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THE ROLE OF EXTERNAL BOARD MEMBERS IN HIGH TECH START-UPS

A RESOURCE DEPENDENCY AND BOARD CAPITAL PERSPECTIVE

Elien Vandenbroucke

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Advisor: Prof. dr. Mirjam Knockaert

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Working papers

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De laatste jaren is de interesse in deugdelijk bestuur sterk gestegen, mede door de bedrijfsschandalen die wereldwijd opdoken (denk maar aan Enron, Parmalat of Lernout & Hauspie). Binnen deze context werd de aandacht vooral gevestigd op de impact van de raad van bestuur, aangezien deze één van de belangrijkste interne bestuursmechanismen is voor bedrijven. Echter, ondanks deze verscherpte aandacht, is er nog steeds erg weinig empirische duidelijkheid over wat de betrokkenheid en doeltreffendheid van raden van bestuur beïnvloedt, laat staan wat hun effect is op bedrijfsprestaties. Bovendien werd er vooral gefocust op de controlerende taak van een raad van bestuur, terwijl dit bestuursorgaan ook op andere vlakken kan bijdragen. De externe bestuurders kunnen via hun dienstenrol additionele kennis toevoegen, toegang verschaffen tot belangrijke bedrijfsmiddelen, hun netwerk ter beschikking stellen en ook de reputatie van het bedrijf verhogen door hun aanwezigheid. Dit takenpakket van de raad van bestuur werd tot nu toe weinig bestudeerd, zeker binnen jonge hoogtechnologische bedrijven. Ook al hebben deze ondernemende start-ups het potentieel om aanzienlijk bij te dragen tot innovatie-ontwikkeling, werkgelegenheid en regionale ontplooiing, toch worden ze geconfronteerd met de nadelen inherent aan nieuwe en kleine ondernemingen. Daarnaast bestaat het top management team vaak uit managers komende uit hetzelfde netwerk, wat resulteert in homogene kennis in termen van opleiding, ervaring en vaardigheden. In deze context zijn externe bestuurders via hun engagement in de dienstenrol uiterst waardevol.

Na de algemene inleiding, worden in de volgende hoofdstukken drie empirische studies gepresenteerd, die meer inzicht verschaffen in de dienstenrol van de raad van bestuur voor hoogtechnologische starters.

De eerste studie onderzoekt hoe conflicten tussen de externe bestuurders en de leden van het top management team de dienstenparticipatie kunnen beïnvloeden. De resultaten tonen aan dat taak-gerelateerde discussies een positief effect hebben en dat persoonlijke meningsverschillen nefast zijn voor de betrokkenheid van de raad van bestuur in hun dienstenrol. Daarnaast zien we ook dat taak-gerelateerd conflict kan overgaan in relationeel conflict, dewelke een indirecte negatieve invloed heeft op de dienstenparticipatie.

De tweede studie focust op de determinanten die de doeltreffendheid van de dienstenrol zullen beïnvloeden. Ten eerste is het belangrijk dat het top management team over een bepaald absorptievermogen beschikt, waardoor de managers het advies van de raad van bestuur kunnen bevatten. Vervolgens is het een must om voldoende meetings te organiseren, omdat kennis het meest efficiënt wordt overgedragen via rechtstreekse contacten. Tenslotte toont deze studie aan dat zowel structurele als contextuele factoren belangrijk zijn om het diensten-engagement van de raad van bestuur te verhogen.

De derde studie licht uit hoe het *human capital* van de externe bestuurders een sterke meerwaarde kan bieden en in welke mate dit de performantie van de hoogtechnologische starter beïnvloedt. De resultaten tonen dat bedrijven die een technologiestrategie nastreven, er baat bij hebben om hun raad van bestuur anders te structureren in vergelijking met bedrijven die een marktstrategie volgen. We zien dat de specifieke ervaring, diversiteit en mandaatperiode van de externe bestuurders belangrijke determinanten zijn van de bedrijfs-performantie bij jonge hoogtechnologische starters.

Het laatste hoofdstuk geeft een overzicht van de voornaamste bevindingen en gaat dieper in op de theoretische en praktische contributies van deze doctoraatsthesis. Tot slot worden ook de beperkingen van dit doctoraat besproken en geven we suggesties voor toekomstig onderzoek.

CHAPTER I

General introduction

1. GENERAL INTRODUCTION

1.1. CORPORATE GOVERNANCE AND BOARD OF DIRECTORS

In recent years, the interest in corporate governance has increased significantly, not least due to several worldwide corporate scandals, of which the Enron case (2001) must be the most notorious example. By means of extensive accounting constructions and setting up over a thousand subsidiaries, the executive management of this large American organization made disappear millions into their own pockets, despite the controlling mechanisms that were put in place (Coffee, 2002). Similar situations emerged in Europe: Parmalat (Italy) and Ahold (the Netherlands), as well as Lernout & Hauspie (Belgium) created a stir, accordingly raising awareness of the risks of poor corporate governance (Enriques & Volpin, 2007). Consequently, as public confidence was lost, many corporate governance codes were set up or reformed in order to rebuild trust.

The term corporate governance is used to indicate how an organization can be led in a good, efficient, and responsible way. It is about who and what really count and the recent crises provided a shift in focus from shareholder supremacy to the significance of several groups of stakeholders. Hence, corporate governance is not only about distributing value among different actors, but also about *creating* value, hereby improving firm structures and continuity (Zahra & Pearce, 1989; Huse, 2005).

Within this larger field, major emphasis has been put on the *board of directors* as it is one of the main internal governance mechanisms available to the firm (Daily, Dalton & Cannella, 2003), influencing corporate outcomes and thus creating value for the firm, its actors involved and society at large (Pearce & Zahra, 1991; Forbes & Milliken, 1999; Hillman & Dalziel, 2003; Huse, 2007). Nevertheless, despite this increased attention, most of the recommendations concerning the board of directors has emphasized formal board structures and characteristics. In particular, mainstream board research largely relied on incomplete quantitative models, investigating the direct relationship between board composition and firm financial performance (Daily, et al., 2003). However, these input-output studies provided no evidence on the processes and mechanisms linking these input and output variables (Pettigrew, 1992). As Van den Berghe and Levrau (2004) indicated, "living up to the formal standards is not enough" (p.462). Actual board behavior should receive more awareness, as there is still little empirical evidence on *how* the board of directors really operates and

functions, nor what determines the board's participation or effectiveness, and how these concepts relate to firm performance (Finkelstein & Mooney, 2003; Wan & Ong, 2005; Zona & Zattoni, 2007).

Moreover, the primary focus has been on the monitoring aspect of the board of directors (e.g. John & Senbet, 1998; Van den Berghe & Baelden, 2005), as it is associated with agency theory, the dominant theoretical perspective in board studies (Dalton, Daily, Ellstrand & Johnson, 1998). Agency theory expects the board to monitor the executive management, in order to ensure maximization of shareholders' wealth (Masson, 1971). However, as the recent scandals revealed the importance of stakeholders rather than shareholders, a broader board governance perspective was reintroduced. Next to evaluating and controlling how well a company is run, the board of directors may also carry out additional tasks. In general, three board tasks are posited: control, service and strategy (Zahra & Pearce, 1989). The strategic task is related to the formulation of corporate goals and policies as well as the allocation of resources necessary to implement the board's strategies (Hung, 1998). This strategic task can be treated as a separate construct (e.g. Stiles & Taylor, 2002) or incorporated within the control and service tasks (e.g. Hillman & Dalziel, 2003). The board service task comprises a range of subtasks which all have a different theoretical basis (Hung, 1998). Table 1-1 provides an overview of the most important academic studies pertaining to these service aspects and their underlying theory (as suggested by Machold & Farquhar, 2013).

Table 1-1 Board service task definitions

Authors	Board service task stipulation	Theoretical framework	Description of the specific board service activities
Zahra & Pearce (1989)	service role	resource dependency theory	- obtaining external resources - enhancing firm legitimacy - linking the firm with the external environment
Johnson, Daily & Ellstrand (1996)	service	strategic choice	- advising the top management team on managerial issues - formulating the firm's strategy
	resource dependency	resource dependency theory	- representing external stakeholders - enhancing firm legitimacy
Forbes & Milliken (1999)	service task	(unspecified)	- providing advice to the top management team - active participation in strategic decision-making
Sundaramurthy & Lewis (2003)	service and advice role	stewardship theory	- advising the top management team - initiating the firm's strategy

Hillman & Dalziel (2003)	provision of resources	resource dependency theory	- offering expertise and advice - linking the firm to important stakeholders - providing access to resources - building external relationships - helping with strategy formulation - enhancing legitimacy

Through its engagement in its service tasks, the board of directors may provide resources essential for company performance, open up their personal networks as such acting as a boundary spanner, and enhance the organization's legitimacy (Pfeffer, 1972; Hillman & Dalziel, 2003). Hence, the board is more than just a controlling entity; also its service tasks are vital for long-term decision-making and subsequently corporate performance (Forbes & Milliken, 1999).

Additionally, corporate governance codes and conventional board research have principally relied on large listed companies, whereas the vast majority of companies are unlisted, small and medium-sized firms, encompassing a wide range of businesses, i.e. start-ups, single owner-manager firms, family businesses, private equity-owned firms, joint ventures and subsidiary companies (EcoDa, 2010). These companies did not yet attract the full attention of regulators or researchers, despite their large number and economic significance, and the importance of board members in supporting the company towards corporate success (Long, Dulewicz & Gay, 2005). Therefore, a contextual approach to understand boards will be compulsory (Huse, 2000). Indeed, given their different ownership structure and distribution of power between internal and external stakeholders, the board functioning of small private firms will be distinct compared to large listed companies (Fiegener, Brown, Dreux & Dennis, 2000; Gabrielsson & Huse, 2002). Moreover, the board control task will be diluted given the lack of separation of ownership and control (Forbes & Milliken, 1999), as such increasing the importance of the board's service tasks (Huse, 1990; Daily & Dalton, 1992).

In this light, a new stream of research is emerging, acknowledging that the "research fortresses surrounding board studies" should be taken down (Daily, et al., 2003; Gabrielsson & Huse, 2004). By applying a broader board theoretical perspective, these scholars strive to understand the dynamics and diverse tasks of the board of directors, in different contexts, as such bridging the gaps between theory and actual board performance. Hence, this doctoral dissertation aims at contributing to this promising stream of research, by going further than

merely studying the impact of the "usual suspects"[1], by investigating the antecedents and outcomes of the board's service tasks, specifically in early stage high-tech firms.

