior to 09/2005), Cambridge University
Keble College, Oxford University
Keele University
King's College Cambridge, University of Cambridge
King's College London, University of London
Lady Margaret Hall, Oxford University
Lancaster University
Lincoln College, Oxford University
London School of Economics (LSE)
Loughborough University
Magdalen College, Oxford University
Magdalene College, Cambridge University
Mansfield College, Oxford University
Merton College, Oxford University
Murray Edwards College, Cambridge University (New Hall College, Cambridge University prior to 06/2008)
New College, Oxford University

Newcastle University (Formerly known as Newcastle Upon Tyne University)
Newnham College, Cambridge University
Nuffield College, Oxford University
Oriel College, Oxford University
Oxford University
Pembroke College, Cambridge University
Pembroke College, Oxford University
Peterhouse College, Cambridge University
Queen Mary, University of London (Formerly known as Queen Mary and Westfield College)
Queen's College, Oxford University
Queens' College, Cambridge University
Robinson College, University of Cambridge
Royal College of Art (RCA) (UK)
Royal Holloway University of London
Said Business School, Oxford University
Selwyn College, Cambridge University
Sidney Sussex College, Cambridge University
Somerville College, Oxford University
St Anne's College, Oxford University
St Catharines College, Cambridge University
St Catherine's College, Oxford University
St Cross College, Oxford University
St Edmund Hall, Oxford University
St Hilda's College, Oxford University
St Hugh's College, Oxford University
St John's College, Oxford University
St John's College, University of Cambridge
St Peter's College, Oxford University
Swansea University
Trinity College, Cambridge University
Trinity College, Oxford University
Trinity Hall, Cambridge University
University College, Oxford University
University College, University of Durham
University of Aberdeen
University of Bath
University of Birmingham
University of Bradford
University of Bristol
University of Cambridge
University of Dundee
University of East Anglia
University of Edinburgh
University of Essex
University of Exeter
University of Glasgow
University of Hull
University of Kent
University of Leeds
University of Leicester

University of Liverpool
University of London
University of Manchester
University of Nottingham
University of Reading
University of Salford
University of Sheffield
University of Southampton
University of St Andrews
University of Stirling
University of Strathclyde
University of Surrey
University of Sussex
University of Warwick
University of York
Wadham College, Oxford University
Wolfson College, Cambridge University
Wolfson College, Oxford University
Worcester College, Oxford University

Table 7.12: List of Post-1992 Universities

Anglia Ruskin University (Anglia Polytechnic University prior to 2005)
Bath Spa University College
Birmingham City University
Bournemouth University
Canterbury Christ Church University
Coventry University
De Montfort University (Leicester Polytechnic prior to 1992)
Glasgow Caledonian University
Imperial College London (The Imperial College of Science Technology and Medicine)
Kingston University (Formerly known as Kingston Polytechnic)
Leeds Metropolitan University
Liverpool John Moores University
London Metropolitan University
London South Bank University
Manchester Metropolitan University
Middlesex University
Napier University
Northumbria University
Nottingham Trent University
Oxford Brookes University
Queen Margaret University, Edinburgh (Formerly known as Queen Margaret College)
Robert Gordon University
Sheffield Hallam University
Southampton Solent University
Staffordshire University
Teesside University
Thames Valley University
University College Northampton
University of Bedfordshire
University of Brighton
University of Central Lancashire
University of Chester
University of Chichester
University of Derby
University of East London
University of Glamorgan
University of Gloucestershire
University of Greenwich
University of Hertfordshire
University of Huddersfield
University of Lincoln
University of Manchester Institute of Science and Technology (UMIST)
University of Northumbria at Newcastle
University of Plymouth
University of Portsmouth
University of Sunderland
University of Wales Aberystwyth
University of Wales Institute, Cardiff (UWIC)

University of Wales, Bangor
University of Wales, Cardiff
University of Wales, Swansea
University of Westminster (Formerly known as Regent Street Polytechnic) (Polytechnic of Central London)
University of Wolverhampton
University of the Arts London
University of the West of England
Winchester College

Table 7.13: List of Group 1994 Universities

Birkbeck College, London University
Durham University
Goldsmiths College, University of London
Institute of Education (IOE) (UK)
Lancaster University
Loughborough University
Queen Mary, University of London (Formerly known as Queen Mary and Westfield College)
Royal Holloway University of London
School of Oriental and African Studies (SOAS)
University of Bath
University of East Anglia
University of Essex
University of Exeter
University of Leicester
University of Reading
University of St Andrews
University of Surrey
University of Sussex
University of York

Table 8.1: Descriptive statistics for accounting variables deflated by the number of shares

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
MV1	1757	4.59	5.04	1.58	3.11	5.57	3.41	0.17	55.99
BV1	1757	1.87	2.34	0.65	1.21	2.19	5.49	0.07	38.16
E1	1757	0.18	0.36	0.03	0.11	0.26	2.68	-1.56	3.59
R&D1	1757	0.04	0.10	0.00	0.00	0.02	4.17	0.00	0.79
D1	1757	0.13	0.18	0.04	0.08	0.17	4.22	0.00	1.94
CC1	1757	-0.04	0.16	-0.02	0.00	0.00	-8.86	-2.83	0.82
CE1	1757	0.26	0.58	0.05	0.12	0.26	7.72	0.00	7.96

MV1 represents the market value per share. BV1 represents the book value per share. E1 represents the earnings per share. D1 represents the dividends per share. R&D1 represents the research and development expenditure per share. CC1 represents the capital contributions per share. CE1 represents the capital expenditures per share.

Table 8.2: Descriptive statistics for accounting variables deflated by net sales or revenues

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
MV2	1731	1.48	1.83	0.55	0.97	1.74	5.38	0.10	27.38
BV2	1731	0.57	0.66	0.23	0.41	0.67	6.27	0.03	12.56
E2	1731	0.05	0.11	0.01	0.04	0.08	-0.43	-0.88	0.56
R&D2	1731	0.02	0.08	0.00	0.00	0.01	8.73	0.00	1.43
D2	1731	0.03	0.03	0.01	0.03	0.04	1.82	0.00	0.20
CC2	1731	-0.02	0.07	0.00	0.00	0.00	-6.76	-0.78	0.21
CE2	1731	0.06	0.09	0.02	0.04	0.07	3.53	0.00	0.72

MV2 represents the market value deflated by net sales or revenues. BV2 represents the book value deflated by net sales or revenues. E2 represents the earnings deflated by net sales or revenues. D2 represents the dividends deflated by net sales or revenues. R&D2 represents the research and development expenditure deflated by net sales or revenues. CC2 represents the capital contributions deflated by net sales or revenues. CE2 represents the capital expenditures deflated by net sales or revenues.

Table 8.3: Descriptive statistics for accounting variables deflated by the opening market value

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
MV3	1716	1.12	0.40	0.86	1.11	1.34	0.59	0.21	2.76
BV3	1716	0.52	0.36	0.28	0.43	0.66	1.66	0.04	2.56
E3	1716	0.04	0.07	0.02	0.04	0.07	-2.74	-0.64	0.26
R&D3	1716	0.01	0.03	0.00	0.00	0.01	3.17	0.00	0.17
D3	1716	0.03	0.02	0.02	0.03	0.04	1.24	0.00	0.16
CC3	1716	-0.01	0.05	0.00	0.00	0.00	-5.71	-0.48	0.15
CE3	1716	0.06	0.07	0.02	0.04	0.08	2.49	0.00	0.52

MV3 represents the market value deflated by the opening market value. BV3 represents the book value deflated by the opening market value. E3 represents the earnings deflated by the opening market value. D3 represents the dividends deflated by the opening market value. R&D3 represents the research and development expenditure deflated by the opening market value. CC3 represents the capital contributions deflated by the opening market value. CE3 represents the capital expenditures deflated by the opening market value.

Table 8.4: Descriptive statistics for accounting variables deflated by the closing book value

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
MV4	1746	3.23	2.89	1.51	2.43	3.81	3.07	0.32	26.62
BV4	1746	1.00	0.00	1.00	1.00	1.00	.	1.00	1.00
E4	1746	0.11	0.18	0.04	0.10	0.18	0.18	-1.11	1.07
R&D4	1746	0.03	0.08	0.00	0.00	0.02	3.50	0.00	0.56
D4	1746	0.09	0.10	0.04	0.06	0.11	3.17	0.00	0.82
CC4	1746	-0.03	0.09	-0.01	0.00	0.00	-4.74	-0.80	0.37
CE4	1746	0.15	0.16	0.05	0.11	0.19	2.86	0.00	1.24

MV4 represents the market value deflated by the closing book value. E4 represents the earnings deflated by the closing book value. D4 represents the dividends deflated by the closing book value. R&D4 represents the research and development expenditure deflated by the closing book value. CC4 represents the capital contributions deflated by the closing book value. CE4 represents the capital expenditures deflated by the closing book value.

Table 8.5: Descriptive Statistics for board-level network measures for the pooled sample

variable	***N***	***mean***	***sd***	***p25***	***p50***	***p75***	***skewness***	***min***	***max***
Boarddegreecentrality	1757	0.006	0.002	0.005	0.006	0.007	0.695	0.001	0.018
Boardclosenesscentrality	1757	0.105	0.057	0.090	0.125	0.146	-0.962	0.001	0.186
Boardbetweencentrality	1757	0.002	0.002	0.000	0.001	0.003	1.834	0.000	0.016
Boardeigenvectorcentrality	1757	0.314	1.530	0.000	0.004	0.055	10.134	0.000	29.854
Boardeffectivesize	1757	3.736	2.199	1.933	3.446	5.131	0.750	1.000	13.925
Boardaggregateconstraint	1757	0.378	0.148	0.274	0.347	0.439	1.354	0.134	1.125

Tables 8.5a - 8.5j: Descriptive Statistics for board-level network measures in each annual cross-section

->Year = 2001

variable	***N***	***mean***	***sd***	***p25***	***p50***	***p75***	***skewness***	***min***	***max***
Boarddegreecentrality	136	0.006	0.003	0.005	0.006	0.008	0.940	0.001	0.016
Boardclosenesscentrality	136	0.066	0.047	0.003	0.088	0.103	-0.471	0.001	0.137
Boardbetweencentrality	136	0.001	0.002	0.000	0.001	0.002	1.989	0.000	0.010
Boardeigenvectorcentrality	136	0.082	0.501	0.000	0.000	0.007	7.974	0.000	4.492
Boardeffectivesize	136	2.618	1.488	1.000	2.411	3.583	0.806	1.000	7.939
Boardaggregateconstraint	136	0.431	0.162	0.322	0.393	0.493	1.279	0.152	1.125

-> Year = 2002

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
Boarddegreecentrality	140	0.007	0.003	0.005	0.006	0.008	0.855	0.001	0.016
Boardclosenesscentrality	140	0.065	0.047	0.003	0.088	0.103	-0.427	0.001	0.137
Boardbetweencentrality	140	0.001	0.002	0.000	0.001	0.002	2.143	0.000	0.012
Boardeigenvectorcentrality	140	0.094	0.551	0.000	0.000	0.011	7.554	0.000	4.902
Boardeffectivesize	140	2.653	1.534	1.000	2.283	3.690	0.799	1.000	7.849
Boardaggregateconstraint	140	0.431	0.167	0.318	0.388	0.493	1.302	0.151	1.125

-> Year = 2003

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
Boarddegreecentrality	151	0.007	0.003	0.005	0.006	0.008	1.073	0.002	0.018
Boardclosenesscentrality	151	0.081	0.052	0.004	0.103	0.121	-0.703	0.001	0.144
Boardbetweencentrality	151	0.002	0.002	0.000	0.001	0.003	2.855	0.000	0.016
Boardeigenvectorcentrality	151	0.087	0.635	0.000	0.000	0.003	8.464	0.000	5.682
Boardeffectivesize	151	3.057	1.678	1.686	3.012	4.294	0.497	1.000	8.701
Boardaggregateconstraint	151	0.394	0.142	0.293	0.363	0.477	1.132	0.167	0.926

-> Year = 2004

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
Boarddegreecentrality	161	0.007	0.002	0.005	0.006	0.008	0.584	0.002	0.016
Boardclosenesscentrality	161	0.097	0.056	0.078	0.120	0.138	-0.928	0.001	0.164
Boardbetweencentrality	161	0.002	0.002	0.000	0.001	0.003	1.353	0.000	0.010
Boardeigenvectorcentrality	161	0.344	1.440	0.000	0.004	0.097	7.860	0.000	15.325
Boardeffectivesize	161	3.611	2.092	1.800	3.519	4.931	0.554	1.000	10.363
Boardaggregateconstraint	161	0.381	0.154	0.274	0.351	0.444	1.381	0.134	0.926

-> Year = 2005

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
Boarddegreecentrality	176	0.006	0.002	0.005	0.006	0.008	0.564	0.002	0.015
Boardclosenesscentrality	176	0.107	0.055	0.104	0.127	0.145	-1.157	0.001	0.174
Boardbetweencentrality	176	0.002	0.002	0.000	0.002	0.003	2.010	0.000	0.015
Boardeigenvectorcentrality	176	0.396	1.327	0.000	0.013	0.143	6.516	0.000	13.335
Boardeffectivesize	176	3.755	2.184	1.928	3.547	5.259	0.634	1.000	10.885
Boardaggregateconstraint	176	0.383	0.154	0.286	0.348	0.447	1.381	0.135	0.926

-> Year = 2006

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
Boarddegreecentrality	180	0.006	0.002	0.005	0.006	0.008	0.525	0.002	0.014
Boardclosenesscentrality	180	0.109	0.055	0.106	0.128	0.145	-1.221	0.001	0.171
Boardbetweencentrality	180	0.002	0.002	0.000	0.001	0.003	1.214	0.000	0.010
Boardeigenvectorcentrality	180	0.538	1.931	0.000	0.023	0.248	7.092	0.000	20.268
Boardeffectivesize	180	3.846	2.321	1.882	3.528	5.358	0.766	1.000	12.904
Boardaggregateconstraint	180	0.373	0.147	0.273	0.338	0.434	1.158	0.138	0.926

-> Year = 2007

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
Boarddegreecentrality	195	0.006	0.002	0.005	0.006	0.007	0.417	0.002	0.012
Boardclosenesscentrality	195	0.117	0.053	0.118	0.135	0.150	-1.524	0.001	0.168
Boardbetweencentrality	195	0.002	0.002	0.000	0.001	0.003	1.409	0.000	0.011
Boardeigenvectorcentrality	195	0.296	2.699	0.000	0.002	0.017	9.942	0.000	29.854
Boardeffectivesize	195	4.134	2.302	2.370	3.790	5.740	0.727	1.000	13.925
Boardaggregateconstraint	195	0.360	0.142	0.264	0.340	0.417	1.559	0.155	0.926

-> Year = 2008

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
Boarddegreecentrality	202	0.006	0.002	0.004	0.006	0.007	0.345	0.002	0.011
Boardclosenesscentrality	202	0.117	0.053	0.117	0.137	0.150	-1.471	0.001	0.169
Boardbetweencentrality	202	0.002	0.002	0.000	0.001	0.003	1.378	0.000	0.011
Boardeigenvectorcentrality	202	0.407	1.482	0.001	0.010	0.073	4.705	0.000	9.777
Boardeffectivesize	202	4.130	2.164	2.543	3.860	5.696	0.393	1.000	9.803
Boardaggregateconstraint	202	0.361	0.136	0.264	0.330	0.421	1.367	0.156	0.926

-> Year = 2009

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
Boarddegreecentrality	205	0.006	0.002	0.005	0.006	0.007	0.475	0.002	0.012
Boardclosenesscentrality	205	0.126	0.050	0.125	0.143	0.156	-1.796	0.001	0.184
Boardbetweencentrality	205	0.002	0.002	0.001	0.001	0.003	1.948	0.000	0.013
Boardeigenvectorcentrality	205	0.269	1.150	0.000	0.004	0.034	5.402	0.000	7.459
Boardeffectivesize	205	4.169	2.272	2.524	3.979	5.476	0.702	1.000	10.733
Boardaggregateconstraint	205	0.358	0.133	0.266	0.330	0.410	1.339	0.142	0.926