1.2. FOCUS OF THE DISSERTATION

Given that board governance deserves more attention in smaller unlisted companies, this dissertation specifically focusses on the context of *early stage high-tech firms*. Early stage high-tech ventures operate in high-tech sectors, are not more than 10 years old, and have no single external shareholder holding a majority stake (Burgel & Murray, 2000; Burgel, Fier & Licht, 2004). These ventures are in transition, evolving into more stable organizations over time, often aiming at reaching an initial public offering (Filatotchev, Toms & Wright, 2006). In this setting, boards of directors and particularly the outside board members, are of great importance. Although entrepreneurial high-tech firms have the potential to contribute significantly to innovation, job creation and regional development (Venkataraman, 2004), they are faced with liabilities of newness and smallness (Henderson, 1999). Imagine two entrepreneurs, both technical specialists, but rather inexperienced in terms of business activities. In this situation, it may be highly relevant to add skilled industry professionals to the board in order to assist the company on a long-term basis (Bjornali & Gulbrandsen, 2010). Hence, this doctoral research seeks to demonstrate the added value brought by the outside board members. Outside board members are no members of the top management team (TMT), their associates or families, no employees of the firm or its subsidiaries, and no members of the immediate past top management group (Pearce & Zahra, 1991). Throughout this dissertation, we refer to this group of directors as the "outside board".

Furthermore, the engagement of outside boards in their *service tasks* may be particularly important in an entrepreneurial environment (Lynall, Golden & Hillman, 2003; Knockaert & Ucbasaran, 2013). Primary, they have the necessary expertise in order to give advice (e.g. on the company's business model, purchasing policies or pursued strategy) as such bridging the encountered resource dependencies related to the often homogeneous knowledge base of the TMT (Ensley & Hmieleski, 2005; Garg, 2013). Moreover, having the experts' support can increase the company's reputation and legitimacy as they open up their personal networks (Pfeffer, 1972), which may help attracting customers, suppliers or investors to go into

[1] The "usual suspects" are the classic indicators, i.e. insider/outsider ratios, board size, CEO duality and ownership, providing no understanding of how boards can contribute to organizational value creation (Finkelstein & Mooney, 2003).

business. Finally, these firms operate in a highly uncertain and changing environment (George, Zahra, Wheatley & Khan, 2001), which requires a regular source of external knowledge (Dees & Hill, 1996). This dissertation deliberately concentrates on the entire set of service tasks – as opposed to the added value of specific outside board members – in order to validate this theoretically identified construct.

Finally, through their engagement in the service tasks, outside boards become an important asset in helping entrepreneurial TMTs to gain access to new and complementary resources (Shenkar & Li, 1999). Indeed, compared to their counterparts in large and established organizations, outside board members in early stage high-tech firms are even more actively involved (Gabrielsson & Huse, 2002). As a result, it is argued that research on the outside board should be integrated with studies on the TMT (Pettigrew, 1992), which definitely holds in an early stage high-tech environment where both decision-making bodies are no standalone entities (Nielsen, 2010), and can even be considered part of the *extended TMT* (Zhang, Baden-Fuller & Pool, 2011). Hence, while focusing on the outside board service tasks, this dissertation also incorporates the TMT into the board perspective. Given that little empirical research is conducted on the interplay between the (outside) board and the TMT, particularly in early stage high-tech settings (Bjornali, 2014), this area of research remains an emerging field, leaving much to explore.

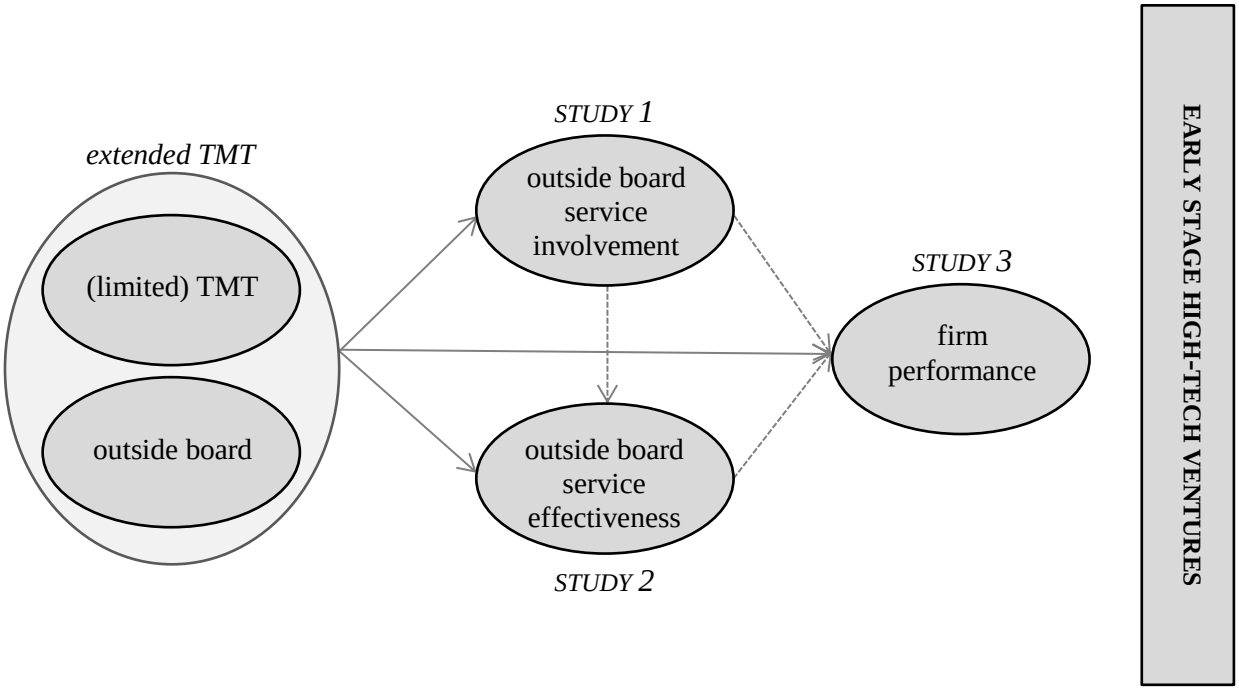
This doctoral research expands on how the outside board can create value for early stage high-tech ventures, regardless of the type of country regulations. Nevertheless, we deliberately target entrepreneurial high-tech firms in *Belgium*. Belgium is an export-driven economy and has relatively large levels of R&D intensity (2% of GDP), targeting at an increase towards 3% by 2020. What innovation is concerned, Belgium is seen as an "innovation follower", with an innovation performance above the European average (EC, 2011). Belgian companies can choose between several legal forms, such as sole proprietorship, general partnership, limited partnership, private limited liability company and private/public limited corporation. Specifically, only the latter category has the legal obligation to establish a board of directors, with no less than 3 board members in place who meet at least once a year. Moreover, the *structure* is based on a one-tier model, where both executive and non-executive directors form the board of directors. Although rarely preferred, new corporate legislations permit the board to delegate several tasks to a "management

board", as such allowing to *operate* as a two-tier model[2]. Additionally, Belgian companies have a predominantly controlled ownership structure and the country has a significant presence of small (listed) companies (Allen & Overy, 2012). What corporate governance is concerned, there is a general corporate governance code for listed companies, just as "Code Buysse" for non-listed companies. As in the other member states of the EU, these codes incorporate the national corporate governance traditions and practices as well as European directives and recommendations. Moreover, Belgium is a forerunner in a number of aspects, for instance in the field of legal provisions related to director remuneration (Allen & Overy, 2012).

1.3. OVERVIEW OF THE DISSERTATION STUDIES

Figure 1-1 shows the graphical representation of the three dissertation papers, aiming at providing a better understanding into the service tasks of the outside board in early stage high-tech ventures.

Figure 1-1 Dissertation framework



[2] In a two-tier board system, there is an executive board (for the executive directors) and a supervisory board (comprising all non-executive directors).

While focusing on extended TMT characteristics and behaviors, both service involvement (study 1) and service effectiveness (study 2) are addressed, as well as the relation with firm performance (study 3). A combination of cross-sectional and longitudinal information is used to cover the specific research questions below.

Particularly, a quantitative research design was carried out. First, through the public database Bel-First[3], we determined all early stage high-tech firms[4] in Belgium. Subsequently, we sent out a letter to the identified CEOs introducing our research and notifying them that we would call to schedule an appointment. Finally, hand-collected information was gathered by means of a structured interview with the CEO of the ventures who were willing to cooperate. Although the studies are presented in a different order, the data collection was conducted in a sequential way: the third study was based on a total sample of 179 early stage high-tech firms, composed in 2011-2013, whereas 195 early stage high-tech firms were identified for the first and second study, for which the data collection took part in 2011-2014. Due to different waves of data collection, the sample size of the three dissertation studies might slightly differ. Response-rates were fairly high, with 57%, 64%, and 62% of the CEO's participating in the first, second, and third study respectively. Additionally, we also asked the TMT and outside board members to fill in an online survey, which allowed us to verify the answers provided by the CEO. This procedure resulted in a unique hand-collected dataset, rarely seen in corporate governance research.

1.3.1. Study 1: Top management team and outside board as communicating vessels in reaching outside board service involvement: A conflict study

This study examines the interpersonal dynamics between the outside board and the TMT in explaining outside board service involvement. Specifically, the focal point of examination is task conflict between the TMT and the outside board. Task conflict refers to differences of opinion about the content of the tasks being performed (Jehn, 1997), which may be particularly important in an early stage high-tech environment (Amason, Shrader & Tompson, 2006). The outside board sees discussions and constructive task disagreements with the TMT as a means to get acquainted with and to fully comprehend firm-specific situations (Johnson, et al., 1996; Castanias & Helfat, 2001). Thus, when open discussions with the TMT are

[3] Bel-First contains general, financial, and board-related information on every Belgian company.
[4] Early stage high-tech firms operate in high-tech sectors, are not more than 10 years old, and have no single external shareholder holding a majority stake (Burgel & Murray, 2000, Burgel, Fier & Licht, 2004).

encouraged, the outside board is better able to perform its service tasks (Conger, Lawler & Finegold, 1998). Additionally, next to this direct effect, TMT – outside board task conflict might also indirectly impact outside board service involvement. Indeed, task conflict may spill over into relationship conflict, i.e. disagreements on personal issues reflecting feelings of resentment (Simons & Peterson, 2000), as such influencing the outside board service involvement in an indirect way. Accordingly, while adopting a conflict perspective, the first study provides a clear understanding of *how task conflict between TMT and outside board impacts outside board service involvement, both directly and indirectly, i.e. through the mediating effect of TMT – outside board relationship conflict*.

1.3.2. Study 2: A learning and attention based view perspective on outside board service effectiveness in early stage high-tech firms

Next to understanding what outside boards do, it is important to investigate the effectiveness of their service interventions. Outside board members may assist the entrepreneurial TMT in gaining access to new knowledge and complementary capabilities (Kroll, Walters & Le, 2007). However, the degree to which the engagement of the outside board in its service tasks helps to bridge the deficiencies within the TMT will depend on how this external knowledge is internalized. By taking a learning perspective, this paper examines the conditions under which service-related interventions by the outside board are considered effective by the TMT. Specifically, the outside board functional diversity, the learning capabilities of the TMT and the frequency of interaction between TMT and outside board are taken into account. By complementing this learning approach with the attention based view, our research also elucidates which contextual and structural factors are crucial in increasing the effectiveness of the outside board's service tasks. Hence, the second study explains *the learning components and contingencies under which the outside board service tasks are considered effective by the TMT*.