-> Year = 2010

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
Boarddegreecentrality	211	0.006	0.002	0.004	0.006	0.007	0.289	0.002	0.012
Boardclosenesscentrality	211	0.133	0.053	0.131	0.151	0.165	-1.792	0.001	0.186
Boardbetweencentrality	211	0.002	0.002	0.001	0.002	0.003	1.773	0.000	0.013
Boardeigenvectorcentrality	211	0.463	1.550	0.006	0.038	0.221	5.559	0.000	12.007
Boardeffectivesize	211	4.485	2.481	2.580	4.267	6.166	0.482	1.000	11.297
Boardaggregateconstraint	211	0.348	0.137	0.245	0.321	0.412	1.396	0.139	0.926

Tables 8.6a - 8.6i: Descriptive Statistics for board-level network measures for the pooled sample classified by the industry

-> ICB_Industry_Name = Basic Materials

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
Boarddegreecentrality	109	0.007	0.002	0.005	0.006	0.008	0.448	0.002	0.012
Boardclosenesscentrality	109	0.101	0.059	0.072	0.122	0.146	-0.804	0.001	0.184
Boardbetweencentrality	109	0.002	0.002	0.000	0.001	0.002	2.716	0.000	0.013
Boardeigenvectorcentrality	109	0.388	1.228	0.000	0.004	0.090	3.881	0.000	6.646
Boardeffectivesize	109	3.653	1.980	2.029	3.486	5.011	0.432	1.000	9.627
Boardaggregateconstraint	109	0.366	0.138	0.249	0.339	0.463	1.026	0.185	0.926

-> ICB_Industry_Name = Consumer Goods

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
Boarddegreecentrality	252	0.006	0.002	0.004	0.006	0.008	0.283	0.001	0.013
Boardclosenesscentrality	252	0.103	0.060	0.078	0.123	0.149	-0.840	0.001	0.184
Boardbetweencentrality	252	0.002	0.002	0.000	0.001	0.003	1.996	0.000	0.011
Boardeigenvectorcentrality	252	0.242	0.926	0.000	0.006	0.084	6.573	0.000	8.898
Boardeffectivesize	252	3.542	2.198	1.857	3.200	4.823	0.822	1.000	10.744
Boardaggregateconstraint	252	0.403	0.185	0.267	0.350	0.478	1.356	0.161	1.125

-> ICB_Industry_Name = Consumer Services

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
Boarddegreecentrality	426	0.007	0.002	0.005	0.006	0.008	0.674	0.002	0.018
Boardclosenesscentrality	426	0.107	0.056	0.092	0.128	0.146	-1.020	0.001	0.186
Boardbetweencentrality	426	0.002	0.002	0.000	0.001	0.003	1.578	0.000	0.013
Boardeigenvectorcentrality	426	0.465	2.151	0.000	0.007	0.088	9.473	0.000	29.854
Boardeffectivesize	426	3.943	2.245	2.071	3.787	5.364	0.719	1.000	13.925
Boardaggregateconstraint	426	0.363	0.141	0.270	0.331	0.424	1.488	0.154	0.926

-> ICB_Industry_Name = Health Care

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
Boarddegreecentrality	71	0.006	0.002	0.004	0.006	0.007	0.900	0.003	0.013
Boardclosenesscentrality	71	0.090	0.064	0.003	0.124	0.141	-0.539	0.002	0.166
Boardbetweencentrality	71	0.001	0.002	0.000	0.001	0.002	1.817	0.000	0.008
Boardeigenvectorcentrality	71	0.226	0.678	0.000	0.003	0.088	3.980	0.000	4.105
Boardeffectivesize	71	3.332	2.230	1.000	3.060	4.789	0.961	1.000	10.885
Boardaggregateconstraint	71	0.393	0.146	0.272	0.354	0.493	0.446	0.183	0.648

-> ICB_Industry_Name = Industrials

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
Boarddegreecentrality	655	0.006	0.002	0.005	0.006	0.007	0.409	0.002	0.012
Boardclosenesscentrality	655	0.106	0.054	0.092	0.124	0.144	-1.043	0.001	0.182
Boardbetweencentrality	655	0.002	0.002	0.000	0.001	0.003	1.791	0.000	0.016
Boardeigenvectorcentrality	655	0.162	0.860	0.000	0.003	0.031	9.404	0.000	12.007
Boardeffectivesize	655	3.762	2.146	1.941	3.528	5.079	0.731	1.000	12.904
Boardaggregateconstraint	655	0.382	0.136	0.301	0.356	0.432	1.595	0.160	0.926

-> ICB_Industry_Name = Oil & Gas

variable	N	mean	sd	p25	p50	p75	skewness	min	max
Boarddegreecentrality	85	0.007	0.003	0.005	0.007	0.008	1.211	0.003	0.016
Boardclosenesscentrality	85	0.118	0.051	0.116	0.134	0.146	-1.509	0.002	0.174
Boardbetweencentrality	85	0.002	0.002	0.000	0.001	0.002	2.392	0.000	0.012
Boardeigenvectorcentrality	85	1.103	3.488	0.001	0.012	0.231	3.857	0.000	20.268
Boardeffectivesize	85	3.775	2.373	2.067	3.111	4.444	1.019	1.000	10.206
Boardaggregateconstraint	85	0.321	0.118	0.250	0.315	0.376	0.909	0.134	0.648

-> ICB_Industry_Name = Technology

variable	N	mean	sd	p25	p50	p75	skewness	min	max
Boarddegreecentrality	78	0.005	0.002	0.003	0.004	0.007	0.509	0.002	0.010
Boardclosenesscentrality	78	0.086	0.060	0.002	0.114	0.132	-0.509	0.001	0.171
Boardbetweencentrality	78	0.001	0.002	0.000	0.001	0.002	1.799	0.000	0.007
Boardeigenvectorcentrality	78	0.010	0.028	0.000	0.001	0.007	5.745	0.000	0.221
Boardeffectivesize	78	2.899	1.911	1.000	2.628	3.604	1.022	1.000	7.891
Boardaggregateconstraint	78	0.457	0.163	0.326	0.455	0.616	0.104	0.218	0.766

-> ICB_Industry_Name = Telecommunications

variable	N	mean	sd	p25	p50	p75	skewness	min	max
Boarddegreecentrality	29	0.006	0.003	0.004	0.005	0.007	0.872	0.003	0.012
Boardclosenesscentrality	29	0.088	0.070	0.003	0.127	0.141	-0.396	0.002	0.169
Boardbetweencentrality	29	0.002	0.002	0.000	0.000	0.003	1.223	0.000	0.009
Boardeigenvectorcentrality	29	0.150	0.398	0.000	0.001	0.011	2.750	0.000	1.537
Boardeffectivesize	29	3.318	2.505	1.000	2.125	5.924	0.490	1.000	7.792
Boardaggregateconstraint	29	0.409	0.156	0.298	0.412	0.512	0.145	0.185	0.648

-> ICB_Industry_Name = Utilities

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
Boarddegreecentrality	52	0.008	0.002	0.006	0.008	0.009	0.23	0.004	0.012
Boardclosenesscentrality	52	0.132	0.048	0.125	0.153	0.162	-1.849	0.002	0.184
Boardbetweencentrality	52	0.003	0.002	0.001	0.002	0.004	1.46	0.000	0.01
Boardeigenvectorcentrality	52	0.571	1.628	0.005	0.049	0.271	3.703	0.000	8.055
Boardeffectivesize	52	4.815	2.27	3.239	4.666	6.154	0.552	1	11.297
Boardaggregateconstraint	52	0.288	0.111	0.217	0.258	0.321	1.492	0.139	0.648

Table 8.7: Descriptive Statistics for board-level human capital measures for the pooled sample

variable	N	mean	sd	p25	p50	p75	skewness	min	max
BoardOrgTenure	1757	3.79	2.16	2.36	3.33	4.75	1.45	0.00	18.00
BoardAge	1757	55.15	3.44	52.89	55.31	57.50	-0.27	42.67	66.00
Boardquotedboardstodate	1757	3.51	1.32	2.56	3.33	4.38	0.55	1.00	9.80
BusyBoard	1757	1.95	0.61	1.50	1.86	2.29	1.02	1.00	5.00
PriorBoardExperience	1757	1.56	0.92	0.88	1.44	2.11	0.80	0.00	6.20
BoardEliteEdu	1757	0.12	0.13	0.00	0.11	0.20	1.04	0.00	0.67
BoardProfQual	1757	0.33	0.16	0.21	0.33	0.43	0.51	0.00	1.00
BoardHighestDegree	1757	0.84	0.51	0.50	0.80	1.15	0.47	0.00	2.38
BoardSciencedegree	1757	0.02	0.05	0.00	0.00	0.00	2.89	0.00	0.33
BoardnonSciencedegree	1757	0.15	0.14	0.00	0.14	0.25	0.82	0.00	0.70
BoardCambridge	1757	0.06	0.09	0.00	0.00	0.13	1.53	0.00	0.50
BoardOxford	1757	0.06	0.09	0.00	0.00	0.11	1.83	0.00	0.50
BoardRussellGroup	1757	0.26	0.19	0.13	0.25	0.38	0.55	0.00	0.88
BoardGroup1994	1757	0.03	0.07	0.00	0.00	0.00	2.67	0.00	0.50
BoardPre1992Uni	1757	0.30	0.20	0.15	0.29	0.43	0.34	0.00	0.88
BoardPost1992Uni	1757	0.02	0.06	0.00	0.00	0.00	2.45	0.00	0.38
BoardIndependence (%)	1757	59.62	14.42	50.00	60.00	71.43	-0.35	0	100

Table 8.7a - 8.7j: Descriptive Statistics for board-level human capital measures in each annual cross-section

-> Year = 2001

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
BoardOrgTenure	136	3.67	2.33	2.13	3.18	4.65	1.59	0.00	14.40
BoardAge	136	53.92	3.74	51.58	54.29	56.43	-0.37	42.67	62.00
Boardquotedboardstodate	136	3.11	1.32	2.14	2.88	3.88	0.78	1.00	7.23
BusyBoard	136	1.93	0.72	1.43	1.76	2.25	1.22	1.00	4.62
PriorBoardExperience	136	1.18	0.75	0.60	1.04	1.71	0.66	0.00	3.47
BoardEliteEdu	136	0.13	0.13	0.00	0.11	0.22	0.90	0.00	0.57
BoardProfQual	136	0.30	0.17	0.17	0.29	0.43	0.69	0.00	1.00
BoardHighestDegree	136	0.80	0.50	0.38	0.75	1.12	0.52	0.00	2.11
BoardSciencedegree	136	0.02	0.05	0.00	0.00	0.00	3.07	0.00	0.25
BoardnonSciencedegree	136	0.15	0.14	0.00	0.14	0.25	0.82	0.00	0.67
BoardCambridge	136	0.06	0.09	0.00	0.00	0.13	1.49	0.00	0.43
BoardOxford	136	0.07	0.09	0.00	0.00	0.13	1.67	0.00	0.50
BoardRussellGroup	136	0.25	0.20	0.11	0.25	0.38	0.67	0.00	0.86
BoardGroup1994	136	0.03	0.06	0.00	0.00	0.00	2.52	0.00	0.33
BoardPre1992Uni	136	0.29	0.19	0.14	0.25	0.41	0.34	0.00	0.75
BoardPost1992Uni	136	0.03	0.06	0.00	0.00	0.00	2.43	0.00	0.33
BoardIndependence (%)	136	53.91	16.85	42.86	50	66.67	-0.13	0	100

-> Year = 2002

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
BoardOrgTenure	140	4.14	2.29	2.76	3.54	5.00	1.67	0.83	15.40
BoardAge	140	54.40	3.66	51.67	55.00	56.93	-0.42	44.38	62.14
Boardquotedboardstodate	140	3.22	1.30	2.35	3.00	4.00	0.62	1.00	7.43
BusyBoard	140	1.93	0.68	1.50	1.82	2.20	1.06	1.00	4.40
PriorBoardExperience	140	1.29	0.81	0.69	1.17	1.75	0.60	0.00	3.43
BoardEliteEdu	140	0.14	0.14	0.00	0.13	0.22	0.93	0.00	0.60
BoardProfQual	140	0.30	0.16	0.18	0.29	0.41	0.32	0.00	0.75
BoardHighestDegree	140	0.85	0.50	0.50	0.83	1.17	0.42	0.00	2.17
BoardSciencedegree	140	0.01	0.05	0.00	0.00	0.00	3.11	0.00	0.22
BoardnonSciencedegree	140	0.15	0.14	0.00	0.14	0.25	0.54	0.00	0.50
BoardCambridge	140	0.07	0.10	0.00	0.00	0.14	1.52	0.00	0.50
BoardOxford	140	0.07	0.09	0.00	0.00	0.13	1.30	0.00	0.43
BoardRussellGroup	140	0.28	0.20	0.14	0.25	0.40	0.46	0.00	0.83
BoardGroup1994	140	0.03	0.07	0.00	0.00	0.00	3.44	0.00	0.50
BoardPre1992Uni	140	0.31	0.20	0.17	0.29	0.50	0.19	0.00	0.83
BoardPost1992Uni	140	0.02	0.06	0.00	0.00	0.00	2.59	0.00	0.33
BoardIndependence (%)	140	54.60	15.65	42.86	50.00	66.67	-0.26	0.00	83.33

-> Year = 2003

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
BoardOrgTenure	151	3.91	2.32	2.33	3.44	4.90	1.45	0.23	13.83
BoardAge	151	54.29	3.27	52.29	54.67	56.57	-0.42	43.29	61.33
Boardquotedboardstodate	151	3.19	1.21	2.29	3.13	3.80	0.49	1.00	6.75
BusyBoard	151	1.87	0.63	1.45	1.75	2.13	1.23	1.00	4.40
PriorBoardExperience	151	1.32	0.78	0.78	1.25	1.77	0.61	0.00	3.89
BoardEliteEdu	151	0.13	0.13	0.00	0.13	0.22	0.90	0.00	0.57
BoardProfQual	151	0.31	0.16	0.20	0.29	0.43	0.52	0.00	0.83
BoardHighestDegree	151	0.83	0.50	0.40	0.83	1.10	0.56	0.00	2.30
BoardSciencedegree	151	0.02	0.05	0.00	0.00	0.00	3.60	0.00	0.33
BoardnonSciencedegree	151	0.14	0.13	0.00	0.14	0.22	0.56	0.00	0.50
BoardCambridge	151	0.06	0.10	0.00	0.00	0.13	1.70	0.00	0.50
BoardOxford	151	0.07	0.09	0.00	0.00	0.13	1.31	0.00	0.40
BoardRussellGroup	151	0.27	0.20	0.13	0.25	0.38	0.58	0.00	0.86
BoardGroup1994	151	0.03	0.06	0.00	0.00	0.00	3.47	0.00	0.50
BoardPre1992Uni	151	0.31	0.19	0.17	0.29	0.44	0.42	0.00	0.86
BoardPost1992Uni	151	0.02	0.05	0.00	0.00	0.00	2.15	0.00	0.20
BoardIndependence (%)	151	53.95	14.47	44.44	54.55	64.71	-0.31	0.00	84.62