1.3.3. Study 3: Outside board human capital and early stage high-tech firm performance

Human capital has been found to be particularly important for new venture performance (Unger, Rauch, Frese & Rosenbusch, 2011). However, although frequently founded by teams, early stage high-tech firms face significant gaps in their human resource and knowledge base

(Han & Benson, 2010). Therefore, building on team production and human capital theory, this third study illustrates how the outside board can fill these gaps related to the TMT's human capital profile and subsequently influences early stage high-tech firm performance. Moreover, the performance of early stage high-tech firms is a contentious issue. Hence, this paper additionally seeks to understand the nature of the relationship between outside board human capital and early stage high-tech firm performance. Following Gans and Stern (2003), we reveal that early stage high-tech firm performance is heterogeneous and that the appropriate performance indicators are contingent on the strategy being pursued by the firm. Accordingly, we differentiate between technological and market performance and *examine which aspects of outside board human capital matter to which aspects of early stage high-tech firm performance*.

In sum, this doctoral research is embedded in the growing interest in both understanding corporate governance and getting richer insights into the functioning of entrepreneurial firms. The following chapters present the three studies outlined above. The concluding chapter of this dissertation provides a summary of the main findings, and outlines the implications for theory and practice.

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CHAPTER II

Top management team and outside board as communicating vessels in reaching outside board service involvement: A conflict study

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2. TOP MANAGEMENT TEAM AND OUTSIDE BOARD AS COMMUNICATING VESSELS IN REACHING OUTSIDE BOARD SERVICE INVOLVEMENT: A CONFLICT STUDY

ABSTRACT

Corporate governance research has mainly focused on outside board characteristics in explaining outside board involvement. However, also the interplay of the outside board members with the top management team (TMT) may influence board functioning, given that both are considered important organizational decision-making bodies. Building on conflict theory, we show how conflict between TMT and outside board unfolds as an important antecedent for outside board *service* involvement. Specifically, we study how TMT – outside board task conflict directly impacts the outside board service involvement. Moreover, we consider this relation to be mediated by TMT – outside board relationship conflict. Building on a hand-collected dataset of 70 early stage high-tech firms in Belgium, we find that TMT – outside board task conflict both has direct and indirect, i.e. through TMT – outside board relationship conflict, effect on outside board service involvement. We discuss implications for academia and practice.

2.1. INTRODUCTION

The importance of good corporate governance in reaching organizational development has prompted many researchers to study the functioning of the outside board[5] (e.g. Johnson, Daily & Ellstrand, 1996; Uhlaner, Wright & Huse, 2007). While this stream of literature has been dominated by a focus on the monitoring function of the outside board (John & Senbet, 1998; Markman, Balkin & Schjoerdt, 2001; Van de Berghe & Baelden, 2005), the relevance of outside board *service* involvement has been given less attention (van den Heuvel, Van Gils & Voordeckers, 2006). However, the outside board service tasks, through which outside board members provide advice, help building external legitimacy and provide new contacts by opening up their personal networks (Hillman & Dalziel, 2003), may be equally important. By

[5] We refer to the outside board as the board of directors without insiders, in order to assess the specific added value of the outside board members' involvement. Outside board members are defined following Pearce and Zahra (1991): they are (1) no member of the TMT, their associates or families, (2) no employees of the firm or its subsidiaries, and (3) no members of the immediate past top management group.

performing its service tasks, the outside board may improve the firm's decision-making process (Lorsch & MacIver, 1989; Donaldson & Davis, 1991; Stiles & Taylor, 2001) just as the relationship with the firm's environment and its most important stakeholders (Zahra & Pearce, 1989). As such, outside boards are ultimately responsible for corporate success (Nicholson & Kiel, 2004).

Generally, in explaining outside board involvement, prior corporate governance research has mainly considered outside board structure, composition and demographics, while neglecting the influence of outside board dynamics (Daily, Dalton & Cannella, 2003; Finkelstein & Mooney, 2003; Huse, 2005, 2007; Leblanc & Schwartz, 2007). Outside boards are however expected to be active teams (Letendre, 2004), in which (inter)personal relationships rather than outside board demographics represent the greatest influence on decision-making (Payne, Benson & Finegold, 1999) and subsequent outside board participation (Neill & Dulewicz, 2010). Specifically, the interactions between the outside board and the top management team (TMT) may influence the functioning of the outside board (Kor, 2006). As such, Pettigrew (1992) argued that research on boards should be integrated with studies on the TMT. Although Finkelstein and Hambrick (1996) refer to outside boards as "supra TMTs", which stand at the strategic apex of a firm (Mintzberg, 1973), corporate governance literature has largely overlooked the relationship between both parties and has generally depicted and studied TMT and outside board as independent actors.

Hence, in examining outside board service involvement, i.e. the engagement of the outside board in its service tasks, our research explores the interpersonal dynamics *between* the TMT and the outside board as TMTs and outside boards are not standalone entities (Vanaelst, Clarysse, Wright, Lockett, Moray & S'Jegers, 2006; Nielsen, 2010). As a result, by investigating the relationship between TMTs and outside boards, we contribute to the corporate governance literature. Moreover, by focusing on the interaction between TMT and outside board, we respond to calls by Huse (2007) and Zona & Zattoni (2007) to further investigate the dynamics that lead to outside board service engagement.

Specifically, we examine the impact of *conflict* between TMT and outside board in explaining outside board service involvement. The complex problems outside boards face require them to draw on multiple perspectives to reach superior decisions (Forbes & Milliken, 1999). Given that TMT and outside board work together to achieve firm success (Finkelstein & Hambrick, 1996), conflicts will be inevitable in this context. A large body of research has investigated the impact of conflict on group performance, with a strong theory linking *task*

conflict to improved decision-making (Amason & Sapienza, 1997; Jehn & Mannix, 2001) and pointing to the negative effects of *relationship* conflict (Jehn, 1997; Simons & Peterson, 2000). Task conflict refers to differences of opinion about the content of the task, whereas relationship conflict occurs when decision-makers disagree on issues that are personal and reflect resentment (Jehn, 1997; De Dreu & Weingart, 2003). However, despite this theoretical consent, empirical support still remains inconsistent (De Dreu & Weingart, 2003; de Wit, Greer & Jehn, 2012; O'Neill, Allen & Hastings, 2013). The positive effect of task conflict might be undone, revised or mitigated by the negative effects of relationship conflict as both types of conflict are interrelated (Amason, 1996; Amason & Sapienza, 1997; Jehn, 1997; Smith & Edmondson, 2006). However, the circumstances explaining why the positive effect of task conflict changes or how both types of conflict affect group performance is not always clear, since the encountered inconsistencies can, amongst others, be attributed to methodological issues (Amason & Loughry, 2014). Therefore, we show that task conflict intrinsically has a positive impact on group performance, but that this effect may be negated by the indirect effect of relationship conflict. Specifically, by using the correct methodology and thus investigating the mediating role of relationship conflict, we provide a more fine-grained insight into the underlying dynamics of the task conflict – outside board service involvement relationship.

In so doing, we investigate an inverted U-shaped effect of task conflict between TMT and outside board on outside board service involvement. Although evidence points to the existence of an optimal level of task conflict, only a limited number of studies has incorporated this curvilinear effect (Jehn, 1995; Amason, 1996; De Dreu, 2006; Tekleab, Quigley & Tesluk, 2009), suggesting that, while task conflict is generally beneficial, its merits fade away after a certain level. Hence, we also add to the conflict literature by following these scholars advocating that the benefits of task conflict are not linear. Finally, while most studies have investigated intragroup conflict (De Dreu & Weingart, 2003; Jehn & Bendersky, 2003), our research focusses on conflict *between* TMT and outside board, which are a firm's central decision-making units (Castro, De La Concha, Gravel & Villegas Periñan, 2009). While limited research has addressed conflict between different decision making bodies (Collewaert (2012) for instance examined conflicts among entrepreneurs and angel investors), to our knowledge, no other empirical work has addressed conflicts between TMT and outside board.

The paper develops as follows. We first present our conceptual framework in which we build on conflict theory in explaining the impact of TMT – outside board task conflict on

outside board service involvement, followed by a description of our research methodology. Subsequently, we present our results and discuss implications for academia and practice.

2.2. CONCEPTUAL FRAMEWORK

Given that the TMT and the outside board are a firm's most important decision-making bodies (Daily, McDougall, Covin & Dalton, 2002), they can be considered part of a collaboration aimed at realizing the firm's full potential (Finkelstein & Hambrick, 1996; Nicholson & Kiel, 2004; Anderson, Melanson & Maly, 2007; Nielsen, 2010). Consequently, given that interactions between both parties are necessary to exchange information, we argue that task-related discussions between TMT and outside board are required in order for the outside board to get involved in its service-related activities. As such, given that the outside board and the TMT may voice different perspectives, task conflict (i.e. content-related differences in opinion about the content of the task, Jehn, 1997) may be inevitable (Amason, 1996). Subsequently, task conflict stimulates both parties to explore new ideas and opportunities as it enables them to consider a broader range of viewpoints, options and issues (Ensley, Pearson & Amason, 2002). Latimer (1998) for example, argued that TMT members can identify more unique approaches to problems when they get exposed to others' standpoints. As such, task conflict can serve as a resource (Miller, Burke & Glick, 1998) for both the TMT and the outside board, making it worthwhile to investigate conflict between both parties, instead of looking at the impact of conflict within the TMT (e.g. Eisenhardt, Kahwajy & Bourgeois, 1997; Lim, Busenitz & Chidambaram, 2012) or the board (e.g. Forbes, Korsgaard & Sapienza, 2010; Kerwin, Doherty & Harman, 2011) separately.

Given that conflict is generally accepted to be multidimensional (Pondy, 1969; Pinkley, 1990; Jehn, 1994; Amason, 1996), next to task conflict, also relationship conflict, i.e. conflict related to personal and emotional disagreement (Jehn, 1997), may be present. Although theory indicates task conflict to be beneficial and relationship conflict to be detrimental for group performance (Jehn, 1995), empirical studies have remained inconsistent (Amason & Loughry, 2014). Particularly, the impact of task conflict on group performance may be more complex than initially thought, given the importance of the nature of the task being performed (Jehn, 1995) and its relatedness with relationship conflict (Simons & Peterson, 2000). Therefore, in what follows, we start off from investigating the relation between task conflict and group performance, and subsequently introduce relationship conflict. As such, we aim at unraveling antecedents and consequences in the conflict – group performance relation.

2.2.1. TMT – outside board task conflict and outside board service involvement

Task conflict occurs when disagreements exist about the content of the task being performed, including differences in viewpoints, ideas and opinions (Jehn, 1995). Whether task conflict is beneficial, depends on the group being investigated and the task being performed (Jehn, 1995). In lower level groups, tasks are routine-based and specific procedures and formalized policies are in place, as such making task conflict less valuable (Olson, Parayitam & Bao, 2007). Yet, in more complex environments, such as executive or directorial teams, there are few procedures at hand and uncertainty is likely to occur, which increases the need for a problem-solving mindset (Van de Ven, Delbecq & Koenig, 1976). Thus, in decision-making groups performing non-routine, complicated and multifaceted tasks, task conflict is crucial, as it allows the members to more thoroughly consider their options and alternatives in reaching high-quality decisions (Schweiger, Sandberg & Ragan, 1986, Jehn, Northcraft & Neale, 1999; O'Neill, et al., 2013). In this context, task conflict facilitates information exchange (Amason, 1996), hereby fostering the development of new insights and enhancing group understanding (Korsgaard, Schweiger & Sapienza, 1995; Amason, 1996). As such, task conflict leads to decision-making groups in becoming more engaged (De Dreu & West, 2001), consequently increasing their group performance (Amason & Sapienza, 1997; Jehn & Mannix, 2001). Tjosvold, Dann and Wong (1992) for example, showed that task conflict enables marketing teams to use their resources more effectively in order to provide improved services to their customers. Likewise, given that both the board and the TMT are a firm's most important decision-making bodies (Daily et al., 2002), we contend that conflict between both parties may be crucial in reaching outside board service involvement. The outside board sees discussions and constructive task disagreements with the TMT as a means to get acquainted with and to fully comprehend firm-specific situations (Johnson, et al., 1996; Castanias & Helfat, 2001). Indeed, in order to increase its task understanding, the outside board needs to draw from multiple perspectives (Amason & Schweiger, 1994; Pelled, Eisenhardt & Xin, 1999) to be able to provide good guidance and advice (Forbes & Milliken, 1999). As such, when content-related disagreements with the TMT take place, the outside board can react more focused in executing its service tasks. Bayazit and Mannix (2003) for example, show that debate is inherently related to the outside board members' role of being a valuable advisor. Moreover, when open discussions with the TMT are encouraged, the outside board not only gets informed, but also becomes more committed (Olson et al., 2007), which consequently enables the outside board members to better perform their service tasks (Conger,

Lawler & Finegold, 2001). Hence, we argue that outside boards will be better able to give advice and to generate external legitimacy when they can constructively discuss content-related issues with the TMT. Therefore, we expect task conflict between TMT and outside board to have a positive effect on outside board service involvement and offer the following hypothesis:

Hypothesis 1: TMT – outside board task conflict is positively related to outside board service involvement.

2.2.2. TMT – outside board task conflict, the more the better?

Despite the expected positive influence of TMT – outside board task conflict on outside board service involvement, it is likely that there exists an optimal level of task conflict (Boulding, 1963, Jehn, 1995; Miao, Tien, Chang & Ko, 2010) beyond which the participation of the outside board in its service tasks decreases. Jehn (1995) shows that too little task conflict causes to ignore problems as it will trigger inactivity given that a sense of urgency is lacking. Consequently, decision-makers, such as outside boards and TMTs, can insufficiently identify and assess the task problems at hand (Van de Vliert & De Dreu, 1994). Likewise, when very high levels of task conflict originate, severe and continuous discussions arise, resulting in a lack of consensus, which makes it unable to reach effective decision making (Gersick, 1989). Indeed, trying to incorporate too many lines of thinking will make the outside board and the TMT lose sight as they become unsatisfied with the lack of progress (Farh, Lee & Farh, 2010). If task conflict intensifies, players' cognitive systems shut down, which might hinder instead of stimulate information processing, resulting in decreased group performance (Carnevale & Probst, 1998). Hence, too much task conflict is costly in time and effort as it constraints the integration and evaluation of valuable information (Jehn, 1995, De Dreu, 2006). Therefore, we argue that too much task conflict between the TMT and the outside board will disable the latter to properly execute its service tasks. We present the following hypothesis:

Hypothesis 2: TMT – outside board task conflict has an inverted U-shaped relation with outside board service involvement, such that TMT – outside board task conflict first enhances outside board service involvement, but impedes such involvement after a certain level.

2.2.3. The mediating role of TMT – outside board relationship conflict

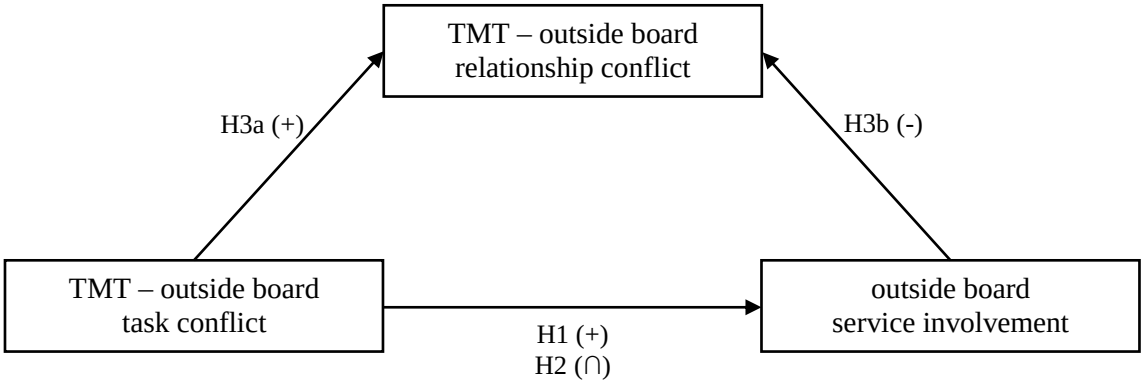
Further, while we expect to find a direct relation between TMT – outside board task conflict and outside board service involvement, we posit that this task conflict also indirectly influences the engagement of the outside board in its service tasks through relationship conflict between the two decision-making units. Particularly, task conflict may lead to relationship conflict, or disagreements based on personal differences and disaffection that undermine constructive interactions by provoking feelings of resentment (Amason, 1996; Buchholtz, Amason & Rutherford, 2005). Indeed, group members might misinterpret cognitive opinions as personal criticism (Eisenhardt & Bourgeois, 1988; Jehn, 1997) and as such might have the tendency to react personally to cognitive discussions (Mooney, Holahan & Amason, 2007). Moreover, members whose ideas get criticized or contradicted, "may feel that others in the group do not respect their judgment" (Pelled, et al., 1999, p.7). Therefore, although task and relationship conflict are distinct concepts (Ensley, et al., 2002), both types of conflict are causally related, such that task conflict may spill over in relationship conflict (Amason & Sapienza, 1997; Simons & Peterson, 2000; De Dreu & Weingart, 2003). Likewise, in a TMT – outside board context, task conflict between both parties can lead to TMT – outside board relationship conflict. Although outside board members see discussions as part of normal business (Mason & Harrison, 1996), they might have different understandings and priorities compared to the TMT. As such, this can give rise to a feeling of value dissimilarity (Jehn, 1994), which causes task-oriented conflict to be perceived as personal disaffection.

In turn, relationship conflict may affect group performance. The personal nature of relationship conflict causes feelings of anger, animosity and stress (Amason, 1996; Pelled, 1996) which leads to decreased cohesion (De Dreu & Weingart, 2003), judgment (Carnevale & Probst, 1998), satisfaction (Jehn, 1994) and commitment (Amason, 1996). Moreover, it limits information processing as members spend time focusing on each other instead of dealing with task-related problems (Simons & Peterson, 2000), which as such interferes with decision quality and group performance (Amason, 1996; De Dreu, 2006). Indeed, if the information processing between outside board and TMT is impeded as they concentrate on emotional problems compared to task issues, the outside board service involvement might be hindered. Hence, we assume that task conflict between TMT and outside board will indirectly, i.e. through TMT – outside board relationship conflict, affect outside board service involvement.

Hypothesis 3: TMT – outside board relationship conflict mediates the relation between TMT – outside board task conflict and outside board service involvement, such that higher levels of TMT – outside board task conflict lead to higher levels of TMT – outside board relationship conflict (H3a), in turn negatively affecting outside board service involvement (H3b).

Figure 2-1 summarizes our hypotheses.

Figure 2-1 Conceptual model



2.3. METHODOLOGY

2.3.1. Early stage high-tech context

We study our research questions aimed at unraveling the impact of TMT – outside board conflict on outside board service involvement in the context of *early stage high-tech firms*. Specifically, this context is relevant as the execution of the outside board service tasks is of great importance in an entrepreneurial environment, as it helps these new ventures to bridge the resource dependencies they encounter (Zahra & Pearce, 1989; Forbes & Milliken, 1999; Lynall, Golden & Hillman, 2003; Garg, 2013). Although new high-tech firms can contribute to innovation and regional development (Oakley, 1995), they have difficulties in realizing this potential as they are confronted with liabilities of newness and smallness (Henderson, 1999) and gaps related to the often homogeneous knowledge base of their TMT (Ensley & Hmieleski, 2005; Han and Benson, 2010). Hence, in order to overcome these dependencies, the engagement of the outside board in its service tasks is crucial (Zahra, Filatotchev & Wright, 2009). Further, the outside board and the TMT are considered a firm's most important decision-making bodies, which definitely holds in an early stage high-tech setting (Daily, et

al. 2002). Indeed, Zhang, Baden-Fuller and Pool (2011) showed that in this context, outside boards and TMTs can be seen as "collective entrepreneurs". Hence, conflicts may arise within this working collective and consequently have an impact on the outside board service activities. Finally, task conflict may be particularly relevant in an early stage high-tech environment, as it is crucial for new ventures where uncertainty is high and creativity is important (Amason, Shrader & Tompson, 2006; Olson, et al., 2007). Indeed, operating in an early stage high-tech environment requires constant innovation due to its dynamic and competitive nature (George, Zahra, Wheatley & Khan, 2001), which enlarges the need for external sources of knowledge (Dees & Hill, 1996). Getting experienced members on the outside board is an asset to the new venture (Kroll, Walters & Le, 2007), subsequently bringing new perspectives, which may also initiate task conflict (Amason & Sapienza, 1997).

2.3.2. Sample and data collection

Our study is based upon a hand-collected data set of early stage high-tech firms in Belgium constructed during 2011-2014. These ventures operated in high-tech sectors as classified by Burgel, Fier and Licht (2004), were founded between 2001 and 2011 as they cannot be older than 10 years (Burgel & Murray, 2000), and had no single external shareholder holding a majority stake (Burgel, et al., 2004). Using the official public database Bel-First, containing general, financial and board-related information on every Belgian company, we identified all early stage high-tech firms in Belgium, which resulted in a population of 195 firms. However, given our focus on the outside board and the TMT, we needed to eliminate those firms which had decision making units that did not conform to the definitions of outside board and TMT. First, the early stage high-tech firms needed to have at least one outside board member, defined as an individual who is not part of the TMT, its associates or families, not an employee of the firm or its subsidiaries, and not a member of the immediate past top management group (Pearce & Zahra, 1991). Of the 195 firms, 55 did not have an outside board, as such reducing our sample to 140 early stage high-tech firms. Second, following Amason (1996), a TMT consist of the group of top managers involved in strategic decision making as identified by the CEO. 18 early stage high-tech firms did not have a TMT in place, as only one person (the CEO) engaged in strategic decision making, as such further decreasing our sample to 122 qualifying early stage high-tech firms. Finally, 70 of these 122 firms (57%) were willing to cooperate in our research. We performed structured face-to-face interviews with the firms' CEO during 2012-2014, and although time-consuming, this

personal approach was required to retrieve often confidential and sensitive information, such as conflict-related data, which resulted in this high response rate.