-> Year = 2004

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
BoardOrgTenure	161	3.78	1.94	2.40	3.46	4.92	1.03	0.86	10.88
BoardAge	161	54.72	3.14	52.86	55.00	56.83	-0.46	44.86	61.57
Boardquotedboardstodate	161	3.30	1.30	2.43	3.20	4.00	1.15	1.00	9.80
BusyBoard	161	1.92	0.65	1.43	1.83	2.22	1.18	1.00	4.50
PriorBoardExperience	161	1.38	0.84	0.80	1.25	1.89	1.39	0.00	6.00
BoardEliteEdu	161	0.13	0.13	0.00	0.11	0.20	0.88	0.00	0.67
BoardProfQual	161	0.32	0.16	0.20	0.30	0.40	0.62	0.00	0.83
BoardHighestDegree	161	0.84	0.51	0.50	0.78	1.10	0.56	0.00	2.30
BoardSciencedegree	161	0.01	0.04	0.00	0.00	0.00	3.04	0.00	0.25
BoardnonSciencedegree	161	0.15	0.13	0.00	0.13	0.22	0.73	0.00	0.56
BoardCambridge	161	0.06	0.09	0.00	0.00	0.13	1.47	0.00	0.50
BoardOxford	161	0.06	0.09	0.00	0.00	0.11	1.42	0.00	0.44
BoardRussellGroup	161	0.27	0.19	0.14	0.25	0.40	0.56	0.00	0.83
BoardGroup1994	161	0.03	0.06	0.00	0.00	0.00	2.32	0.00	0.29
BoardPre1992Uni	161	0.31	0.19	0.17	0.30	0.43	0.34	0.00	0.83
BoardPost1992Uni	161	0.02	0.05	0.00	0.00	0.00	2.40	0.00	0.27
BoardIndependence (%)	161	57.04	14.55	50.00	57.14	66.67	0.09	14.29	100

-> Year = 2005

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
BoardOrgTenure	176	3.65	2.00	2.22	3.16	4.73	1.06	0.00	11.50
BoardAge	176	54.82	3.21	52.63	55.00	57.14	-0.46	43.50	61.33
Boardquotedboardstodate	176	3.40	1.27	2.47	3.24	4.29	0.46	1.00	7.13
BusyBoard	176	1.97	0.62	1.50	1.90	2.35	0.74	1.00	3.88
PriorBoardExperience	176	1.43	0.83	0.85	1.22	2.00	0.62	0.00	3.83
BoardEliteEdu	176	0.13	0.13	0.00	0.11	0.20	0.85	0.00	0.55
BoardProfQual	176	0.33	0.16	0.21	0.33	0.44	0.27	0.00	0.83
BoardHighestDegree	176	0.85	0.52	0.50	0.78	1.13	0.48	0.00	2.25
BoardSciencedegree	176	0.01	0.04	0.00	0.00	0.00	3.20	0.00	0.25
BoardnonSciencedegree	176	0.15	0.14	0.00	0.14	0.22	0.75	0.00	0.60
BoardCambridge	176	0.06	0.09	0.00	0.00	0.13	1.46	0.00	0.43
BoardOxford	176	0.06	0.10	0.00	0.00	0.11	1.68	0.00	0.45
BoardRussellGroup	176	0.26	0.19	0.13	0.25	0.40	0.56	0.00	0.78
BoardGroup1994	176	0.03	0.07	0.00	0.00	0.00	2.14	0.00	0.33
BoardPre1992Uni	176	0.31	0.20	0.16	0.29	0.44	0.29	0.00	0.78
BoardPost1992Uni	176	0.03	0.06	0.00	0.00	0.00	2.53	0.00	0.38
BoardIndependence (%)	176	58.68	13.43	50.00	57.14	66.67	-0.09	25.00	88.89

-> Year = 2006

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
BoardOrgTenure	180	3.65	2.02	2.47	3.25	4.42	1.17	0.25	12.13
BoardAge	180	55.25	3.14	53.22	55.65	57.41	-0.49	43.38	61.67
Boardquotedboardstodate	180	3.55	1.24	2.75	3.39	4.37	0.35	1.00	7.00
BusyBoard	180	2.01	0.59	1.57	2.00	2.33	0.65	1.00	3.79
PriorBoardExperience	180	1.54	0.86	0.89	1.42	2.11	0.54	0.00	4.17
BoardEliteEdu	180	0.12	0.13	0.00	0.11	0.17	0.97	0.00	0.54
BoardProfQual	180	0.34	0.16	0.23	0.33	0.43	0.25	0.00	0.83
BoardHighestDegree	180	0.85	0.53	0.50	0.75	1.20	0.48	0.00	2.38
BoardSciencedegree	180	0.02	0.05	0.00	0.00	0.00	2.81	0.00	0.25
BoardnonSciencedegree	180	0.15	0.14	0.00	0.13	0.22	0.98	0.00	0.67
BoardCambridge	180	0.06	0.09	0.00	0.00	0.13	1.33	0.00	0.38
BoardOxford	180	0.06	0.10	0.00	0.00	0.12	2.02	0.00	0.50
BoardRussellGroup	180	0.26	0.19	0.13	0.22	0.38	0.59	0.00	0.78
BoardGroup1994	180	0.03	0.07	0.00	0.00	0.00	2.44	0.00	0.38
BoardPre1992Uni	180	0.30	0.20	0.14	0.29	0.43	0.41	0.00	0.86
BoardPost1992Uni	180	0.02	0.06	0.00	0.00	0.00	2.24	0.00	0.25
BoardIndependence (%)	180	60.21	12.55	50.00	60.00	69.62	-0.05	25.00	88.89

-> Year = 2007

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
BoardOrgTenure	195	3.64	2.17	2.33	3.22	4.33	1.48	0.00	13.13
BoardAge	195	55.32	3.30	53.25	55.38	57.38	-0.19	46.50	63.83
Boardquotedboardstodate	195	3.66	1.27	2.80	3.50	4.56	0.41	1.00	7.38
BusyBoard	195	2.01	0.58	1.57	2.00	2.33	0.62	1.00	3.71
PriorBoardExperience	195	1.65	0.89	1.00	1.57	2.20	0.60	0.00	4.67
BoardEliteEdu	195	0.11	0.13	0.00	0.11	0.15	1.22	0.00	0.53
BoardProfQual	195	0.34	0.16	0.25	0.33	0.43	0.54	0.00	1.00
BoardHighestDegree	195	0.84	0.52	0.50	0.80	1.17	0.52	0.00	2.33
BoardSciencedegree	195	0.02	0.04	0.00	0.00	0.00	2.81	0.00	0.25
BoardnonSciencedegree	195	0.15	0.14	0.00	0.13	0.25	0.74	0.00	0.60
BoardCambridge	195	0.06	0.09	0.00	0.00	0.11	1.56	0.00	0.43
BoardOxford	195	0.06	0.09	0.00	0.00	0.11	2.25	0.00	0.50
BoardRussellGroup	195	0.26	0.18	0.13	0.25	0.38	0.66	0.00	0.88
BoardGroup1994	195	0.03	0.06	0.00	0.00	0.00	2.36	0.00	0.29
BoardPre1992Uni	195	0.30	0.19	0.14	0.29	0.44	0.32	0.00	0.88
BoardPost1992Uni	195	0.02	0.05	0.00	0.00	0.00	3.05	0.00	0.33
BoardIndependence (%)	195	61.59	12.59	50.00	62.50	71.43	-0.06	25.00	100

-> Year = 2008

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
BoardOrgTenure	202	3.64	2.19	2.20	3.25	4.67	1.34	0.00	12.56
BoardAge	202	55.47	3.46	52.83	55.86	57.89	-0.26	45.40	62.71
Boardquotedboardstodate	202	3.68	1.29	2.80	3.50	4.57	0.44	1.00	7.44
BusyBoard	202	1.95	0.54	1.60	1.90	2.22	1.09	1.00	4.67
PriorBoardExperience	202	1.73	0.95	1.00	1.61	2.40	0.55	0.00	4.83
BoardEliteEdu	202	0.11	0.12	0.00	0.11	0.17	1.22	0.00	0.56
BoardProfQual	202	0.35	0.17	0.23	0.33	0.43	0.54	0.00	1.00
BoardHighestDegree	202	0.86	0.52	0.50	0.80	1.22	0.43	0.00	2.27
BoardSciencedegree	202	0.02	0.05	0.00	0.00	0.00	2.57	0.00	0.22
BoardnonSciencedegree	202	0.16	0.15	0.00	0.14	0.25	0.79	0.00	0.67
BoardCambridge	202	0.06	0.09	0.00	0.00	0.11	1.54	0.00	0.38
BoardOxford	202	0.06	0.09	0.00	0.00	0.11	2.16	0.00	0.50
BoardRussellGroup	202	0.25	0.18	0.13	0.25	0.36	0.43	0.00	0.75
BoardGroup1994	202	0.04	0.08	0.00	0.00	0.00	2.97	0.00	0.50
BoardPre1992Uni	202	0.31	0.20	0.14	0.29	0.43	0.40	0.00	0.88
BoardPost1992Uni	202	0.02	0.05	0.00	0.00	0.00	2.37	0.00	0.29
BoardIndependence (%)	202	62.46	13.49	50.00	62.50	71.43	-0.50	0	100

-> Year = 2009

variable	N	mean	sd	p25	p50	p75	skewness	min	max
BoardOrgTenure	205	3.78	2.01	2.33	3.44	4.82	1.24	0.50	12.00
BoardAge	205	55.92	3.39	53.33	56.14	58.22	0.01	45.67	65.00
Boardquotedboardstodate	205	3.78	1.40	2.78	3.56	4.67	0.57	1.00	8.50
BusyBoard	205	1.94	0.60	1.56	1.82	2.25	1.50	1.00	5.00
PriorBoardExperience	205	1.84	1.04	1.00	1.67	2.50	0.73	0.00	5.80
BoardEliteEdu	205	0.10	0.12	0.00	0.09	0.17	1.28	0.00	0.63
BoardProfQual	205	0.34	0.17	0.22	0.33	0.43	0.61	0.00	1.00
BoardHighestDegree	205	0.84	0.51	0.44	0.80	1.14	0.47	0.00	2.22
BoardSciencedegree	205	0.02	0.05	0.00	0.00	0.00	2.37	0.00	0.25
BoardnonSciencedegree	205	0.16	0.15	0.00	0.14	0.25	0.91	0.00	0.67
BoardCambridge	205	0.05	0.08	0.00	0.00	0.11	1.70	0.00	0.43
BoardOxford	205	0.05	0.09	0.00	0.00	0.11	2.06	0.00	0.50
BoardRussellGroup	205	0.25	0.18	0.13	0.22	0.38	0.47	0.00	0.80
BoardGroup1994	205	0.03	0.07	0.00	0.00	0.00	2.54	0.00	0.43
BoardPre1992Uni	205	0.29	0.20	0.14	0.29	0.43	0.28	0.00	0.80
BoardPost1992Uni	205	0.03	0.06	0.00	0.00	0.00	2.39	0.00	0.33
BoardIndependence (%)	205	64.07	13.59	55.56	62.50	71.43	-0.20	0	100

-> Year = 2010

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
BoardOrgTenure	211	4.05	2.31	2.46	3.67	5.00	1.87	0.33	18.00
BoardAge	211	56.35	3.42	53.88	56.40	58.80	0.03	45.80	66.00
Boardquotedboardstodate	211	3.85	1.35	2.89	3.75	4.63	0.44	1.00	8.60
BusyBoard	211	1.94	0.54	1.57	1.88	2.29	0.87	1.00	4.50
PriorBoardExperience	211	1.91	1.02	1.17	1.80	2.50	0.80	0.00	6.20
BoardEliteEdu	211	0.11	0.12	0.00	0.10	0.18	1.08	0.00	0.63
BoardProfQual	211	0.34	0.17	0.22	0.33	0.43	0.65	0.00	1.00
BoardHighestDegree	211	0.87	0.50	0.50	0.86	1.20	0.32	0.00	2.20
BoardSciencedegree	211	0.02	0.05	0.00	0.00	0.00	2.69	0.00	0.33
BoardnonSciencedegree	211	0.17	0.15	0.00	0.15	0.25	0.93	0.00	0.70
BoardCambridge	211	0.05	0.08	0.00	0.00	0.11	1.27	0.00	0.33
BoardOxford	211	0.05	0.09	0.00	0.00	0.11	2.02	0.00	0.50
BoardRussellGroup	211	0.25	0.18	0.13	0.25	0.38	0.51	0.00	0.82
BoardGroup1994	211	0.04	0.07	0.00	0.00	0.00	2.21	0.00	0.43
BoardPre1992Uni	211	0.30	0.20	0.17	0.29	0.43	0.37	0.00	0.83
BoardPost1992Uni	211	0.03	0.07	0.00	0.00	0.00	2.08	0.00	0.33
BoardIndependence (%)	211	64.05	13.49	55.56	66.67	71.43	-1.07	0	90.91

Table 8.8a - 8.8i: Descriptive Statistics for board-level human capital measures for the pooled sample classified by the industry

-> ICB_Industry_Name = Basic Materials

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
BoardOrgTenure	109	3.62	2.15	2.00	3.14	4.83	0.75	0.00	9.50
BoardAge	109	56.65	3.68	54.88	57.43	59.17	-0.55	46.86	65.70
Boardquotedboardstodate	109	3.93	1.39	3.00	3.82	5.08	0.04	1.00	7.23
BusyBoard	109	2.46	0.89	1.86	2.33	2.86	0.60	1.00	4.67
PriorBoardExperience	109	1.46	0.80	0.88	1.33	1.91	0.45	0.00	3.91
BoardEliteEdu	109	0.13	0.14	0.00	0.11	0.21	1.02	0.00	0.55
BoardProfQual	109	0.24	0.16	0.13	0.22	0.36	0.71	0.00	0.67
BoardHighestDegree	109	1.26	0.52	1.00	1.20	1.50	0.10	0.00	2.30
BoardSciencedegree	109	0.05	0.07	0.00	0.00	0.11	0.87	0.00	0.23
BoardnonSciencedegree	109	0.25	0.18	0.13	0.23	0.40	0.31	0.00	0.67
BoardCambridge	109	0.07	0.08	0.00	0.00	0.14	0.72	0.00	0.29
BoardOxford	109	0.07	0.11	0.00	0.00	0.11	2.08	0.00	0.47
BoardRussellGroup	109	0.22	0.16	0.13	0.22	0.33	0.34	0.00	0.64
BoardGroup1994	109	0.02	0.05	0.00	0.00	0.00	2.62	0.00	0.20
BoardPre1992Uni	109	0.24	0.19	0.11	0.22	0.36	0.55	0.00	0.71
BoardPost1992Uni	109	0.01	0.03	0.00	0.00	0.00	2.72	0.00	0.14
BoardIndependence (%)	109	69.60	13.71	57.14	71.43	81.82	-0.28	40	90.91

-> ICB_Industry_Name = Consumer Goods

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
BoardOrgTenure	252	3.97	2.27	2.43	3.33	5.14	1.09	0.00	12.71
BoardAge	252	55.58	2.86	53.60	55.61	57.38	0.32	48.50	66.00
Boardquotedboardstodate	252	3.50	1.49	2.33	3.20	4.50	0.56	1.00	8.00
BusyBoard	252	1.95	0.67	1.43	1.83	2.35	0.89	1.00	5.00
PriorBoardExperience	252	1.55	0.97	0.80	1.39	2.20	0.68	0.00	4.67
BoardEliteEdu	252	0.09	0.13	0.00	0.00	0.14	1.60	0.00	0.63
BoardProfQual	252	0.34	0.16	0.22	0.33	0.43	0.44	0.00	1.00
BoardHighestDegree	252	0.72	0.58	0.20	0.67	1.08	0.49	0.00	2.08
BoardSciencedegree	252	0.01	0.03	0.00	0.00	0.00	3.13	0.00	0.18
BoardnonSciencedegree	252	0.13	0.16	0.00	0.09	0.20	1.26	0.00	0.70
BoardCambridge	252	0.05	0.09	0.00	0.00	0.09	1.76	0.00	0.38
BoardOxford	252	0.04	0.09	0.00	0.00	0.08	2.90	0.00	0.50
BoardRussellGroup	252	0.22	0.21	0.00	0.20	0.33	0.87	0.00	0.80
BoardGroup1994	252	0.02	0.06	0.00	0.00	0.00	3.29	0.00	0.33
BoardPre1992Uni	252	0.25	0.22	0.09	0.20	0.40	0.69	0.00	0.80
BoardPost1992Uni	252	0.03	0.06	0.00	0.00	0.00	2.81	0.00	0.38
BoardIndependence (%)	252	59.85	16.58	50	60	71.43	-0.08	14.29	100