Our study focusses on TMT – outside board dynamics at the group level. Given that we use CEOs as key informants, we face the risk that their view of TMT – outside board dynamics differed systematically from those of other TMT or outside board members. However, this risk is lowered to a great extent since the interviewed CEOs answered specific questions related to the recent dynamics of a small group of people, about which they had extensive, first-hand knowledge (Chen, Fahr & MacMillan, 1993). Additionally, there is empirical evidence that individual respondents do provide reliable and valid responses regarding group phenomena (Westphal, 1999; Atuahene-Gima & Murray, 2004). Nevertheless, we also collected data from the other TMT and outside board members to assess the reliability and validity of the CEO answers. After obtaining their email addresses through the CEO, we asked the TMT and outside board members to fill in an online survey and received additional information for 29 of the 70 early stage high-tech firms in our sample (41%). By using the Paired Samples T Test for those 29 firms, we find that the responses of the CEOs did not differ significantly from those of the TMT and outside board members (p=.659 and .599 for the task and relationship conflict scale, respectively). As such, the answers provided by the CEOs are representative and can be used in our analyses.

2.3.3. Measures

Dependent variable

Outside board service involvement. We used Minichilli, Zattoni and Zona (2009)'s measure of service involvement and asked the CEOs to indicate to what extent the outside board carries out its service tasks. The items were as follows: "To what extent does the outside board (1) contribute on management issues (2) contribute on financial issues, (3) contribute on technical issues, (4) contribute on market issues, (5) contribute on legal issues and taxation, (6) provide linkage to important external stakeholders, (7) provide the firm with external legitimacy and reputation, (8) promote strategic initiatives, (9) get involved in long-term strategic decision-making and (10) implement long-term strategic decision-making?". Responses were recorded using a seven-point Likert scale, ranging from 1 (very small extent) to 7 (very large extent). The mean value was 4.12 and the Cronbach's Alpha coefficient for the summated scale was .79.

Independent and mediator variables

TMT – outside board task conflict was computed based on Pearson, Ensley and Amason's (2002) revised version of Jehn's cognitive conflict scale (1995). The following questions were asked: "(1) How often do TMT and outside board members disagree about opinions regarding the work being done? (2) How frequently are there conflicts about the ideas outside board and TMT members have? (3) How much conflict about the work the outside board does is there between outside board and TMT members? (4) To which extent are there differences of opinion between outside board and TMT members?". Responses were recorded using a seven-point Likert scale, ranging from 1 (none) to 7 (a lot). Likewise, *TMT – outside board relationship conflict* was measured based upon the revised version of Jehn's affective conflict scale (1995) by Pearson et al. (2002). The following questions were posed: "(1) How much friction is there among outside board and TMT members? (2) How much are personality conflicts evident between outside board and TMT members? (3) How much tension is there among outside board and TMT members? (4) How much emotional conflict is there among outside board and TMT members?". Again, responses were recorded using a seven-point Likert scale, ranging from 1 (none) to 7 (a lot). The mean value for TMT – outside board task conflict was 3.05 and 2.78 for TMT – outside board relationship conflict. The Cronbach's Alpha coefficients were .88 and .90 for the summated task and relationship conflict scales respectively, indicating excellent reliability.

In order to test the distinctiveness of our conflict scales, we performed a confirmatory factor analysis. We compared a two-factor model where the two latent variables were allowed to correlate, with a one-factor model where all eight items loaded on one latent variable. The results showed that the two-factor model (comparative fit index (CFI) = .98; root mean square of approximation (RMSEA) = .10 (confidence interval (CI): .027-.156); standardized root mean residual (SRMR) = .05) fits the data better than the one-factor model (CFI = .929; RMSEA = .18 (CI: .136-.233); SRMR = .075). This indicated that task and relationship conflict can be discriminated by respondents.

Control variables

In addition to our hypothesized predictors, several other aspects may influence outside board service involvement. Therefore, we control for firm age, firm industry, frequency of board meetings, CEO duality, venture capital ownership and outsider/insider ratio.

We control for *firm age* by taking the natural log of the number of years the new venture exists, to ensure that none of the identified effects are the result of age-related processes. The sampled early stage high-tech firms are on average 6.90 years old.

Firm industry is controlled for by introducing two dummies: ICT industry and health and life sciences industry. These variables equal 1 if the firm belongs to this industry category, and 0 otherwise. The rationale for controlling for the technological domain lies in institutional theory, which suggests that organizational practices may be related to industry-specific norms (Eisenhardt, 1988). Fifty two percent of the firms in our sample belong to the ICT industry and twenty percent operate in the health and life sciences industry. The category "other industry" is used as the reference category.

Frequency of board meetings is measured as the number of board meetings organized on a yearly basis (Vafeas, 1999). The more frequently board meetings are held, the better informed outside board members are about the firm, necessary for providing tailored support. The firms in our sample on average hold 6.53 meetings a year.

CEO duality equals 1 if the CEO of the company is also the board chair, 0 otherwise. We control for CEO duality because the creation of a centralized representative can enhance clarity, particularly in a dynamic high-tech environment (Gabrielsson, 2007). Forty one percent of the firms in our sample reported CEO duality.

Venture capital ownership is a dummy variable (0/1) indicating whether the firm has raised venture capital (VC) or not. Forty four percent of the firms in our sample are VC-backed, which is high but not surprising, as this type of financing is often seen as one of the most appropriate ways of funding early stage high-tech firms (Gompers & Lerner, 2001). We control for VC financing as outside boards in VC-backed firms may be more actively involved in strategic decision making, which is one of the service tasks (Gabrielsson & Huse, 2002).

Outsider/insider ratio is the proportion of outsiders to insiders in the board room. The motivation to control for this variable is that boards with higher proportions of outsiders may have more weight attributed to the outsiders in board decision making (Haynes & Hillman, 2010). The boards in our sample on average have almost three times as many outsiders as insiders.

2.4. RESULTS

Given our focus on the interaction between outside board and TMT, we only incorporated those early stage high-tech ventures with at least one outside board and TMT member, which might give rise to potential selectivity biases. Consequently, we use Heckman's selection procedure to assure that our results are not affected by any self-selection effect (Heckman, 1979). Essentially, this selectivity model entails a two-stage procedure. In the first stage, or the selection equation (presented in Table 2-1), a probit regression is used to determine whether the early stage high-tech firm has an outside board and TMT, or not. We define this dummy variable to be a function of the venture's age, independence, industry, VC ownership and firm size (in terms of full time equivalents), which is largely in line with other selection models applied in board research (e.g. Knockaert & Ucbasaran, 2013). Based upon the results of this first-stage model, we predicted and saved the value for the inverse Mill's ratio (λ_i), which is the monotone decreasing function of the probability that an observation is selected into our sample. In the second stage or regression equation, which estimates the outside board service involvement model, the inverse Mill's ratio enters as an explanatory variable. This two-stage procedure generates consistent and asymptotically efficient estimates (Heckman, 1979).

Table 2-1 Selection equation

Selection equation (step 1) Outside board and TMT 0/1	**Unstandardized coefficients**
Firm age (ln)	.49
Firm independence	-.25
ICT industry	-.44^{+}
VC ownership	.71*
Firm size: number of full time equivalents	.04**
Constant	-.08

*Significance levels: +p<.10, *p<.05, **p<.01, ***p<.001*

The selection step is presented in Table 2-1 and indicates that larger firms, as well as VC-backed firms are more likely to have both an outside board and TMT. These outcomes are not surprising, as larger firms need more structure and firm size is strongly associated with both TMT (Beckman, Burton & O'Reilly, 2007) and outside board (Zald, 1969) size. Moreover, venture capitalists typically require the establishment of an outside board and get a seat on the board following their investment (Gabrielsson & Huse, 2001; Gompers & Lerner, 2001).

Table 2-2 provides the descriptive statistics and correlations for all variables used, for those firms which have an outside board and a TMT.

Table 2-2 Means, standard deviations and correlations

Variables	mean	s.d.	1	2	3	4	5	6	7	8	9	10
1. Firm age (ln)	1.83	0.48										
2. ICT industry [a]	0.52	0.50	-.04									
3. Health and life sciences industry [a]	0.20	0.41	-.17	**-.53**								
4. Frequency of board meetings	6.53	3.36	-.04	.03	-.01							
5. CEO duality [a]	0.41	0.49	.06	.19	**-.20**	-.01						
6. VC ownership [a]	0.44	0.50	-.09	-.14	**.41**	-.05	**-.25**					
7. Outsider/insider ratio	2.98	2.10	-.02	-.21	**.37**	.01	**-.28**	**.39**				
8. Mills ratio	0.59	0.38	-.14	**.41**	**-.44**	.03	**.25**	**-.71**	**-.39**			
9. TMT – outside board task conflict	3.05	1.32	.00	.08	-.13	-.06	.13	-.16	-.10	.22		
10. TMT – outside board relationship conflict	2.78	1.42	-.04	.03	.03	-.08	.13	-.15	-.06	.19	**.71**	
11. Outside board service involvement	4.02	1.10	-.07	**-.27**	.13	**.34**	-.02	-.13	.04	.01	**.27**	.01

*Pearson correlation coefficients (1-tailed), indicating significant correlations ($p<.05$) in **bold**.*

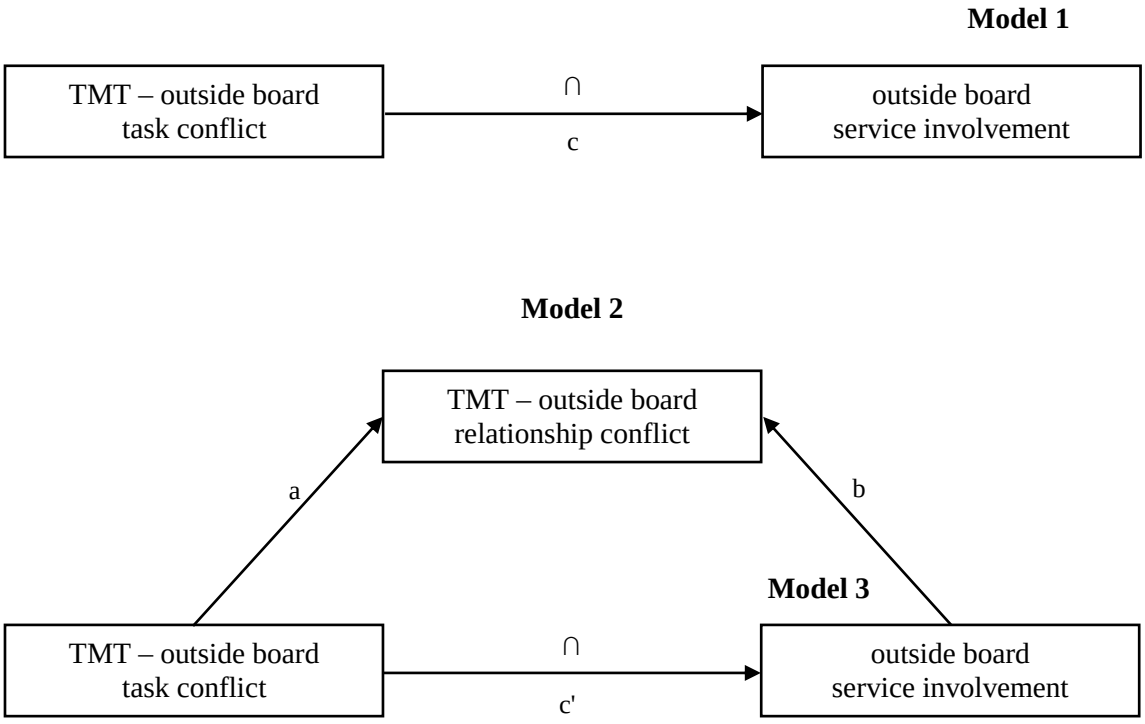
[a] *Correlations of binary variables should be interpreted with care.*

Next, our main hypotheses were tested using ordinary least squares (OLS) regression analysis (step 2). Variance inflation factors ranged between 1.055 and 2.161, indicating that multicollinearity is unlikely to be an issue in our study (Hair, Black, Babin, Anderson & Tahal, 2006). Additionally, we analyzed the nonlinear effect of TMT – outside board task conflict on outside board service involvement and its mediating effect through TMT – outside board relationship conflict using the MEDCURVE macro for SPSS (Hayes & Preacher, 2010). This method provides bootstrap estimates with bias-corrected confidential intervals of the indirect effect. We particularly rely on this method as it allows us to specify the functional paths in the model and at the same time, it permits us to compose a mediation model. As such, we set the relation between TMT – outside board task conflict and outside board service involvement as quadratic and indicate TMT – outside board relationship conflict as being the mediation variable.

Figure 2-2 illustrates our conceptual model in path diagram. The first model, in Panel A, is used to test whether TMT – outside board task conflict has an effect on outside board service

involvement (Hypotheses 1 and 2). Of interest in this model is an estimate and test of the significance of path c. The second and third model, in Panel B, are pertinent to the estimation of the indirect effect of TMT – outside board task conflict on outside board service involvement through TMT – outside board relationship conflict (Hypothesis 3), derived from paths a and b.

Figure 2-2 Conceptual model represented in the form of a path model, referring to the OLS regression coefficients estimated and reported in Table 2-3



The results of these main analyses are presented in Table 2-3. First, the control model contains control variables only. We find that the ICT industry dummy variable has a significant negative impact on outside board service involvement (B=-.660, p<.05). Moreover, early stage high-tech firms holding board meetings more frequently experience higher levels of outside board service involvement (B=.110, p<.01). Second, Model 1 reports the total effect (c in Panel A of Figure 2-2) and estimates whether TMT – outside board task conflict has a positive effect on outside board service involvement. We find a significant positive relation between TMT – outside board task conflict and outside board service involvement (B=.295, p<.01), but no total quadratic effect, as the squared coefficient for task conflict points into the expected direction, but is statistically insignificant. As such, we find

support for **Hypothesis 1**, but **no support** for **Hypothesis 2**. Finally, Model 2 and 3 decompose Model 1, allowing to estimate the presence and level of the direct (c' in Panel B of Figure 2-2) and indirect (a and b in Panel B of Figure 2-2) effect. We find a direct effect of TMT – outside board task conflict on outside board service involvement (B=.755, p<.05) and this path is significantly mediated by the indirect effect of TMT – outside board relationship conflict (based on path a (B=.756, p<.001) and path b (B=-.265, p<.05), the indirect effect is significantly negative; 95% CI [-.430; -.054]). Hence, our results provide **support** for **Hypothesis 3**, just as our sub-hypotheses H3a and H3b.

Table 2-3 OLS regression model with MEDCURVE (standard errors in parentheses)

	Control model **Outside board service involvement**	***Model 1*** **Outside board service involvement**	***Model 2*** **TMT – outside board relationship conflict**	***Model 3*** **Outside board service involvement**
Constant	3.909*** (.766)	2.923** (.869)	.263 (.952)	2.586* (.988)
Predictors				
TMT – outside board task conflict		c → .295** (.097)	a → .756*** (.099)	c' → .755* (.380)
TMT – outside board task conflict squared		-.058 (.056)		-.044 (.055)
TMT – outside board relationship conflict				b → -.265* (.114)
Controls				
Firm age (ln)	-.143 (.252)	-.126 (.266)	.029 (.291)	-.114 (.256)
ICT industry	-.660* (.280)	-.574 (.301)	.162 (.329)	-.533 (.291)
Health & life sciences industry	.078 (.364)	-.029 (.398)	.751 (.436)	.167 (.394)
Frequency of board meetings	.110** (.032)	.142*** (.035)	-.023 (.039)	.136*** (.034)
CEO duality	.093 (.237)	.116 (.269)	.094 (.294)	.136 (.260)
VC ownership	-.390 (.337)	-.293 (.339)	-.185 (.370)	-.334 (.328)
Outsider/insider ratio	.031 (.060)	.036 (.069)	-.003 (.075)	.033 (.066)
Mills ratio	.028 (.467)	-.287 (.493)	.239 (.540)	-.221 (.477)
Adjusted R^2	.145	.243	.456	.296
F-statistic	2.845**	3.220**	7.672***	3.633***

*Significance levels:*p<.05, **p<.01, ***p<.001; N=70*

2.5. DISCUSSION

This paper has sought to contribute to our understanding of how board interpersonal dynamics, and particularly task conflict between TMT and outside board, affect outside board service involvement. Research adopting a conflict perspective has typically investigated conflict in an intragroup context, while this study explored the interactions *between* outside board and TMT, given that both parties are a firm's most important decision-making units (Pettigrew, 1992). Moreover, previous studies have found strong linkages between task and relationship conflict, but the findings related to the impact of both types of conflict on group performance remain inconsistent (Amason, 1996; Jehn & Mannix, 2001; Ensley et al., 2002). As Forbes, et al. (2010) indicate, more insight is needed into the impact of task conflict "to clarify how and why its process unfolds as it does" (p. 579). Hence, this paper aimed at providing a clear understanding of the task conflict – group performance relation, by disentangling its direct and indirect effects in a board service context.

Our analyses show that TMT – outside board task conflict has a positive *total* effect on outside board service involvement. Moreover, we identify TMT – outside board relationship conflict to be an important mediator in this relation. Specifically, there is a positive *direct* effect of TMT – outside board task conflict on outside board service involvement, while its *indirect* effect, i.e. through TMT – outside board relationship conflict, has negative implications for the engagement of the outside board in its service tasks. Consequently, although previous empirical evidence has been inconsistent, we find that task conflict indeed produces the desired positive effects for group performance, but that the unintentionally triggered relationship conflict weakens this result. Therefore, it is crucial to apply the right methodology in order to correctly analyze the obtained results. Moreover, these outcomes learn us that the outside board should attempt to minimize the deteriorating effect of relationship conflict. Decision-making groups must realize that they come together to share diverse perspectives and thus should not let personal issues or emotions interfere (O'Neill, et al., 2013). Additionally, we did not detect an optimal level of TMT – outside board task conflict in explaining outside board service involvement, which can be due to our sample of early stage high-tech firms, which may still be too young for severe conflicts to have occurred. Alternatively, these ventures may be so resource-dependent that any intervention by the outside board is deemed to contribute, irrespective of the level of task conflict it generates.

2.5.1. Implications for theory

Our research makes a number of contributions to the corporate governance, entrepreneurship and conflict literatures. First, *corporate governance and entrepreneurship literatures* have primarily focused on the control tasks of the outside board (e.g. Baysinger & Hoskisson, 1990, Markman et al., 2001). Yet, outside board service involvement is equally important, especially in early stage (high-tech) ventures, where advice and network access are crucial (Hillman & Dalziel, 2003; Huse, 2007) given the encountered liabilities of newness and smallness (Henderson, 1999) and the demanding and rapidly changing environment they are operating in (Zahra & George, 2002). As such, our study contributes by unfolding (particularly conflict-related) dynamics which affect outside board service involvement. Moreover, our study contributes by integrating the TMT, often studied in entrepreneurship studies, and the outside board, often addressed in the corporate governance literature. Indeed, while Pettigrew (1992) indicated that research on board functioning should be incorporated with studies on the TMT, given that these can be considered a collective working together to reach a firm's full potential, recent research even observes a dividing line between both streams (Nielsen, 2010). As such, we respond to several calls to study outside boards and TMTs together instead of considering them as standalone entities (Carpenter, Pollock & Leary, 2003; Nicholson & Kiel, 2004; Nielsen, 2010). Finally, we show that it is worthwhile to investigate the interpersonal relationships between TMT and outside board, rather than merely looking at their demographics. Hence, we follow Zona and Zattoni (2007) showing that corporate governance research needs to go beyond "the black box of demographics" in studying outside board service involvement. Second, our paper enriches the *conflict literature* by gaining a better insight into the complex relation between conflict and group performance. Our study demonstrated that task and relationship conflict are two distinct constructs (Pearson, et al., 2002), which allowed us to further investigate the interplay between both. While we do find that the overall effect of task conflict is positive for group performance, the levels of relationship conflict, which are induced by higher levels of task conflict, are not to be ignored given their negative influence on group performance. As such, the fact that most research has explored direct and standalone effects of different types of conflict on group performance may explain the inconsistency of reported findings. Moreover, while task and relationship conflict have mainly been studied in an intragroup context (De Dreu & Weingart, 2003), our study shows that it is beneficial to investigate conflict in an intergroup context, in which conflict between organizational decision-making units is considered.

2.5.2. Implications for practice

Our study has implications for practitioners, such as (high-tech) entrepreneurs, outside board members and their stakeholders. Given the importance of task conflict in reaching superior decision-making, discussions in the boardroom should be stimulated in order to share different perspectives. At the same time, participants in such discussions should be cautious in order to avoid task conflict from spilling over into relationship conflict. For example, relationship conflict can be minimized through "harmonious personal relationships"(Neill & Dulewicz, 2010). It is further most likely that also the board chair, as an important actor in creating engaged boards (Leblanc, 2005), has an important role to play in making sure that discussions in the board room are not perceived as personal critique towards specific board members.

2.5.3. Limitations and directions for future research

While our research has both theoretical and practical implications, it also has limitations which may lead to future research directions. First, our research design was cross-sectional. While in line with the majority of conflict studies, further research could adopt a longitudinal design to explore how different types of conflict develop over time and to distinguish between short-term and long-term consequences of conflict for outside board service involvement. Second, our findings built on a sample of firms established in one country, namely Belgium. While exclusively focusing on Belgium had the advantage of gaining access to the CEO through face-to-face interviews just as the achievement of high response rates, it has the disadvantage that the results could be more difficult to generalize to other regions. Future studies could therefore analyze the extent to which our results hold in different contexts, where other regulations related to board composition and functioning may apply. Third, while TMT – outside board interactions are especially important in an early stage high-tech setting, it could be interesting to study whether our results withstand in larger and more established organizational settings, in which firms may be less dependent on the service involvement of the outside board. Finally, while our results indicated that outside board service involvement declines when task conflict spills over into relationship conflict, follow-up studies could investigate which mechanisms or procedures (e.g. board chair characteristics, interaction and communication patterns) could mitigate or avoid this effect from taking place. Most interestingly, researcher could make use of qualitative research designs, such as action research or participant observations, in studying these contingencies.