-> ICB_Industry_Name = Consumer Services

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
BoardOrgTenure	426	3.86	2.36	2.17	3.43	5.00	1.10	0.00	13.50
BoardAge	426	54.19	3.76	51.56	53.82	56.83	0.12	42.67	64.63
Boardquotedboardstodate	426	3.69	1.43	2.71	3.61	4.56	0.54	1.00	9.80
BusyBoard	426	1.96	0.63	1.50	1.86	2.29	0.96	1.00	4.50
PriorBoardExperience	426	1.73	1.03	1.00	1.67	2.29	0.88	0.00	6.20
BoardEliteEdu	426	0.11	0.12	0.00	0.11	0.17	1.06	0.00	0.57
BoardProfQual	426	0.32	0.15	0.22	0.33	0.43	0.02	0.00	0.75
BoardHighestDegree	426	0.74	0.43	0.44	0.75	1.00	0.35	0.00	2.09
BoardSciencedegree	426	0.00	0.02	0.00	0.00	0.00	5.33	0.00	0.14
BoardnonSciencedegree	426	0.16	0.13	0.00	0.14	0.22	0.74	0.00	0.60
BoardCambridge	426	0.05	0.08	0.00	0.00	0.11	1.63	0.00	0.38
BoardOxford	426	0.06	0.09	0.00	0.00	0.13	1.80	0.00	0.50
BoardRussellGroup	426	0.23	0.17	0.13	0.22	0.33	0.61	0.00	0.88
BoardGroup1994	426	0.04	0.08	0.00	0.00	0.00	2.50	0.00	0.50
BoardPre1992Uni	426	0.31	0.19	0.20	0.29	0.43	0.50	0.00	0.88
BoardPost1992Uni	426	0.02	0.05	0.00	0.00	0.00	2.17	0.00	0.22
BoardIndependence (%)	426	59.10	15.43	50.00	60.00	71.43	-0.66	0	100

-> ICB_Industry_Name = Health Care

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
BoardOrgTenure	71	3.33	1.79	2.15	3.00	4.25	1.12	0.71	9.29
BoardAge	71	56.95	3.71	55.00	57.33	59.85	-0.66	45.67	63.63
Boardquotedboardstodate	71	4.11	1.18	3.17	4.07	5.00	0.15	1.56	6.87
BusyBoard	71	2.25	0.63	1.75	2.14	2.71	0.32	1.17	3.44
PriorBoardExperience	71	1.86	0.79	1.38	1.79	2.29	0.09	0.14	3.47
BoardEliteEdu	71	0.15	0.14	0.00	0.14	0.23	0.58	0.00	0.50
BoardProfQual	71	0.26	0.11	0.17	0.25	0.33	-0.11	0.00	0.44
BoardHighestDegree	71	1.52	0.56	1.00	1.75	1.93	-0.66	0.17	2.25
BoardSciencedegree	71	0.03	0.05	0.00	0.00	0.07	1.31	0.00	0.20
BoardnonSciencedegree	71	0.23	0.14	0.17	0.25	0.33	-0.30	0.00	0.47
BoardCambridge	71	0.10	0.11	0.00	0.11	0.17	0.78	0.00	0.43
BoardOxford	71	0.05	0.08	0.00	0.00	0.13	1.01	0.00	0.25
BoardRussellGroup	71	0.36	0.21	0.22	0.36	0.50	0.04	0.00	0.86
BoardGroup1994	71	0.05	0.09	0.00	0.00	0.09	1.74	0.00	0.33
BoardPre1992Uni	71	0.39	0.20	0.29	0.38	0.50	-0.12	0.00	0.75
BoardPost1992Uni	71	0.04	0.06	0.00	0.00	0.11	1.06	0.00	0.22
BoardIndependence (%)	71	69.99	10.63	66.67	72.73	76.92	-1.28	33.33	86.67

-> ICB_Industry_Name = Industrials

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
BoardOrgTenure	655	3.65	2.02	2.43	3.27	4.43	2.03	0.00	15.40
BoardAge	655	55.26	2.97	53.44	55.50	57.30	-0.29	44.43	63.13
Boardquotedboardstodate	655	3.34	1.17	2.50	3.22	4.17	0.45	1.00	7.38
BusyBoard	655	1.84	0.47	1.50	1.80	2.14	0.51	1.00	3.50
PriorBoardExperience	655	1.50	0.88	0.88	1.33	2.00	0.68	0.00	4.17
BoardEliteEdu	655	0.12	0.12	0.00	0.11	0.17	1.04	0.00	0.67
BoardProfQual	655	0.38	0.16	0.25	0.38	0.50	0.52	0.00	1.00
BoardHighestDegree	655	0.73	0.40	0.43	0.71	1.00	0.41	0.00	2.17
BoardSciencedegree	655	0.02	0.05	0.00	0.00	0.00	3.18	0.00	0.33
BoardnonSciencedegree	655	0.12	0.12	0.00	0.11	0.17	0.89	0.00	0.67
BoardCambridge	655	0.06	0.09	0.00	0.00	0.13	1.70	0.00	0.50
BoardOxford	655	0.06	0.09	0.00	0.00	0.13	1.78	0.00	0.50
BoardRussellGroup	655	0.27	0.18	0.14	0.25	0.40	0.56	0.00	0.86
BoardGroup1994	655	0.03	0.07	0.00	0.00	0.00	2.97	0.00	0.50
BoardPre1992Uni	655	0.30	0.18	0.17	0.29	0.43	0.40	0.00	0.86
BoardPost1992Uni	655	0.03	0.06	0.00	0.00	0.00	2.28	0.00	0.33
BoardIndependence (%)	655	56.98	12.84	50.00	57.14	66.67	-0.29	0	100

-> ICB_Industry_Name = Oil & Gas

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
BoardOrgTenure	85	4.47	1.60	3.57	4.36	5.46	0.13	0.86	8.67
BoardAge	85	57.27	2.33	55.78	57.36	59.00	-0.39	50.50	61.29
Boardquotedboardstodate	85	3.47	1.38	2.40	3.00	4.63	0.78	1.33	7.00
BusyBoard	85	1.94	0.55	1.55	1.78	2.25	0.84	1.17	3.40
PriorBoardExperience	85	1.53	0.93	0.80	1.30	2.11	1.07	0.17	5.00
BoardEliteEdu	85	0.14	0.09	0.11	0.16	0.20	-0.26	0.00	0.33
BoardProfQual	85	0.17	0.10	0.10	0.18	0.25	0.09	0.00	0.40
BoardHighestDegree	85	1.25	0.45	0.92	1.17	1.44	0.73	0.29	2.38
BoardSciencedegree	85	0.03	0.05	0.00	0.00	0.00	1.46	0.00	0.17
BoardnonSciencedegree	85	0.22	0.14	0.15	0.21	0.33	0.33	0.00	0.67
BoardCambridge	85	0.07	0.07	0.00	0.08	0.14	0.26	0.00	0.20
BoardOxford	85	0.07	0.09	0.00	0.00	0.14	1.01	0.00	0.30
BoardRussellGroup	85	0.32	0.14	0.22	0.30	0.43	0.23	0.00	0.71
BoardGroup1994	85	0.03	0.05	0.00	0.00	0.07	1.20	0.00	0.17
BoardPre1992Uni	85	0.34	0.14	0.25	0.30	0.42	0.73	0.00	0.83
BoardPost1992Uni	85	0.03	0.05	0.00	0.00	0.00	1.53	0.00	0.17
BoardIndependence (%)	85	60.27	11.56	50.00	60.00	66.67	0.27	37.50	81.82

-> ICB_Industry_Name = Technology

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
BoardOrgTenure	78	4.40	2.78	2.67	3.67	5.83	1.81	0.57	18.00
BoardAge	78	52.98	4.65	49.80	53.09	57.00	-0.31	43.29	60.89
Boardquotedboardstodate	78	2.95	1.03	2.00	3.07	3.75	0.18	1.17	6.00
BusyBoard	78	1.96	0.53	1.50	2.00	2.25	0.57	1.17	4.00
PriorBoardExperience	78	0.99	0.60	0.50	1.00	1.50	0.07	0.00	2.20
BoardEliteEdu	78	0.13	0.16	0.00	0.00	0.31	0.65	0.00	0.44
BoardProfQual	78	0.33	0.17	0.20	0.32	0.38	1.43	0.00	1.00
BoardHighestDegree	78	0.94	0.44	0.67	0.85	1.30	-0.03	0.00	1.80
BoardSciencedegree	78	0.03	0.06	0.00	0.00	0.08	1.72	0.00	0.25
BoardnonSciencedegree	78	0.16	0.14	0.00	0.14	0.25	0.63	0.00	0.50
BoardCambridge	78	0.10	0.12	0.00	0.00	0.17	0.78	0.00	0.33
BoardOxford	78	0.03	0.06	0.00	0.00	0.00	1.55	0.00	0.20
BoardRussellGroup	78	0.29	0.23	0.13	0.25	0.44	0.41	0.00	0.82
BoardGroup1994	78	0.05	0.08	0.00	0.00	0.13	0.86	0.00	0.20
BoardPre1992Uni	78	0.35	0.23	0.14	0.40	0.56	-0.42	0.00	0.70
BoardPost1992Uni	78	0.01	0.05	0.00	0.00	0.00	4.79	0.00	0.33
BoardIndependence (%)	78	60.19	14.86	50.00	66.67	66.67	-0.86	0	100

-> ICB_Industry_Name = Telecommunications

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
BoardOrgTenure	29	3.02	1.05	2.38	3.00	3.71	0.08	1.00	5.00
BoardAge	29	53.33	3.24	51.00	54.13	55.23	-0.41	45.80	59.50
Boardquotedboardstodate	29	3.49	1.45	2.44	3.00	3.69	1.27	2.00	6.88
BusyBoard	29	1.88	0.67	1.40	1.67	2.23	0.95	1.00	3.50
PriorBoardExperience	29	1.61	0.89	1.00	1.29	1.62	1.47	0.67	3.88
BoardEliteEdu	29	0.13	0.15	0.00	0.13	0.15	1.68	0.00	0.60
BoardProfQual	29	0.39	0.10	0.33	0.38	0.40	1.07	0.25	0.60
BoardHighestDegree	29	0.86	0.69	0.22	0.60	1.46	0.40	0.00	2.13
BoardSciencedegree	29	0.00	0.00	0.00	0.00	0.00	.	0.00	0.00
BoardnonSciencedegree	29	0.14	0.12	0.00	0.13	0.20	0.51	0.00	0.40
BoardCambridge	29	0.09	0.12	0.00	0.08	0.13	1.79	0.00	0.50
BoardOxford	29	0.04	0.07	0.00	0.00	0.00	1.41	0.00	0.20
BoardRussellGroup	29	0.26	0.14	0.17	0.25	0.38	0.56	0.00	0.60
BoardGroup1994	29	0.02	0.05	0.00	0.00	0.00	1.73	0.00	0.13
BoardPre1992Uni	29	0.23	0.20	0.00	0.25	0.38	0.07	0.00	0.60
BoardPost1992Uni	29	0.02	0.03	0.00	0.00	0.00	1.45	0.00	0.08
BoardIndependence (%)	29	62.66	12.52	53.85	62.50	71.43	-0.73	28.57	80.00

-> ICB_Industry_Name = Utilities

variable	*N*	*mean*	*sd*	*p25*	*p50*	*p75*	*skewness*	*min*	*max*
BoardOrgTenure	52	3.32	1.66	2.10	2.89	4.52	0.52	0.00	6.57
BoardAge	52	54.76	2.39	53.00	54.85	56.35	0.46	50.22	61.20
Boardquotedboardstodate	52	3.47	0.88	2.87	3.13	3.84	1.15	2.40	5.69
BusyBoard	52	1.88	0.30	1.65	1.79	2.05	0.56	1.33	2.54
PriorBoardExperience	52	1.59	0.64	1.14	1.38	1.90	1.03	0.80	3.15
BoardEliteEdu	52	0.21	0.16	0.07	0.23	0.33	0.11	0.00	0.50
BoardProfQual	52	0.22	0.08	0.18	0.21	0.25	-0.85	0.00	0.38
BoardHighestDegree	52	1.10	0.37	0.89	1.14	1.32	-0.18	0.20	1.83
BoardSciencedegree	52	0.04	0.05	0.00	0.00	0.08	1.13	0.00	0.18
BoardnonSciencedegree	52	0.23	0.12	0.13	0.21	0.30	0.15	0.00	0.50
BoardCambridge	52	0.04	0.07	0.00	0.00	0.09	1.37	0.00	0.22
BoardOxford	52	0.17	0.13	0.04	0.19	0.28	-0.06	0.00	0.40
BoardRussellGroup	52	0.37	0.20	0.29	0.38	0.50	-0.29	0.00	0.75
BoardGroup1994	52	0.03	0.05	0.00	0.00	0.09	1.25	0.00	0.17
BoardPre1992Uni	52	0.45	0.20	0.35	0.50	0.59	-0.82	0.00	0.75
BoardPost1992Uni	52	0.04	0.06	0.00	0.00	0.10	1.14	0.00	0.20
BoardIndependence (%)	52	57.19	7.32	54.55	58.33	61.54	-1.58	28.57	70.00

Table 8.9a: Correlation Matrix for Accounting Variables

	MV1	***BV1***	***E1***	***RD1***	***D1***	***CC1***	***CE1***
MV1	1						
BV1	0.6192* 0.0000	1					
E1	0.6177* 0.0000	0.5573* 0.0000	1				
RD1	0.1960* 0.0000	0.0670* 0.0050	0.3066* 0.0000	1			
D1	0.6140* 0.0000	0.6113* 0.0000	0.3888* 0.0000	0.1698* 0.0000	1		
CC1	-0.1811* 0.0000	-0.1150* 0.0000	-0.0417 0.0804	0.0079 0.7413	0.0093 0.6954	1	
CE1	0.4775* 0.0000	0.6752* 0.0000	0.4128* 0.0000	-0.0012 0.9603	0.5183* 0.0000	-0.0646* 0.0067	1

Table 8.9b: Correlation Matrix for Network Measures

	DegreeCen	***CloseCen***	***BetweenCen***	***EigenvectorCen***	***Effectivesize***	***AggregateCons***
DegreeCen	1					
CloseCen	0.5796* 0.0000	1				
BetweenCen	0.6324* 0.0000	0.5960* 0.0000	1			
EigenvectorCen	0.3311* 0.0000	0.1772* 0.0000	0.1259* 0.0000	1		
EffectiveSize	0.7425* 0.0000	0.7629* 0.0000	0.8440* 0.0000	0.2564* 0.0000	1	
AggregateCons	-0.8500* 0.0000	-0.7502* 0.0000	-0.5977* 0.0000	-0.2202* 0.0000	-0.7406* 0.0000	1

Table 8.9c: Correlation Matrix for Human Capital Measures

	BoardAge	Boardquoted	BusyBoard	BoardOrgTen	PriorBoardExp	BoardEliteEdu	BoardProf	BoardCamb	BoardOxf	Russell
BoardAge	1									
Boardquotedtodate	0.2905*	1								
	0.0000									
BusyBoard	0.2694*	0.7847*	1							
	0.0000	0.0000								
BoardOrgTenure	0.2087*	-0.1987*	-0.1812*	1						
	0.0000	0.0000	0.0000							
PriorBoardExp	0.2377*	0.9125*	0.4625*	-0.1646*	1					
	0.0000	0.0000	0.0000	0.0000						
BoardEliteEdu	0.0585*	0.1648*	0.1437*	-0.1222*	0.1408*	1				
	0.0141	0.0000	0.0000	0.0000	0.0000					
BoardProfQual	-0.0908*	-0.0229	-0.0971*	0.0071	0.0313	-0.2145*	1			
	0.0001	0.3379	0.0000	0.7665	0.1892	0.0000				
BoardCamb	0.0425	0.1137*	0.1515*	-0.0756*	0.0627*	0.6873*	-0.1206*	1		
	0.0749	0.0000	0.0000	0.0015	0.0085	0.0000	0.0000			
BoardOxf	0.0397	0.1174*	0.0522*	-0.0955*	0.1335*	0.7156*	-0.1792*	-0.0155	1	
	0.0962	0.0000	0.0286	0.0001	0.0000	0.0000	0.0000	0.5149		
BoardRussell	0.0076	0.1857*	0.1369*	-0.1072*	0.1752*	0.6784*	-0.1226*	0.4912*	0.4615*	1
	0.7490	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	

Table 8.10: Univariate Analyses - Network Measures –Market value deflated by the number of shares

	MV1	MV1	MV1	MV1	MV1	MV1
Boarddegreecentrality	-139.563					
	(1.52)					
Boardclosenesscentrality		13.053				
		(4.88)***				
Boardbetweennesscentrality			11.877			
			(0.20)			
Boardeigenvectorcentrality				0.058		
				(1.24)		
Boardeffectivesize					0.207	
					(2.91)***	
Boardaggregateconstraint						-4.125
						(4.62)***
_cons	5.461	3.217	4.566	4.570	3.816	6.148
	(9.53)***	(11.44)***	(40.08)***	(310.26)***	(14.39)***	(18.21)***
R-squared_within	0.003	0.036	0.000	0.001	0.011	0.013
R-squared_between	0.091	0.015	0.005	0.012	0.024	0.060
R-squared_overall	0.049	0.031	0.003	0.009	0.023	0.051
Number of groups	242	242	242	242	242	242
Number of observations	1,757	1,757	1,757	1,757	1,757	1,757

* p<0.1; ** p<0.05; *** p<0.01

MV1 represents the market value per share.