2.6. CONCLUSION

In this study, we jointly studied TMTs and outside boards by unraveling their interpersonal dynamics. Our findings demonstrate, by using the appropriate methodology, that TMT – outside board task conflict both directly and indirectly affects outside board service involvement.

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CHAPTER III

A learning and attention based view perspective on outside board service effectiveness in early stage high-tech firms

3. A LEARNING AND ATTENTION BASED VIEW PERSPECTIVE ON OUTSIDE BOARD SERVICE EFFECTIVENESS IN EARLY STAGE HIGH-TECH FIRMS

ABSTRACT

Early stage high-tech ventures face a number of challenges, related to the resource dependencies they face. In this context, the importance of the outside board service tasks is likely to be enhanced, given that outside board members may assist the top management team (TMT) in gaining access to new knowledge and complementary capabilities. However, the degree to which the outside board knowledge helps to bridge deficiencies within the TMT will depend on how this external knowledge is internalized. As such, by taking a learning perspective, we examine the conditions under which service-related interventions by the outside board are considered effective by the TMT. Drawing on a hand-collected dataset of 89 early stage high-tech firms in Belgium, we find that TMT absorptive capacity and frequency of interaction between TMT and outside board are important antecedents of outside board service effectiveness. Further, by complementing the learning perspective with the attention based view, we show that both structural and contextual factors, such as CEO duality and firm underperformance, are important elements in increasing the effectiveness of the outside board's service tasks. We discuss implications for academia and practice.

3.1. INTRODUCTION

Although high-tech firms have the potential to contribute significantly to individual wealth and regional prosperity (Venkataraman, 2004), they experience difficulties in realizing this potential in the early days due to liabilities of newness and smallness (Stinchcombe, 1965). Outside boards[6] may be particularly important in an early stage (high-tech) environment (Zahra, Filatotchev & Wright, 2009; Chancharat, Krishnamurti & Tian, 2012) as they help these new ventures to bridge the challenges and dependencies they are faced with. Unlike their counterparts in large, established firms, outside boards in these new ventures may be

[6] We refer to the outside board as the board of directors without insiders in order to assess the specific added value of the outside board members in relation to the TMT. Outside board members are defined following Pearce and Zahra (1991): they are (1) not members of the TMT, their associates or families, (2) not employees of the firm or its subsidiaries, and (3) not members of the immediate past top management group.

more likely to engage in their service tasks rather than performing a control function (Forbes & Milliken, 1999; Hillman & Dalziel, 2003; Garg, 2013; Knockaert & Ucbasaran, 2013). Specifically, entrepreneurial top management teams (TMTs) in high-tech firms are often homogeneous in terms of knowledge, education and experience (Franklin, Wright & Locket, 2001; Ensley & Hmieleski, 2005) as they are largely technical in nature and lack important commercial skills and networks (Lockett, Siegel, Wright & Ensley, 2005). Moreover, operating in a high-tech industry requires constant innovation due to its dynamic and competitive nature (George, Zahra, Wheatley & Khan, 2001), which requires a regular source of external knowledge (Dees & Hill, 1996). Hence, while significant human resource gaps within these TMTs are common (Han & Benson, 2010), external human capital might address these dependencies (Zahra, 1996). Therefore, outside boards are important in helping TMTs gain access to new knowledge, resources and complementary capabilities (Shenkar & Li, 1999; Zahra & Filatotchev, 2004), through the engagement in their service tasks (Zahra & Pearce, 1989).

Outside board members can provide advice and strengthen external legitimacy and networking, which are considered amongst the most valuable outside board service tasks (Hillman & Dalziel, 2003). As such, the outside board can help the TMT to improve decision-making processes (Donaldson & Davis, 1991) and to increase the quality of strategic decision-making (Stiles & Taylor, 2001). Simultaneously, outside board members assist in building the firm's external legitimacy and reputation by opening up their personal networks (Pfeffer, 1972) which will improve the firm's relationship with the environment and its most important stakeholders (Zahra & Pearce, 1989). Nielsen (2010) accordingly argues that TMTs and outside boards are not standalone entities, whereas Zhang, Baden-Fuller and Pool (2011) explicate this complementarity by calling outside boards and TMTs "collective entrepreneurs" in entrepreneurial threshold firms.

Despite the importance of the outside board service involvement in an early stage high-tech context, both the entrepreneurship and corporate governance literatures have only sparsely studied its antecedents and effectiveness. Hence, this paper seeks to make a number of contributions to both corporate governance and entrepreneurship literatures. First, governance studies have traditionally explored how board structure and composition impact board functioning (Daily, Dalton & Cannella, 2003). However, studying these "usual suspects" does not provide understanding of *how* outside boards can contribute to organizational value creation (Finkelstein & Mooney, 2003; Huse, 2007). Therefore, recent

studies call to move beyond board demographics to examine *what* drives outside board involvement (Wan & Ong, 2005; Huse, 2007; Zona & Zattoni, 2007). Moreover, the primary focus of corporate governance research has been on the monitoring aspect of the outside board (e.g. John & Senbet, 1998; Van den Berghe & Baelden, 2005). We try to give a better insight into the outside board *service* tasks as these remain fairly understudied (van den Heuvel, Van Gils & Voordeckers, 2006), while at least equally important, especially in an early stage (high-tech) environment (Garg, 2013). Furthermore, we do not merely record what outside boards do, but focus on the *effectiveness* of their service interventions for the TMT, hereby responding to several research calls to include firm behavioral and context specific characteristics in studying the outside board's engagement in the service tasks (Pye & Pettigrew, 2005; Huse, 2007; Minichilli, Zattoni & Zona, 2009). As such, we investigate when outside board involvement is considered valuable by the TMT. Second, the entrepreneurship literature has thoroughly studied the TMT, while the outside board has only recently been recognized as an important decision-making party (Machold, Huse, Minichilli & Nordqvist, 2011; Zhang et al., 2011). Therefore, by exploring when and how outside boards contribute to the TMT, this paper adds to the literature by recognizing the outside board as an important complement to the TMT. Moreover, the few studies that did focus on the outside board in this context have largely taken a board capital perspective, arguing that experienced outside board members are an asset to the new venture (Kroll, Walters & Le, 2007; Bjornali & Gulbrandsen, 2010). While we agree on the potential value of outside board capital, we argue that adding sufficiently high levels of outside board human capital may be a necessary but insufficient condition for outside board service effectiveness. Specifically, we add to the board capital literature by taking a learning perspective and reason that, next to outside board human capital, the outside board service effectiveness will be contingent on the learning capabilities of the TMT and the frequency of interaction between both parties. Additionally, this learning perspective is complemented by the attention based view (Ocasio, 1997), suggesting that more complementary knowledge brought by the outside board will particularly lead to higher levels of outside board service effectiveness when structural and contextual factors motivate the outside board to draw their attention towards specific service tasks. As such, our contribution is to identify the contingencies under which outside board capital is more or less valuable whilst demonstrating how the attention based view can be a useful complement to learning theory.

In what follows, we first build our theoretical framework drawing from learning theory and the attention based view. Next, we elaborate on our research methodology. We subsequently present our analysis and results, and reflect on our findings, including implications for academia and practice.

3.2. CONCEPTUAL FRAMEWORK

The process where knowledge is created, distributed, communicated and integrated into the organization is called organizational learning (Duncan & Weiss, 1978). Yet, in order for organizations to solve highly complex problems, team learning is also essential (Katzenbach & Smith, 1993; Marsick, Dechant & Kasl, 1993). Indeed, the organizational learning literature has shown that teams are vital in acquiring, sharing and refining task-relevant knowledge (Argote, 1999; Edmondson, 2002) and Senge (1990: 10) even argues that "unless teams can learn, the organization cannot learn". Team learning is defined as "a relatively permanent change in the team's collective level of knowledge and skills produced by the shared experience of the team members" (Ellis, Hollenbeck, Ilgen, Porter, West & Moon, 2003, p.822). Following a team learning perspective fits our purpose as TMTs in an early stage high-tech environment can reconfigure the nature of their capabilities through accessing, developing and integrating new and existing knowledge (Lockett et al., 2005), which can in turn create and preserve a sustainable competitive advantage (Grant, 1996; Liebeskind, 1996; Lane & Lubatkin, 1998). Entrepreneurial TMTs can acquire new knowledge and complementary capabilities through the outside board (Shenkar & Li, 1999; Zahra & Filatotchev, 2004). In such a learning context, the TMT can be considered the *student* whereas the outside board is the *teacher* (Audretsch & Stephan, 1996). Subsequently, we explain the conditions under which the student is able to effectively learn from its teacher.

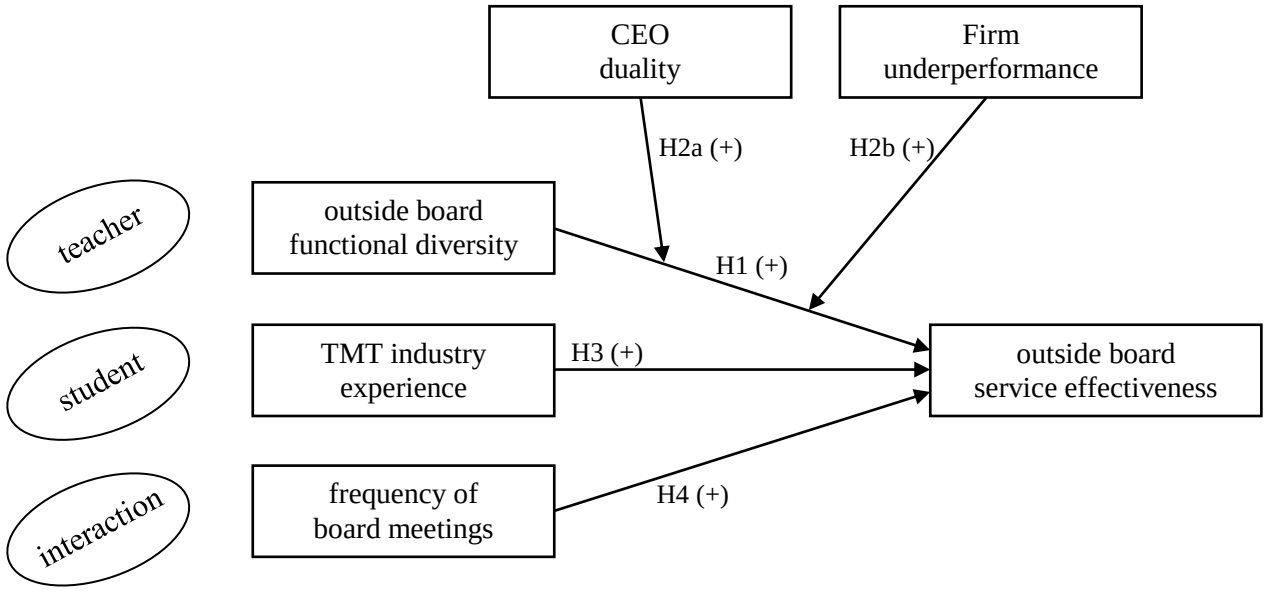
The organizational, individual and team learning literature consistently identify three main learning components (Grant, 1996; Kessler, Bierly & Gopalakrishnan, 2000). A first component is the teacher's new and diverse knowledge, which relates, in our board perspective, to the novelty and diversity of the knowledge brought by the outside board. The second learning component involves the student's absorptive capacity, which is its ability to absorb new knowledge provided by the teacher. Therefore, in a board learning context, we identify TMT absorptive capacity as the second important learning element. The third and final learning component refers to the intensity of interaction between teacher and student. Since continuous and frequent interactions are a precondition for successful learning and

collaboration (Kirat & Lung, 1999), we consider the frequency of board meetings as a final component in a board learning context.