Table 8.11: Univariate Analyses – Human Capital Measures –Market value deflated by the number of shares

	MV1	MV1	MV1	MV1	MV1	MV1	MV1	MV1
BoardAge	0.201							
	(4.38)***							
Boardquotedboardstodate		0.146						
		(0.86)						
BusyBoard			-0.324					
			(0.82)					
BoardOrgTenure				0.155				
				(2.13)**				
PriorBoardExp					0.378			
					(1.93)*			
BoardEliteEducation						0.444		
						(0.30)		
BoardProfQual							1.881	
							(1.75)*	
BoardHighestDegree								0.113
								(0.14)
_cons	-6.470	4.076	5.220	4.002	3.998	4.536	3.969	4.493
	(2.57)**	(6.83)***	(6.75)***	(14.51)***	(13.06)***	(25.50)***	(11.19)***	(6.55)***
R-squared_within	0.019	0.001	0.001	0.006	0.005	0.000	0.004	0.000
R-squared_between	0.055	0.032	0.087	0.003	0.005	0.003	0.069	0.084
R-squared_overall	0.044	0.036	0.059	0.000	0.012	0.001	0.031	0.063
Number of groups	242	242	242	242	242	242	242	242
Number of observations	1,757	1,757	1,757	1,757	1,757	1,757	1,757	1,757

* p<0.1; ** p<0.05; *** p<0.01

MV1 represents the market value per share.

Table 8.12: Univariate Analyses – Human Capital Measures –Market value deflated by the number of shares

	MV1	MV1	MV1	MV1	MV1	MV1	MV1	MV1
BoardCambridge	-2.563 (1.50)							
BoardOxford		2.991 (0.97)						
BoardScienceDegree			5.840 (1.08)					
BoardnonScienceDegree				4.805 (1.93)*				
BoardRussellGroup					-0.001 (0.00)			
BoardPre1992_Uni						0.314 (0.37)		
BoardPost1992_Uni							0.844 (0.38)	
BoardGroup1994								1.232 (0.69)
_cons	4.739 (47.26)***	4.409 (23.74)***	4.488 (48.08)***	3.855 (10.16)***	4.589 (15.88)***	4.494 (17.38)***	4.568 (82.62)***	4.550 (82.00)***
R-squared_within	0.002	0.003	0.003	0.016	0.000	0.000	0.000	0.000
R-squared_between	0.000	0.007	0.060	0.022	0.000	0.000	0.001	0.003
R-squared_overall	0.000	0.003	0.033	0.041	0.000	0.001	0.000	0.000
Number of groups	242	242	242	242	242	242	242	242
Number of observations	1,757	1,757	1,757	1,757	1,757	1,757	1,757	1,757

* p<0.1; ** p<0.05; *** p<0.01

MV1 represents the market value per share.

Table 8.13: Univariate Analyses - Network Measures –Market value deflated by net sales or revenues

	MV2	MV2	MV2	MV2	MV2	MV2
Boarddegreecentrality	-12.968					
	(0.57)					
Boardclosenesscentrality		0.590				
		(0.58)				
Boardbetweennesscentrality			1.192			
			(0.07)			
Boardeigenvectorcentrality				-0.002		
				(0.42)		
Boardeffectivesize					0.010	
					(0.55)	
Boardaggregateconstraint						-0.090
						(0.24)
_cons	1.565	1.420	1.480	1.483	1.444	1.516
	(10.82)***	(13.14)***	(44.53)***	(774.72)***	(20.39)***	(10.77)***
R-squared_within	0.000	0.001	0.000	0.000	0.000	0.000
R-squared_between	0.011	0.025	0.031	0.006	0.035	0.007
R-squared_overall	0.000	0.001	0.005	0.002	0.005	0.000
Number of groups	237	237	237	237	237	237
Number of observations	1,731	1,731	1,731	1,731	1,731	1,731

* *p*<0.1; ** *p*<0.05; *** *p*<0.01

MV2 represents the market value deflated by net sales or revenues.

Table 8.14: Univariate Analyses – Human Capital Measures –Market value deflated by net sales or revenues

	MV2	MV2	MV2	MV2	MV2	MV2	MV2	MV2
BoardAge	0.015 (0.86)							
Boarquotedboardsto date		0.008 (0.25)						
BusyBoard			0.022 (0.33)					
BoardOrgTenure				0.038 (1.50)				
PriorBoardExp					0.005 (0.13)			
BoardEliteEducation						0.402 (1.23)		
BoardProfQual							0.573 (2.73)***	
BoardHighestDeg								0.106 (0.74)
_cons	0.640 (0.65)	1.453 (12.35)***	1.440 (10.92)***	1.339 (13.99)***	1.474 (22.63)***	1.435 (36.73)***	1.295 (18.79)***	1.393 (11.43)***
R-squared_within	0.001	0.000	0.000	0.003	0.000	0.001	0.003	0.001
R-squared_between	0.016	0.005	0.000	0.009	0.013	0.000	0.023	0.062
R-squared_overall	0.002	0.001	0.002	0.007	0.007	0.003	0.016	0.049
Number of groups	237	237	237	237	237	237	237	237
Number of observations	1,731	1,731	1,731	1,731	1,731	1,731	1,731	1,731

* p<0.1; ** p<0.05; *** p<0.01

MV2 represents the market value deflated by net sales or revenues.

Table 8.15: Univariate Analyses – Human Capital Measures –Market value deflated by net sales or revenues

	MV2	MV2	MV2	MV2	MV2	MV2	MV2	MV2
BoardCambridge	0.517							
	(1.10)							
BoardOxford		0.272						
		(0.68)						
BoardScienceDegree			-0.062					
			(0.08)					
BoardnonScienceDegree				0.202				
				(0.65)				
BoardRussellGroup					0.463			
					(1.72)*			
BoardPre1992_Uni						0.377		
						(1.64)		
BoardPost1992_Uni							0.370	
							(0.55)	
BoardGroup1994								-0.479
								(1.08)
_cons	1.452	1.466	1.484	1.451	1.363	1.369	1.473	1.497
	(52.52)***	(60.39)***	(99.65)***	(30.17)***	(19.50)***	(19.84)***	(85.46)***	(108.68)***
R-squared_within	0.001	0.000	0.000	0.000	0.003	0.002	0.000	0.001
R-squared_between	0.002	0.000	0.002	0.020	0.003	0.004	0.002	0.002
R-squared_overall	0.008	0.000	0.010	0.007	0.002	0.001	0.000	0.001
Number of groups	237	237	237	237	237	237	237	237
Number of observations	1,731	1,731	1,731	1,731	1,731	1,731	1,731	1,731

* *p*<0.1; ** *p*<0.05; *** *p*<0.01

MV2 represents the market value deflated by net sales or revenues.

Table 8.16: Univariate Analyses – Network Measures –Market value deflated by the opening market value

	MV3	MV3	MV3	MV3	MV3	MV3
Boarddegreecentrality	2.162					
	(0.24)					
Boardclosenesscentrality		0.555				
		(1.93)*				
Boardbetweennesscentrality			1.231			
			(0.18)			
Boardeigenvectorcentrality				-0.001		
				(0.08)		
Boardeffectivesize					0.006	
					(0.82)	
Boardaggregateconstraint						-0.217
						(1.44)
_cons	1.111	1.067	1.122	1.125	1.103	1.207
	(19.33)***	(35.63)***	(90.39)***	(417.12)***	(41.02)***	(21.21)***
R-squared_within	0.000	0.003	0.000	0.000	0.000	0.002
R-squared_between	0.005	0.010	0.025	0.012	0.029	0.000
R-squared_overall	0.001	0.000	0.002	0.001	0.002	0.000
Number of groups	240	240	240	240	240	240
Number of observations	1,716	1,716	1,716	1,716	1,716	1,716

* *p*<0.1; ** *p*<0.05; *** *p*<0.01

MV3 represents the market value deflated by the opening market value.

Table 8.17: Univariate Analyses – Human Capital Measures –Market value deflated by the opening market value

	MV3	MV3	MV3	MV3	MV3	MV3	MV3	MV3
BoardAge	0.009							
	(1.24)							
Boardquotedboardstodate		0.005						
		(0.30)						
BusyBoard			-0.028					
			(0.90)					
BoardOrgTenure				-0.002				
				(0.32)				
PriorBoardExp					0.019			
					(0.96)			
BoardEliteEducation						-0.002		
						(0.01)		
BoardProfQual							0.269	
							(2.08)**	
BoardHighestDegree								-0.017
								(0.29)
_cons	0.637	1.108	1.179	1.134	1.095	1.125	1.037	1.139
	(1.62)	(20.46)***	(19.53)***	(38.86)***	(35.45)***	(63.33)***	(24.57)***	(23.48)***
R-squared_within	0.002	0.000	0.001	0.000	0.001	0.000	0.004	0.000
R-squared_between	0.039	0.006	0.000	0.016	0.010	0.000	0.004	0.000
R-squared_overall	0.004	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Number of groups	240	240	240	240	240	240	240	240
Number of observations	1,716	1,716	1,716	1,716	1,716	1,716	1,716	1,716

* *p*<0.1; ** *p*<0.05; *** *p*<0.01

MV3 represents the market value deflated by the opening market value.

Table 8.18: Univariate Analyses – Human Capital Measures –Market value deflated by the opening market value

	MV3	MV3	MV3	MV3	MV3	MV3	MV3	MV3
BoardCambridge	0.021							
	(0.09)							
BoardOxford		-0.022						
		(0.11)						
BoardScienceDegree			-0.058					
			(0.17)					
BoardnonScienceDegree				-0.154				
				(1.02)				
BoardRussellGroup					-0.013			
					(0.13)			
BoardPre1992_Uni						-0.013		
						(0.14)		
BoardPost1992_Uni							0.320	
							(0.99)	
BoardGroup1994								-0.219
								(0.94)
_cons	1.123	1.126	1.126	1.148	1.128	1.129	1.117	1.131
	(82.07)***	(91.13)***	(173.87)***	(49.58)***	(41.54)***	(38.99)***	(137.76)***	(159.22)***
R-squared_within	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.001
R-squared_between	0.000	0.000	0.002	0.015	0.001	0.002	0.021	0.010
R-squared_overall	0.000	0.000	0.000	0.003	0.000	0.001	0.000	0.001
Number of groups	240	240	240	240	240	240	240	240
Number of observations	1,716	1,716	1,716	1,716	1,716	1,716	1,716	1,716

* *p*<0.1; ** *p*<0.05; *** *p*<0.01

MV3 represents the market value deflated by the opening market value.

Table 8.19: Univariate Analyses - Network Measures –Market value deflated by the closing book value

	MV4	MV4	MV4	MV4	MV4	MV4
Boarddegreecentrality	-37.899					
	(0.78)					
Boardclosenesscentrality		-0.080				
		(0.06)				
Boardbetweennesscentrality			-54.690			
			(1.28)			
Boardeigenvectorcentrality				-0.007		
				(0.12)		
Boardeffectivesize					-0.023	
					(0.66)	
Boardaggregateconstraint						0.004
						(0.01)
_cons	3.469	3.239	3.333	3.233	3.315	3.230
	(11.38)***	(21.77)***	(41.62)***	(163.30)***	(26.05)***	(12.67)***
R-squared_within	0.001	0.000	0.002	0.000	0.000	0.000
R-squared_between	0.006	0.004	0.003	0.000	0.000	0.011
R-squared_overall	0.002	0.001	0.001	0.000	0.000	0.003
Number of groups	242	242	242	242	242	242
Number of observations	1,746	1,746	1,746	1,746	1,746	1,746

* p<0.1; ** p<0.05; *** p<0.01

MV4 represents the market value deflated by the closing book value.

Table 8.20: Univariate Analyses – Human Capital Measures –Market value deflated by the closing book value

	MV4	MV4	MV4	MV4	MV4	MV4	MV4	MV4
BoardAge	-0.059							
	(1.64)							
Boardquotedboardstodate		-0.061						
		(0.71)						
BusyBoard			0.106					
			(0.60)					
BoardOrgTenure				-0.061				
				(1.19)				
PriorBoardExp					-0.143			
					(1.29)			
BoardEliteEducation						0.117		
						(0.15)		
BoardProfQual							0.160	
							(0.22)	
BoardHighestDegree								-0.182
								(0.65)
_cons	6.468	3.446	3.023	3.461	3.454	3.217	3.179	3.386
	(3.28)***	(11.40)***	(8.79)***	(17.94)***	(19.93)***	(35.90)***	(13.58)***	(14.17)***
R-squared_within	0.004	0.000	0.000	0.002	0.002	0.000	0.000	0.000
R-squared_between	0.002	0.000	0.000	0.006	0.000	0.002	0.002	0.004
R-squared_overall	0.006	0.000	0.002	0.000	0.000	0.003	0.001	0.003
Number of groups	242	242	242	242	242	242	242	242
Number of observations	1,746	1,746	1,746	1,746	1,746	1,746	1,746	1,746

* *p*<0.1; ** *p*<0.05; *** *p*<0.01

MV4 represents the market value deflated by the closing book value.

Table 8.21: Univariate Analyses – Human Capital Measures –Market value deflated by the closing book value

	MV4	MV4	MV4	MV4	MV4	MV4	MV4	MV4
BoardCambridge	-0.231 (0.22)							
BoardOxford		0.393 (0.43)						
BoardScienceDegree			1.089 (0.64)					
BoardnonScienceDegree				-0.149 (0.17)				
BoardRussellGroup					-0.151 (0.28)			
BoardPre1992_Uni						-0.569 (1.06)		
BoardPost1992_Uni							0.562 (0.38)	
BoardGroup1994								-1.813 (1.52)
_cons	3.245 (52.33)***	3.207 (57.40)***	3.211 (100.70)***	3.254 (24.76)***	3.270 (23.29)***	3.401 (21.17)***	3.217 (85.97)***	3.286 (90.95)***
R-squared_within	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.002
R-squared_between	0.001	0.011	0.002	0.004	0.007	0.002	0.000	0.001
R-squared_overall	0.000	0.006	0.000	0.004	0.003	0.002	0.000	0.000
Number of groups	242	242	242	242	242	242	242	242
Number of observations	1,746	1,746	1,746	1,746	1,746	1,746	1,746	1,746

* *p*<0.1; ** *p*<0.05; *** *p*<0.01

MV4 represents the market value deflated by the closing book value.

Table 8.22: Univariate Analyses – Total Network Measures –Market value deflated by the number of shares

	MV1	MV1	MV1	MV1	MV1	MV1
totalnormaliseddegreecentrality	-0.226					
	(0.04)					
totalclosenesscentrality		1.690				
		(5.26)***				
totalbetweennesscentrality			1.312			
			(0.22)			
totalneigencentrality				0.003		
				(1.04)		
totaleffectivesize					0.029	
					(3.48)***	
totalaggregateconstraint						-0.373
						(1.96)*
_cons	4.601	3.071	4.567	4.579	3.670	5.644
	(14.42)***	(10.65)***	(47.61)***	(502.15)***	(13.89)***	(10.46)***
R-squared_within	0.000	0.046	0.000	0.000	0.018	0.004
R-squared_between	0.106	0.068	0.030	0.013	0.072	0.001
R-squared_overall	0.063	0.074	0.013	0.007	0.056	0.004
Number of groups	242	242	242	242	242	242
Number of observations	1,757	1,757	1,757	1,757	1,757	1,757

* p<0.1; ** p<0.05; *** p<0.01

MV1 represents the market value per share.

Table 8.23: Univariate Analyses – Total Human Capital Measures –Market value deflated by the number of shares

	MV1	MV1	MV1	MV1	MV1	MV1	MV1	MV1
totalAge	0.005							
	(3.60)***							
totalquotedboardstodate		0.036						
		(1.95)*						
totalquotedcurrent			0.007					
			(0.21)					
totalOrgtenure				0.031				
				(2.91)***				
totalBoardExp					0.070			
					(2.77)***			
totalEliteEducation						0.187		
						(0.61)		
totalProfessionalQual							0.428	
							(3.59)***	
totalHighestDegree								0.075
								(0.83)
_cons	2.456	3.554	4.475	3.634	3.685	4.398	3.510	4.041
	(4.15)***	(6.69)***	(8.11)***	(11.07)***	(11.30)***	(14.11)***	(11.67)***	(6.12)***
R-squared_within	0.013	0.006	0.000	0.016	0.012	0.002	0.013	0.003
R-squared_between	0.128	0.126	0.170	0.027	0.066	0.024	0.018	0.134
R-squared_overall	0.088	0.105	0.114	0.015	0.067	0.015	0.003	0.101
Number of groups	242	242	242	242	242	242	242	242
Number of observations	1,757	1,757	1,757	1,757	1,757	1,757	1,757	1,757

* *p*<0.1; ** *p*<0.05; *** *p*<0.01

MV1 represents the market value per share.

Table 8.24: Univariate Analyses – Total Human Capital Measures –Market value deflated by the number of shares

	MV1	MV1	MV1	MV1	MV1	MV1	MV1	MV1
totalCambridge	-0.464							
	(1.66)*							
totalOxford		0.638						
		(1.17)						
totalScience			1.138					
			(1.59)					
totalnonScience				0.643				
				(2.01)**				
totalRussell					0.131			
					(0.73)			
totalPre1992						0.141		
						(1.08)		
totalPost1992							0.127	
							(0.35)	
totalGroup1994								0.162
								(0.60)
_cons	4.819	4.257	4.411	3.735	4.307	4.239	4.562	4.549
	(34.77)***	(15.03)***	(39.48)***	(8.80)***	(11.12)***	(13.14)***	(59.65)***	(68.15)***
R-squared_within	0.004	0.011	0.010	0.024	0.002	0.002	0.000	0.000
R-squared_between	0.003	0.032	0.093	0.071	0.018	0.013	0.000	0.000
R-squared_overall	0.001	0.020	0.060	0.084	0.010	0.008	0.000	0.000
Number of groups	242	242	242	242	242	242	242	242
Number of observations	1,757	1,757	1,757	1,757	1,757	1,757	1,757	1,757

* p<0.1; ** p<0.05; *** p<0.01

MV1 represents the market value per share.

Table 8.25: Univariate Analyses – Total Network Measures –Market value deflated by net sales or revenues

	MV2	MV2	MV2	MV2	MV2	MV2
totalnormaliseddegreecentrality	-0.761					
	(0.47)					
totalclosenesscentrality		0.063				
		(0.49)				
totalbetweennesscentrality			-0.080			
			(0.05)			
totaleigencentrality				-0.000		
				(1.06)		
totaleffectivesize					0.001	
					(0.57)	
totalaggregateconstraint						0.029
						(0.49)
_cons	1.525	1.425	1.484	1.484	1.442	1.400
	(16.88)***	(12.20)***	(51.67)***	(1,323.86)***	(20.51)***	(8.32)***
R-squared_within	0.000	0.001	0.000	0.000	0.000	0.000
R-squared_between	0.001	0.007	0.018	0.003	0.012	0.051
R-squared_overall	0.001	0.000	0.002	0.001	0.000	0.019
Number of groups	237	237	237	237	237	237
Number of observations	1,731	1,731	1,731	1,731	1,731	1,731

* p<0.1; ** p<0.05; *** p<0.01

MV2 represents the market value deflated by net sales or revenues.

Table 8.26: Univariate Analyses – Total Human Capital Measures –Market value deflated by net sales or revenues

	MV2	MV2	MV2	MV2	MV2	MV2	MV2	MV2
totalAge	0.000							
	(0.41)							
totalquotedboardstodate		0.001						
		(0.32)						
totalquotedcurrent			0.003					
			(0.41)					
totalOrgtenure				0.006				
				(1.60)				
totalBoardExp					0.001			
					(0.17)			
totalEliteEducation						0.032		
						(0.68)		
totalProfessionalQual							0.068	
							(2.50)**	
totalHighestDegree								0.007
								(0.40)
_cons	1.399	1.442	1.434	1.312	1.469	1.450	1.312	1.430
	(6.96)***	(11.40)***	(12.00)***	(12.24)***	(18.63)***	(30.39)***	(19.19)***	(10.87)***
R-squared_within	0.000	0.000	0.000	0.005	0.000	0.000	0.003	0.000
R-squared_between	0.006	0.000	0.002	0.008	0.004	0.002	0.019	0.035
R-squared_overall	0.009	0.001	0.008	0.010	0.000	0.007	0.006	0.039
Number of groups	237	237	237	237	237	237	237	237
Number of observations	1,731	1,731	1,731	1,731	1,731	1,731	1,731	1,731

* *p*<0.1; ** *p*<0.05; *** *p*<0.01

MV2 represents the market value deflated by net sales or revenues.

Table 8.27: Univariate Analyses – Total Human Capital Measures –Market value deflated by net sales or revenues

	MV2	MV2	MV2	MV2	MV2	MV2	MV2	MV2
totalCambridge	0.039							
	(0.60)							
totalOxford		0.023						
		(0.43)						
totalScience			0.012					
			(0.12)					
totalnonScience				0.016				
				(0.43)				
totalRussellGroup					0.054			
					(1.35)			
totalPre1992						0.042		
						(1.16)		
totalPost1992							0.031	
							(0.36)	
totalGroup1994								-0.094
								(1.43)
_cons	1.463	1.471	1.480	1.461	1.367	1.379	1.476	1.506
	(44.25)***	(53.12)***	(80.23)***	(29.14)***	(15.93)***	(15.42)***	(80.98)***	(92.47)***
R-squared_within	0.000	0.000	0.000	0.000	0.003	0.002	0.000	0.001
R-squared_between	0.002	0.000	0.003	0.012	0.000	0.000	0.002	0.001
R-squared_overall	0.012	0.000	0.012	0.009	0.010	0.006	0.000	0.001
Number of groups	237	237	237	237	237	237	237	237
Number of observations	1,731	1,731	1,731	1,731	1,731	1,731	1,731	1,731

* p<0.1; ** p<0.05; *** p<0.01

MV2 represents the market value deflated by net sales or revenues.

Table 8.28: Univariate Analyses – Total Network Measures –Market value deflated by the opening market value

	MV3	MV3	MV3	MV3	MV3	MV3
totalnormaliseddegreecentrality	-0.075					
	(0.14)					
totalclosenesscentrality		0.044				
		(1.44)				
totalbetweennesscentrality			-0.137			
			(0.22)			
totaleigencentrality				-0.000		
				(0.68)		
totaleffectivesize					0.000	
					(0.40)	
totalaggregateconstraint						-0.027
						(1.19)
_cons	1.129	1.085	1.127	1.126	1.115	1.200
	(37.94)***	(39.77)***	(110.46)***	(617.36)***	(49.01)***	(18.90)***
R-squared_within	0.000	0.001	0.000	0.000	0.000	0.001
R-squared_between	0.000	0.002	0.015	0.002	0.010	0.031
R-squared_overall	0.001	0.000	0.002	0.001	0.002	0.001
Number of groups	240	240	240	240	240	240
Number of observations	1,716	1,716	1,716	1,716	1,716	1,716

* p<0.1; ** p<0.05; *** p<0.01

MV3 represents the market value deflated by the opening market value.

Table 8.29 - Univariate Analyses – Total Human Capital Measures –Market value deflated by the opening market value

	MV3	MV3	MV3	MV3	MV3	MV3	MV3	MV3
totalAge	0.000							
	(0.06)							
totalquotedboardstodate		-0.000						
		(0.24)						
totalquotedcurrent			-0.004					
			(1.27)					
totalOrgtenure				-0.000				
				(0.02)				
totalBoardExp					0.002			
					(0.63)			
totalEliteEducation						0.007		
						(0.40)		
totalProfessionalQual							0.024	
							(1.59)	
totalHighestDegree								-0.001
								(0.10)
_cons	1.120	1.136	1.185	1.125	1.105	1.118	1.065	1.129
	(16.64)***	(22.90)***	(25.05)***	(35.31)***	(35.25)***	(67.78)***	(28.35)***	(28.14)***
R-squared_within	0.000	0.000	0.001	0.000	0.000	0.000	0.002	0.000
R-squared_between	0.013	0.000	0.001	0.017	0.003	0.001	0.001	0.001
R-squared_overall	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000
Number of groups	240	240	240	240	240	240	240	240
Number of observations	1,716	1,716	1,716	1,716	1,716	1,716	1,716	1,716

* *p*<0.1; ** *p*<0.05; *** *p*<0.01

MV3 represents the market value deflated by the opening market value.

Table 8.30: Univariate Analyses – Total Human Capital Measures –Market value deflated by the opening market value

	MV3	MV3	MV3	MV3	MV3	MV3	MV3	MV3
totalCambridge	0.006							
	(0.21)							
totalOxford		0.006						
		(0.29)						
totalScience			-0.006					
			(0.17)					
totalnonScience				-0.013				
				(0.77)				
totalRussellGroup					0.001			
					(0.06)			
totalPre1992						0.001		
						(0.06)		
totalPost1992							0.026	
							(0.65)	
totalGroup1994								-0.019
								(0.63)
_cons	1.122	1.122	1.126	1.142	1.123	1.123	1.119	1.129
	(75.20)***	(108.34)***	(180.63)***	(49.56)***	(43.98)***	(42.30)***	(131.31)***	(153.14)***
R-squared_within	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R-squared_between	0.000	0.000	0.000	0.007	0.000	0.000	0.012	0.007
R-squared_overall	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.001
Number of groups	240	240	240	240	240	240	240	240
Number of observations	1,716	1,716	1,716	1,716	1,716	1,716	1,716	1,716

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

MV3 represents the market value deflated by the opening market value.

Table 8.31 - Univariate Analyses – Total Network Measures –Market value deflated by the closing book value

	MV4	MV4	MV4	MV4	MV4	MV4
totalnormaliseddegreecentrality	-1.931					
	(0.57)					
totalclosenesscentrality		-0.069				
		(0.42)				
totalbetweennesscentrality			-5.604			
			(0.99)			
totalNeigencentrality				-0.000		
				(0.04)		
totaleffectivesize					-0.003	
					(0.77)	
totalaggregateconstraint						0.155
						(1.54)
_cons	3.338	3.293	3.322	3.232	3.336	2.791
	(17.59)***	(22.47)***	(36.34)***	(207.09)***	(24.28)***	(9.77)***
R-squared_within	0.000	0.000	0.002	0.000	0.001	0.001
R-squared_between	0.016	0.014	0.000	0.000	0.004	0.005
R-squared_overall	0.004	0.004	0.000	0.000	0.001	0.001
Number of groups	242	242	242	242	242	242
Number of observations	1,746	1,746	1,746	1,746	1,746	1,746

* p<0.1; ** p<0.05; *** p<0.01

MV4 represents the market value deflated by the closing book value.

Table 8.32: Univariate Analyses – Total Human Capital Measures –Market value deflated by the closing book value

	MV4	MV4	MV4	MV4	MV4	MV4	MV4	MV4
totalAge	-0.000							
	(0.25)							
totalquotedboardstodate		-0.003						
		(0.28)						
totalquotedcurrent			0.012					
			(0.68)					
totalOrgtenure				-0.008				
				(1.35)				
totalBoardExp					-0.015			
					(0.89)			
totalEliteEducation						-0.037		
						(0.35)		
totalProfessionalQual							0.028	
							(0.38)	
totalHighestDegree								-0.025
								(0.85)
_cons	3.315	3.326	3.034	3.481	3.421	3.268	3.161	3.416
	(9.94)***	(9.82)***	(10.44)***	(18.75)***	(15.99)***	(30.84)***	(17.26)***	(15.60)***
R-squared_within	0.000	0.000	0.000	0.002	0.001	0.000	0.000	0.001
R-squared_between	0.027	0.011	0.011	0.031	0.008	0.000	0.011	0.012
R-squared_overall	0.005	0.003	0.005	0.006	0.001	0.001	0.001	0.006
Number of groups	242	242	242	242	242	242	242	242
Number of observations	1,746	1,746	1,746	1,746	1,746	1,746	1,746	1,746

* p<0.1; ** p<0.05; *** p<0.01

MV4 represents the market value deflated by the closing book value.

Table 8.33: Univariate Analyses – Total Human Capital Measures –Market value deflated by the closing book value

	MV4	MV4	MV4	MV4	MV4	MV4	MV4	MV4
totalCambridge	-0.082							
	(0.71)							
totalOxford		-0.001						
		(0.00)						
totalScience			0.123					
			(0.58)					
totalnonScience				-0.009				
				(0.09)				
totalRussellGroup					-0.050			
					(0.77)			
totalPre1992						-0.081		
						(1.24)		
totalPost1992							0.003	
							(0.02)	
totalGroup1994								-0.274
								(1.66)*
_cons	3.272	3.231	3.210	3.243	3.338	3.431	3.230	3.297
	(57.10)***	(44.70)***	(86.05)***	(24.88)***	(24.07)***	(21.25)***	(69.65)***	(82.79)***
R-squared_within	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.002
R-squared_between	0.002	0.002	0.000	0.015	0.000	0.001	0.000	0.002
R-squared_overall	0.000	0.002	0.001	0.007	0.000	0.000	0.000	0.000
Number of groups	242	242	242	242	242	242	242	242
Number of observations	1,746	1,746	1,746	1,746	1,746	1,746	1,746	1,746

* p<0.1; ** p<0.05; *** p<0.01

MV4 represents the market value deflated by the closing book value.

Table 8.34: Ohlson Model – Baseline Models (1)-(5) - Number of shares as deflator

	MV1	MV1	MV1	MV1	MV1
BV1	0.911	0.611	0.577	0.512	0.044
	(3.16)***	(1.93)*	(2.01)**	(1.85)*	(0.78)
E1	3.706	4.032	3.971	3.933	1.561
	(5.62)***	(6.10)***	(6.00)***	(5.94)***	(2.04)**
D1		7.257	7.349	7.184	0.981
		(4.26)***	(4.53)***	(4.43)***	(0.90)
R&D1			2.723	2.837	-0.150
			(1.33)	(1.39)	(0.16)
CC1			-2.505	-2.533	-2.216
			(2.08)**	(2.08)**	(1.29)
CE1				0.466	0.028
				(1.21)	(0.12)
lagMV1_1					0.890
					(12.37)***
_cons	2.150	1.695	1.556	1.571	0.263
	(4.55)***	(4.36)***	(4.06)***	(4.12)***	(1.80)*
R-squared_within	0.310	0.366	0.383	0.385	0.461
R-squared_between	0.541	0.604	0.616	0.614	0.962
R-squared_overall	0.485	0.560	0.577	0.577	0.834
Number of groups	242	242	242	242	228
Number of observations	1,757	1,757	1,757	1,757	1,478

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

MV1 represents the market value per share. BV1 represents the book value per share. E1 represents the earnings per share. D1 represents the dividends per share. R&D1 represents the research and development expenditure per share. CC1 represents the capital contributions per share. CE1 represents the capital expenditures per share. LagMV1_1 is the MV1 with one year lag.

Table 8.35: Ohlson Model – Baseline Models (1)-(5) with firm-fixed effects- Number of shares as deflator

	MV1	MV1	MV1	MV1	MV1
BV1	0.920	0.671	0.639	0.564	0.374
	(2.56)**	(1.80)*	(1.83)*	(1.67)*	(1.87)*
E1	3.406	3.815	3.690	3.656	2.080
	(5.37)***	(6.15)***	(6.02)***	(5.93)***	(2.38)**
D1		6.817	6.745	6.587	2.903
		(4.79)***	(5.06)***	(4.87)***	(2.15)**
R&D1			4.966	4.930	3.295
			(2.05)**	(2.05)**	(1.59)
CC1			-2.213	-2.258	-1.539
			(2.21)**	(2.21)**	(1.59)
CE1				0.574	-1.044
				(1.68)*	(1.42)
lagMV1_1					0.518
					(4.63)***
_cons	2.246	1.722	1.543	1.560	1.072
	(3.35)***	(2.91)***	(2.73)***	(2.77)***	(2.61)***
R-squared_within	0.310	0.367	0.385	0.387	0.490
R-squared_between	0.536	0.598	0.602	0.600	0.861
R-squared_overall	0.482	0.556	0.568	0.569	0.790
Number of groups	242	242	242	242	228
Number of observations	1,757	1,757	1,757	1,757	1,478

* p<0.1; ** p<0.05; *** p<0.01

MV1 represents the market value per share. BV1 represents the book value per share. E1 represents the earnings per share. D1 represents the dividends per share. R&D1 represents the research and development expenditure per share. CC1 represents capital contributions per share. CE1 represents the capital expenditures per share. LagMV1_1 is the MV1 with one year lag.

Table 8.36: Ohlson Model – Baseline Models (1)-(5) - Net sales/revenues as deflator

	MV2	MV2	MV2	MV2	MV2
BV2	1.101	1.099	1.016	0.943	0.455
	(6.41)***	(6.64)***	(5.93)***	(5.05)***	(4.36)***
E2	2.155	2.411	2.341	2.240	0.175
	(2.52)**	(2.73)***	(2.70)***	(2.74)***	(0.19)
D2		10.226	11.007	9.591	7.468
		(4.14)***	(4.14)***	(3.40)***	(4.70)***
R&D2			2.339	2.584	2.657
			(1.57)	(1.78)*	(1.85)*
CC2			-0.996	-0.805	0.437
			(1.08)	(0.94)	(0.26)
CE2				3.507	0.246
				(1.72)*	(0.34)
lagMV2_1					0.607
					(8.08)***
_cons	0.837	0.482	0.428	0.291	-0.016
	(6.51)***	(3.59)***	(3.30)***	(2.12)**	(0.17)
R-squared_within	0.033	0.053	0.061	0.085	0.133
R-squared_between	0.618	0.683	0.659	0.672	0.882
R-squared_overall	0.430	0.486	0.499	0.505	0.720
Number of groups	237	237	237	237	224
Number of observations	1,731	1,731	1,731	1,731	1,445

* p<0.1; ** p<0.05; *** p<0.01

MV2 represents the market value deflated by net sales or revenues. BV2 represents the book value deflated by net sales or revenues. E2 represents the earnings deflated by net sales or revenues. D2 represents the dividends deflated by net sales or revenues. R&D2 represents the research and development expenditure deflated by net sales or revenues. CC2 represents the capital contributions deflated by net sales or revenues. CE2 represents the capital expenditures deflated by net sales or revenues. LagMV2_1 is the MV2 with one year lag.

Table 8.37: Ohlson Model – Baseline Models (1)-(5) with firm-fixed effects- Net sales/revenues as deflator

	MV2	MV2	MV2	MV2	MV2
BV2	0.605	0.563	0.460	0.408	0.502
	(1.91)*	(1.79)*	(1.56)	(1.38)	(3.13)***
E2	0.972	1.124	1.289	1.248	0.273
	(1.23)	(1.40)	(2.03)**	(2.01)**	(0.32)
D2		8.064	8.673	7.466	5.968
		(3.37)***	(3.31)***	(2.98)***	(2.41)**
R&D2			6.163	6.000	5.904
			(1.74)*	(1.73)*	(1.50)
CC2			-0.534	-0.341	0.240
			(0.52)	(0.36)	(0.17)
CE2				3.287	-0.034
				(1.62)	(0.04)
lagMV2_1					0.309
					(3.95)***
_cons	1.084	0.836	0.720	0.586	0.365
	(5.80)***	(4.10)***	(3.51)***	(3.03)***	(1.83)*
R-squared_within	0.034	0.056	0.071	0.097	0.149
R-squared_between	0.608	0.682	0.383	0.423	0.691
R-squared_overall	0.422	0.471	0.387	0.426	0.645
Number of groups	237	237	237	237	224
Number of observations	1,731	1,731	1,731	1,731	1,445

* *p*<0.1; ** *p*<0.05; *** *p*<0.01

MV2 represents the market value deflated by net sales or revenues. BV2 represents the book value deflated by net sales or revenues. E2 represents the earnings deflated by net sales or revenues. D2 represents the dividends deflated by net sales or revenues. R&D2 represents the research and development expenditure deflated by net sales or revenues. CC2 represents the capital contributions deflated by net sales or revenues. CE2 represents the capital expenditures deflated by net sales or revenues. LagMV2_1 is the MV2 with one year lag.

Table 8.38: Ohlson Model – Baseline Models (1)-(5) - Opening market value as deflator

	MV3	MV3	MV3	MV3	MV3
BV3	0.251	0.243	0.215	0.203	0.188
	(6.32)***	(6.08)***	(5.73)***	(5.43)***	(4.51)***
E3	0.952	0.977	0.977	0.977	0.629
	(5.93)***	(5.99)***	(5.79)***	(5.80)***	(3.21)***
D3		0.669	0.900	0.793	0.310
		(1.07)	(1.47)	(1.29)	(0.46)
R&D3			0.052	0.108	0.308
			(0.09)	(0.18)	(0.49)
CC3			-0.713	-0.706	-0.996
			(2.87)***	(2.85)***	(3.39)***
CE3				0.196	0.105
				(1.20)	(0.56)
lagMV3_1					0.064
					(1.85)*
_cons	0.957	0.940	0.938	0.935	0.915
	(42.42)***	(31.59)***	(31.28)***	(30.35)***	(14.86)***
R-squared_within	0.113	0.117	0.114	0.114	0.085
R-squared_between	0.009	0.006	0.008	0.010	0.027
R-squared_overall	0.059	0.060	0.067	0.068	0.062
Number of groups	240	240	240	240	225
Number of observations	1,716	1,716	1,716	1,716	1,412

* p<0.1; ** p<0.05; *** p<0.01

MV3 represents the market value deflated by the opening market value. BV3 represents the book value deflated by the opening market value. E3 represents the earnings deflated by the opening market value. D3 represents the dividends deflated by the opening market value. R&D3 represents the research and development expenditure deflated by the opening market value. CC3 represents the capital contributions deflated by the opening market value. CE3 represents the capital expenditures deflated by the opening market value. LagMV3_1 is the MV3 with one year lag.

Table 8.39: Ohlson Model – Baseline Models (1)-(5) with firm-fixed effects- Opening market value as deflator

	MV3	MV3	MV3	MV3	MV3
BV3	0.565	0.534	0.479	0.468	0.517
	(8.33)***	(7.68)***	(6.87)***	(6.60)***	(6.27)***
E3	1.079	1.164	1.129	1.133	0.888
	(5.87)***	(6.18)***	(6.01)***	(6.01)***	(4.25)***
D3		2.006	2.222	2.172	2.512
		(2.00)**	(2.24)**	(2.18)**	(2.10)**
R&D3			2.912	2.890	2.814
			(1.70)*	(1.69)*	(1.49)
CC3			-0.513	-0.505	-0.668
			(1.93)*	(1.91)*	(2.21)**
CE3				0.240	0.770
				(0.69)	(2.35)**
lagMV3_1					0.067
					(1.60)
_cons	0.791	0.741	0.725	0.717	0.594
	(20.90)***	(16.00)***	(15.21)***	(14.73)***	(5.97)***
R-squared_within	0.128	0.134	0.143	0.144	0.145
R-squared_between	0.001	0.000	0.005	0.003	0.002
R-squared_overall	0.051	0.051	0.050	0.051	0.044
Number of groups	240	240	240	240	225
Number of observations	1,716	1,716	1,716	1,716	1,412

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

MV3 represents the market value deflated by the opening market value. BV3 represents the book value deflated by the opening market value. E3 represents the earnings deflated by the opening market value. D3 represents the dividends deflated by the opening market value. R&D3 represents the research and development expenditure deflated by the opening market value. CC3 represents the capital contributions deflated by the opening market value. CE3 represents the capital expenditures deflated by the opening market value. LagMV3_1 is the MV3 with one year lag.

Table 8.40: Ohlson Model – Baseline Models (1)-(5) - Closing book value as deflator

	MV4	MV4	MV4	MV4	MV4
E4	5.454	5.220	5.095	4.959	2.464
	(6.30)***	(8.67)***	(8.09)***	(7.97)***	(2.62)***
D4		14.751	14.750	13.959	9.493
		(11.47)***	(11.34)***	(10.13)***	(5.97)***
R&D4			2.635	2.704	1.232
			(1.90)*	(2.00)**	(1.02)
CC4			-0.695	-0.648	0.421
			(2.21)**	(2.06)**	(0.85)
CE4				1.571	0.658
				(2.56)**	(1.43)
lagMV4_1					0.393
					(7.61)***
_cons	2.717	1.386	1.298	1.142	0.631
	(18.41)***	(9.00)***	(8.80)***	(8.14)***	(6.24)***
R-squared_within	0.148	0.379	0.384	0.392	0.309
R-squared_between	0.443	0.689	0.678	0.670	0.853
R-squared_overall	0.256	0.565	0.560	0.560	0.657
Number of groups	242	242	242	242	226
Number of observations	1,746	1,746	1,746	1,746	1,462

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

MV4 represents the market value deflated by the closing book value. E4 represents the earnings deflated by the closing book value. D4 represents the dividends deflated by the closing book value. R&D4 represents the research and development expenditure deflated by the closing book value. CC4 represents the capital contributions deflated by the closing book value. CE4 represents the capital expenditures deflated by the closing book value. LagMV4_1 is the MV4 with one year lag.

Table 8.41: Ohlson Model – Baseline Models (1)-(5) with firm-fixed effects- Closing book value as deflator

	MV4	MV4	MV4	MV4	MV4
E4	4.783	4.762	4.577	4.464	2.740
	(5.74)***	(7.78)***	(7.26)***	(7.06)***	(2.78)***
D4		13.445	13.190	12.464	9.583
		(8.91)***	(8.61)***	(7.72)***	(4.92)***
R&D4			5.771	5.217	6.411
			(2.60)***	(2.44)**	(3.17)***
CC4			-0.453	-0.429	0.111
			(1.23)	(1.14)	(0.21)
CE4				1.726	1.368
				(2.45)**	(1.94)*
lagMV4_1					0.178
					(3.03)***
_cons	2.691	1.501	1.348	1.183	1.007
	(28.58)***	(8.53)***	(7.89)***	(7.04)***	(6.06)***
R-squared_within	0.148	0.379	0.387	0.394	0.338
R-squared_between	0.443	0.689	0.634	0.640	0.693
R-squared_overall	0.256	0.565	0.534	0.541	0.575
Number of groups	242	242	242	242	226
Number of observations	1,746	1,746	1,746	1,746	1,462

* *p*<0.1; ** *p*<0.05; *** *p*<0.01

MV4 represents the market value deflated by the closing book value. E4 represents the earnings deflated by the closing book value. D4 represents the dividends deflated by the closing book value. R&D4 represents the research and development expenditure deflated by the closing book value. CC4 represents the capital contributions deflated by the closing book value. CE4 represents the capital expenditures deflated by the closing book value. LagMV4_1 is the MV4 with one year lag.

Table 8.42a: Factor analysis - Principal-Component Factors

Factor	*Variance*	*Difference*	*Proportion*	*Cumulative*
Factor1	2.21591	0.97603	0.3166	0.3166
Factor2	1.23988	0.01255	0.1771	0.4937
Factor3	1.22733	.	0.1753	0.669
Number of obs	1,757			
Retained factors	3			
Number of params	18			

LR test: independent vs. saturated: chi2(21) = 2502.67 Prob>chi2 = 0.00
Rotation: *orthogonal varimax*

Table 8.42b: Rotated factor loadings (pattern matrix) and unique variance

Variable	*Factor1*	*Factor2*	*Factor3*	*Uniqueness*
BoardCloseCen	0.867	-0.0158	-0.0131	0.2479
BoardAggCon	-0.8341	0.2517	0.0409	0.2392
PriorBoardExp	0.7118	0.1554	0.1585	0.4441
BoardOrgTen	-0.3344	0.0274	0.7284	0.357
BoardAge	0.2585	-0.0734	0.8068	0.2768
BoardEliteEdu	0.2877	-0.6468	-0.1035	0.4881
BoardProfQual	0.0219	0.853	-0.0906	0.2637

Table 8.42c: Factor Rotation Matrix

	Factor1	***Factor2***	***Factor3***
Factor1	0.9605	-0.2783	0.0043
Factor2	-0.0516	-0.1629	0.9853
Factor3	0.2735	0.9466	0.1708

Table 8.42d: Scoring coefficients (based on varimax rotated factors)

Variable	***Factor1***	***Factor2***	***Factor3***
BoardCloseCen	0.40346	0.08753	-0.00987
BoardAggCon	-0.36059	0.11368	0.03485
PriorBoardExp	0.35101	0.21427	0.13152
BoardOrgTen	-0.15229	-0.00891	0.59341
BoardAge	0.11324	-0.02333	0.65704
BoardEliteEdu	0.05911	-0.50803	-0.09032
BoardProfQual	0.1094	0.71442	-0.06545

Table 8.43: Ohlson Model with firm-fixed effects -with SHC indices as other information

	MV1	***MV2***	***MV3***	***MV4***
BV	0.537	0.396	0.460	-
	-1.56	-1.32	(6.65)***	-
E	3.618	1.217	1.132	4.463
	(5.87)***	(1.96)*	(5.95)***	(7.09)***
D	6.447	7.409	2.277	12.532
	(4.89)***	(3.02)***	(2.33)**	(7.76)***
R&D	4.541	6.197	3.021	5.207
	(1.96)*	(1.78)*	(1.79)*	(2.48)**
CC	-2.226	-0.348	-0.518	-0.457
	(2.16)**	-0.37	(1.94)*	-1.21
CE	0.615	3.371	0.306	1.704
	(1.82)*	-1.65	-0.91	(2.43)**
Network	0.335	0.03	0.021	-0.117
	(2.79)***	-0.49	-1.02	-1.5
Expertise	-0.076	0.055	0.031	0.153
	-0.58	-1.41	-1.4	(1.71)*
Experience	0.08	0.039	-0.02	-0.108
	-0.68	-0.79	-1.17	-1.46
_cons	1.64	0.586	0.713	1.18
	(2.79)***	(3.05)***	(14.88)***	(6.90)***
R-squared_within	0.392	0.1	0.147	0.398
R-squared_between	0.600	0.409	0.011	0.632
R-squared_overall	0.571	0.416	0.048	0.541
Number of groups	242	237	240	242
Number of observations	1,757	1,731	1,716	1,746

* p<0.1; ** p<0.05;*** p<0.01

MV represents the market value deflated by the number of shares, net sales, the opening market value and the closing book value respectively. BV represents the book value deflated by the number of shares, net sales, the opening market value and the closing book value respectively. E represents the earnings deflated by the number of shares, net sales, the opening market value and the closing book value respectively. D represents the dividends deflated by the number of shares, net sales, the opening market value and the closing book value respectively. R&D represents the research and development expenditure deflated by the number of shares, net sales, the opening market value and the closing book value respectively. CC represents the capital contributions deflated by the number of shares, net sales, the opening market value and the closing book value respectively. CE represents the capital expenditures deflated by the number of shares, net sales, the opening market value and the closing book value respectively.

Table 8.44: The Demand for Social and Human Capital at the Individual Level – Quoted Current Boards as the Dependent Variable

	QuotedCurrent Boards	QuotedCurrent Boards	QuotedCurrent Boards	QuotedCurrent Boards	QuotedCurrent Boards	QuotedCurrent Boards
DegreeCen	125.953					
	(32.16)***					
AgeGroup	0.063	0.004	0.039	0.031	-0.009	-0.017
	(2.88)***	(0.17)	(1.75)*	(1.34)	(0.41)	(0.75)
EDNEDdummy	0.202	0.145	0.174	0.188	0.126	0.112
	(3.56)***	(2.33)**	(2.98)***	(3.06)***	(2.35)**	(1.83)*
OrgTenure	-0.003	-0.017	-0.011	-0.012	-0.018	-0.020
	(1.10)	(6.06)***	(4.39)***	(4.18)***	(7.04)***	(7.26)***
ClosenessCen		1.548				
		(8.85)***				
BetweenCen			62.963			
			(23.76)***			
EigenvectorCen				0.002		
				(0.47)		
EffectiveSize					0.100	
					(36.70)***	
AggregateCon						-2.126
						(20.46)***
_cons	0.979	1.900	1.800	1.950	1.717	2.911
	(13.06)***	(26.10)***	(26.04)***	(27.15)***	(26.64)***	(37.84)***
R-squared_within	0.171	0.010	0.112	0.003	0.208	0.079
R-squared_between	0.292	0.108	0.313	0.126	0.331	0.181
R-squared_overall	0.286	0.103	0.308	0.112	0.336	0.177
Number of groups	7,781	7,781	7,781	7,781	7,781	7,781
Number of obs.	35,327	35,327	35,327	35,327	35,327	35,327

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Quoted current boards is the number of listed firms a director sits in a particular year.

Table 8.45: The Demand for Social and Human Capital at the Individual Level – Quoted Boards to Date as the Dependent Variable

	QuotedBoards toDate	QuotedBoards toDate	QuotedBoards toDate	QuotedBoards toDate	QuotedBoards toDate	QuotedBoards toDate
DegreeCen	63.446					
	(10.67)***					
AgeGroup	0.399	0.314	0.388	0.384	0.349	0.339
	(14.56)***	(11.85)***	(14.10)***	(13.83)***	(13.55)***	(12.82)***
EDNEDdummy	0.513	0.396	0.497	0.507	0.452	0.436
	(6.22)***	(5.04)***	(6.04)***	(6.04)***	(5.97)***	(5.50)***
OrgTenure	0.077	0.058	0.073	0.073	0.068	0.065
	(18.95)***	(16.05)***	(18.67)***	(18.60)***	(18.29)***	(17.62)***
ClosenessCen		3.889				
		(17.83)***				
BetweenCen			36.776			
			(9.68)***			
EigenvectorCen				-0.010		
				(1.78)*		
EffectiveSize					0.085	
					(21.14)***	
AggregateCon						-1.950
						(17.95)***
_cons	1.717	2.081	2.119	2.207	2.010	3.088
	(17.53)***	(24.29)***	(24.63)***	(25.53)***	(25.18)***	(35.03)***
R-squared_within	0.155	0.156	0.150	0.121	0.240	0.172
R-squared_between	0.195	0.153	0.179	0.100	0.269	0.207
R-squared_overall	0.186	0.133	0.170	0.090	0.263	0.192
Number of groups	7,781	7,781	7,781	7,781	7,781	7,781
Number of obs.	35,327	35,327	35,327	35,327	35,327	35,327

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Quoted boards to date is the total number of listed firms a director sat in previous years.

APPENDIX II

CURRENT ACCOUNTING STANDARDS AND PRACTICES FOR INTANGIBLES

Generally Accepted Accounting Practice in the UK (UK GAAP)

In 2012 and 2013, the Financial Reporting Council[75] (FRC) revised financial reporting standards in the United Kingdom and Republic of Ireland. These revisions fundamentally reformed financial reporting, replacing almost all extant standards with three Financial Reporting Standards: (1) FRS 100 Application of Financial Reporting Requirements, (2) FRS 101 Reduced Disclosure Framework, and (3) FRS 102 The Financial Reporting Standard applicable in the UK and Republic of Ireland. Although early application of FRS 102 is permitted for accounting periods ending on or after 31 December 2012, entities shall apply these revised financial reporting standards for accounting periods ending on or after 1 January 2015. Since this chapter aims to shed light on the current accounting regulation and practices for intangibles, this thesis will expand on the content of accounting standards prior to the most recent revision, which are still in effect.

In the UK, accounting treatment for "Goodwill and Intangible Assets" is regulated by FRS 10 whereas accounting for "Research and Development" (R&D) expenditures is described in SSAP 13. The objective of FRS 10 is to ensure that purchased goodwill and intangible assets are charged to the income statement in the periods in which they are depleted. The standard advocates the view that goodwill arising on an acquisition (the cost of acquisition less the aggregate of the fair value of the purchased entity's identifiable assets and liabilities) is neither an asset like other assets nor an immediate loss in value. It rather refers to goodwill as a bridge between the cost of an investment shown as an asset in the acquirer's own financial statements and the values attributed to the acquired assets and liabilities in the consolidated financial statements (FRS 10, Para. B). Although purchased

[75] The Financial Reporting Council (FRC) became the prescribed body for issuing accounting standards on 2 July 2012; the prescribed body was previously the Accounting Standards Board (ASB). References in this section are made to the FRC and ASB, as appropriate in terms of the time period and context of the reference.

goodwill is not in itself an asset, its inclusion amongst the assets of the reporting entity, rather than as a deduction from shareholders' equity, recognises that goodwill is part of a larger asset, the investment, for which management remains accountable[76].

The standard requires positive purchased goodwill to be capitalised and classified as an asset on the statement of financial position (FRS 10, Para. 7). It also requires the purchased goodwill to be amortised over its useful economic life which should not exceed 20 years from the date of acquisition (FRS 10, Para. 19). An alternative approach to accounting for purchased goodwill is described in SSAP 22[77], which was outlawed by FRS 10. This standard requires the purchased goodwill to be capitalised and to be amortised on a systematic basis over a finite period. The underlying rationale is that the value of purchased goodwill diminishes over time as internally generated goodwill replaces purchased goodwill. On the other hand, FRS 10 does not permit the capitalisation of internally generated goodwill (FRS 10, Para. 8).

In FRS 10, the standard-setting body also prescribes the accounting treatment for intangible assets. The standard states that an intangible item may meet the definition of an asset when access to the future economic benefits that it represents is controlled by the reporting entity, whether through custody or legal protection (e.g. licences, quotas, patents, copyrights, franchises and trademarks). The ASB acknowledges that intangible assets range from those that can readily be identified and measured separately from goodwill to those that are essentially very similar to goodwill. The basic principles set out in the standard for accounting treatment of intangible assets that are similar in nature to goodwill are, therefore, closely aligned with those set out for goodwill.

The requirements of FRS 10 apply to all intangible assets with the exception of (1) oil and gas exploration and development costs, (2) R&D costs, and (3) any other intangible assets addressed by

[76] See Nobes (1992) for the "hole in the balance sheet" argument.
[77] In 1984, the ASC issued SSAP 22 "Accounting for Goodwill", which was later revised in 1989. SSAP 22 allowed companies a choice of treatment of purchased goodwill. The preferred treatment was the immediate write-off to reserves.

another accounting standard. The standard requires an intangible asset purchased separately from a business to be capitalised at its cost (FRS 10, Para. 9). It is also required that intangible assets acquired as part of the acquisition of a business should be capitalised separately from goodwill if its value can be measured reliably on initial recognition (FRS 10, Para. 10). These assets should initially be recorded at their fair values[78]. If the value of such assets cannot be measured reliably, intangible assets purchased as part of the acquisition of a business should be subsumed within the amount of the purchase price attributed to goodwill (FRS 10, Para. 13). On the other hand, FRS 10 allows the capitalisation of an internally developed intangible asset only if it has a readily ascertainable market value (FRS 10, Para.14). Therefore, all internally developed intangible assets which do not have readily ascertainable market values are expensed. Like goodwill, the standard also requires purchased intangible assets to be amortised on a systematic basis over their useful economic lives, which are not to exceed periods of 20 years.

The accounting treatment for R&D expenditure is set out in SSAP 13. In this standard, the term "research and development" is used to cover a wide range of activities, including those in the services sector. Classification of R&D expenditure is often contingent upon the type of business and its organisation. However, the statement recognises three broad categories of activity, namely pure research, applied research and development. Expenditure on pure and applied research (unless it is expenditure on fixed assets, which should be capitalised and amortised over their useful lives) should be written off in the year of expenditure through the profit and loss account. Development expenditure should also be written off in the year of expenditure except in certain strictly defined circumstances. In situations where all the relevant criteria are met (see SSAP 13 for details), it is allowed to defer development expenditure to the extent that its recovery can reasonably regarded as assured. Such deferred development costs must be amortised in future years. Furthermore, the standard requires disclosure on accounting policy (as required by SSAP 2), the total amount of R&D

[78] FRS 7 "Fair Values in Acquisition Accounting" requires that where an intangible asset is recognised, its fair value should be based on its replacement cost.

expenditure charged in the profit and loss account, distinguishing between the current year's expenditure and amount amortised from deferred expenditure, and the movements on deferred development expenditure during the year.

International Accounting Standards (IAS)

The IASB issued IAS 38 "Intangible Assets" in 1998 to outline the accounting requirements for intangible assets. Revisions and amendments to IAS 38 were completed in March 2004, May 2008, and April 2009 respectively. The board outlines the objective of IAS 38 as prescribing the accounting treatment for intangible assets that are not dealt with specifically in another IFRS (IAS 38.1). The scope of IAS 38 comprises all intangible assets other than those specified in IAS 38.2-3. Intangible assets covered by another IFRS, such as intangibles held for sale, assets arising from employee benefits, and goodwill are excluded from the content of IAS 38. Accounting requirements for Goodwill is prescribed by IFRS 3.

The standard requires an entity to recognise an intangible asset if, and only if, certain criteria are met. Recognition criteria for purchased and self-created intangible assets are stated as: (1) it is probable that the future economic benefits that are attributable to the asset will flow to the entity, and (2) the cost of the asset can be measured reliably (IAS 38.21). The probability recognition criterion is always deemed satisfied for intangible assets that are acquired separately or in a business combination (IAS 38.33). IAS 38 requires all intangible assets to be initially measured at cost (IAS 38.24), subsequently measured at cost or using the revaluation model (IAS 38.72), and amortised on a systematic basis over their useful economic lives (unless the asset has an indefinite useful life, in which case it is not amortised).

Comparing these recognition criteria with requirements under the UK GAAP, differences between IAS 38 and FRS 10 are identified. Firstly, the requirement of FRS 10 is that internally developed intangible assets should be capitalised only where they have a readily ascertainable market value whereas IAS 38 applies additional specific criteria for the recognition of internally developed intangible assets (IAS

38.5). Furthermore, IAS 38 does not recognise internally generated brands or other items similar in substance as intangible assets (IAS 38.63). Secondly, FRS 10 requires that an intangible asset purchased separately from a business should be capitalised at cost. Furthermore, the standard requires that an intangible asset acquired as part of the acquisition of a business should be capitalised separately from goodwill if its value can be measured reliably on initial recognition. IAS 38 applies specific recognition criteria on the initial recognition of intangible assets. With respect to amortisation of intangible assets, FRS 10 has a rebuttable presumption that the useful economic lives of intangible assets are limited to periods of 20 years or less, unless otherwise justified and the asset is capable of continued measurement (FRS 38 Para.19). IAS 38 requires that amortisation of an asset with a finite life be amortised on a systematic basis over its useful life, and provides examples of useful life for different types of intangible assets (IAS 38.97).

The scope of IAS 38 also comprises accounting treatment for research and development costs. The standard requires all research costs to be expensed (IAS 38.54). IAS 38 requires the capitalisation of development costs only after technical and commercial feasibility of the asset for sale or use has been established. This means that the entity must have the intent and ability to complete the intangible asset to either use or sell it and be able to demonstrate how the asset will generate future economic benefits (IAS 38.57). The research phase of an internal project to create an intangible asset cannot be distinguished from the development phase; the entity treats the expenditure for that project as if it were incurred in the research phase only. A research and development project acquired in a business combination is recognised as an asset at cost, even if a component of that project is research. Subsequent expenditure on that project is accounted for as any other research and development cost (expensed except to the extent that the expenditure satisfies the relevant criteria described in IAS 38 for recognising such expenditure as an intangible asset) (IAS 38.34).

Accounting treatment for goodwill is prescribed in IFRS 3 “Business Combinations”. IFRS 3 (2008) superseded IFRS 3 (2004). IFRS 3 (2008) was issued as a result of IASB-FASB joint project. Based on

IFRS 3, goodwill is measured as the difference between the aggregate of (i) the acquisition-date fair value of the consideration transferred, (ii) the amount of any non-controlling interest (NCI, formerly called minority interest), and the net of the acquisition-date amounts of the identifiable assets acquired and the liabilities assumed (measured in accordance with IFRS 3). If the difference is found negative, the resulting gain is recognised as a bargain purchase in profit or loss. The acquirer shall reassess the identifiable assets acquired and liabilities assumed, the non-controlling interest, and the consideration transferred before recognising a gain on a bargain purchase. In accordance with IAS 36 (Impairment of Assets), goodwill should be tested for impairment annually. To test for impairment, goodwill must be allocated to each of the acquirer's cash-generating units or groups of cash-generating units that are expected to benefit from the synergies of the combination, irrespective of whether other assets or liabilities of the acquiree are assigned to those units or groups of units.

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