Nevertheless, in order for the teacher to share new knowledge, the outside board members need extrinsic and intrinsic knowledge sharing motivation (Lin, 2007). Therefore, we complement learning theory with the attention based view (ABV) in order to study which internal (i.e. structural) and external (i.e. situational) factors draw the outside board's attention towards engagement in those service activities that matter most to the firm. Specifically, and in line with the ABV literature, we identify CEO duality and firm underperformance as important elements influencing structural distribution of attention and situated attention of the outside board, respectively.

Building on learning theory and the attention based view, we develop our conceptual framework in explaining outside board service effectiveness, defined as the effectiveness of the outside board's interventions through its service tasks. In so doing, we get new insights into when the outside board service involvement is found effective by the TMT, as such explaining the conditions under which the latter is able to effectively learn from the outside board. Our theoretical framework is illustrated in Figure 3-1.

Figure 3-1 Theoretical framework



3.2.1. Learning component 1: Teacher perspective

A first learning component involves the novel and diverse knowledge brought by the teacher (Lane & Lubatkin, 1998; Cohen & Levinthal, 1990). The teacher ensures new knowledge and external relationships, allowing the student to gain important complementary sources of knowledge (Harrigan, 1985; Dees & Hill, 1996). Consequently, in the board learning context, this first learning component relates to outside board human capital, which has been shown to be important for the outside board's ability to advise the TMT (Arthurs, Hoskisson, Busenitz & Johnson, 2008; Kor & Sundaramurthy, 2009). In an early stage high-tech context, the TMT often has high levels of technical experience (Ensley & Hmieleski, 2005), but lacks other types of human capital. Given the need to access knowledge and skills in multiple fields following the dynamic characteristics of the early stage high-tech environment (George, et al., 2001), the outside board is particularly likely to contribute when it brings diverse human capital. Indeed, Wuyts, Colombo and Dutta (2005) point to diversity as a crucial condition for learning and innovation, which is associated with agents with different knowledge or skills. Ideally, the outside board adds business experts with knowledge on corporate issues, support specialists with expertise in financial affairs and community influentials with experience and relationships with external stakeholders (Hillman, Cannella & Paetzold, 2000). An outside board with such functional diversity is better able to give advice to the TMT (Westphal, 1999) as it can provide a larger variety of knowledge (Kroll, et al., 2007), and can enhance the TMT's networking ties (Beckman & Haunschild, 2002) just as firm legitimacy (Certo, Daily & Dalton, 2001). Furthermore, outside board functional diversity will lead to different types of perspectives and a greater ability to solve problems (Bunderson & Sutcliffe, 2002), increased quality of decision-making in the board (Doz & Kosonen, 2008) and consequently better (outside board) performance (Johnson, Schnatterly & Hill, 2013). As such, more diverse outside boards are likely to bring knowledge where TMTs can learn from, and which may possibly lead to overlaps in the interpretation systems between TMT and outside board, hereby enabling the latter to understand the issues relevant for the TMT. Subsequently, we argue that the TMT will value the outside board interventions through the service tasks more pronouncedly when the outside board has a high level of functional diversity, and offer the following hypothesis:

Hypothesis 1: There is a positive relationship between outside board functional diversity and outside board service effectiveness.

3.2.2. Role of situated and structural attention

Although the board capital literature has proposed that new and diverse knowledge brought by the outside board may be beneficial to the effectiveness of the outside board's interventions, outside board members are, as all decision-makers, limited in their information procession capacities (Cyert & March, 1963), which requires them to selectively attend to certain issues and answers, while neglecting others (Ocasio, 1997). Therefore, as we argue below, the diverse human capital the outside board brings, will be particularly beneficial through its service involvement, if structural or contextual factors motivate outside board members to focus their attention towards their service tasks.

First, an important principle of the ABV is structural distribution of attention, or the idea that structural factors, such as the firm's rules, resources, and social relationships regulate and control the focus of actors' attention (Ocasio, 1997). As such, formal firm structures will affect the board's allocation of attention towards the service tasks or particular service components. One of the most important structural elements of the outside board is CEO duality (Finkelstein, Hambrick & Cannella, 2009). CEO duality occurs when a firm's CEO also holds the board chair position of the firm (Rechner & Dalton, 1991). Although agency theory advocates the potential drawbacks originating from this dual position, CEO duality may be particularly beneficial in an early stage high-tech environment. Indeed, entrepreneurial firms are less likely to encounter agency problems (Garg, 2013) and therefore conflicts of interest between CEO and outside board are not a main concern (Krause, Semadeni & Cannella, 2014). Instead, CEO duality provides a unity of command necessary to manage the environmental uncertainty, which asks for speedy decision-making (Boyd, 1995). Moreover, it increases the firm's legitimacy by sending a signal to stakeholders that the company has a clear sense of direction (Salancik & Meindl, 1984). Since the CEO-chair is expected to have a better insight into what is readily available within the TMT, (s)he also recognizes which knowledge is lacking and what the diverse outside board can add in order for the TMT to learn and make progress. With the chair also being part of the TMT, the outside board is more rapidly acquainted with the TMT's necessities and knowledge requirements as the CEO-chair may communicate these issues to the outside board, hereby resolving decision-making uncertainties (Machold et al., 2011). In turn, the outside board is more likely to get involved and to direct its attention towards the engagement in its service tasks given that they are kept informed by the CEO-chair (Mallette & Fowler, 1992;

Knockaert, Bjornali & Erikson, 2014). Similarly, first-hand information can help the outside board to direct its attention towards those service elements which are particularly relevant to the TMT. Hence, we argue that bringing functional diversity in the outside board will be beneficial to the TMT through the generation of higher levels of outside board service effectiveness, and that this relationship will be strengthened by CEO duality which may help to direct the outside board's attention towards those service activities which are relevant to the TMT. We present the following hypothesis:

Hypothesis 2a: CEO duality will positively moderate the relationship between outside board functional diversity and outside board service effectiveness.

Second, the principle of situated attention in the ABV indicates that what issues and answers decision-makers focus on, and what they do, depends on the particular context or situation they find themselves in (Ocasio, 1997). Following this principle, contextual elements might affect the extent to which outside boards put their board capital to work for the benefit of the focal firm. One such contextual factor is firm underperformance (see Tuggle, Sirmon, Reutzel & Bierman, 2010). Firm underperformance is a way of assessing managerial effectiveness (Walsh & Seward, 1990) and occurs when the current firm performance is below a certain aspiration level, as perceived by the decision-makers (Audia & Greve, 2006). Consequently, firm underperformance may trigger problemistic search by the outside board, as problems are only recognized to the extent that firms fail to satisfy their objective(s) (Cyert & March, 1963). This negative performance deviation might trigger the decision-makers' behavior to adjust their actions accordingly and the outside board will aim at finding solutions to immediate problems of accountability (Cyert & March, 1963; Milliken & Lant, 1991). As such, instead of trying to deal with every threat or opportunity, the satisficing nature of outside board decision-making is considered a guiding principle (Baumol, 2004; Hendry, 2005). Likewise, venture capitalists, which typically have a seat on the outside board, encounter significant time-constraints and thus concentrate their efforts on the underperforming firms in their portfolio (Fredriksen, Olofsson & Wahlbin, 1997) in order to regenerate the weak portfolio companies (MacMillan, Kulow & Khoylian, 1988). Additionally, firm underperformance might implicate that the outside board's reputation is at stake (Fama, 1980) and consequently outside board members will most likely feel responsible and direct their attention towards firm-relevant service tasks. Hence, firm underperformance can motivate outside board members to become more engaged (Kahneman & Tversky, 1979;

Audia & Greve, 2006; Tuggle, et al., 2010). It follows that the impact of outside board functional diversity on outside board service effectiveness will be intensified when the firm performs below its expectations, due to heightened attention by the outside board to their service involvement. Consequently, we offer the following hypothesis:

Hypothesis 2b: Firm underperformance will positively moderate the relationship between outside board functional diversity and outside board service effectiveness.

3.2.3. Learning component 2: Student perspective

The second learning component relates to the absorptive capacity of the student. Absorptive capacity is the general ability to value, assimilate and commercialize new and external knowledge (Cohen & Levinthal, 1990). Indeed, people see the world according to their cognition which has developed in different conditions, such as organizational culture, social norms and values (Wuyts, et al., 2005). In order for the student to learn from the teacher, a "shared interpretation system" (Weick, 1995) is needed, in which they share basic perceptions and values to be able to align competences and motives. In order for students to successfully understand, interpret and realize the benefits of external information, a nominal level of expertise in that particular area is essential (Cohen & Levinthal, 1990), which is mainly a function of its prior related knowledge (Lane & Lubatkin, 1998).

Applying this concept of student absorptive capacity to a board learning context, we argue that TMT (i.e. the student) absorptive capacity will help the TMT to learn from, absorb and deploy external knowledge brought to it by the outside board (i.e. the teacher). Higher levels of team absorptive capacity have been shown to result in a better integration of new knowledge (Griffith & Sawyer, 2010). Moreover, the existence of external knowledge as such provides no benefits to the TMT if it cannot identify and deploy this knowledge (West & Gallagher, 2006). Therefore, as learning can only take place when a shared interpretation system is established, the TMT needs absorptive capacity in order to effectively learn from the (new) external knowledge offered by the outside board.

In an early stage high-tech firm, TMT members often originate from a research context (Franklin, Wright & Lockett, 2001). At the same time, outside board members are typically active in a business environment (Kor & Sundaramurthy, 2009), where other types of conditions and cultures apply. Furthermore, it is well acknowledged that inherent tensions exist between research and commercial environments (Hackett, 2001). Consequently, we

argue that, in order for TMTs to learn from the new knowledge brought to them by the outside board, they will need some industry experience (Tyler & Steensma, 1998) in order to understand the corporate environment outside board members typically come from. The more the TMT shares basic perceptions to align its competences and motives with the outside board, the better it is capable of absorbing the advice provided by the outside board (Hillman & Dalziel, 2003). Given that TMTs with industry experience can determine opportunities for innovation (Weterings & Koster, 2007), trigger entrepreneurial actions (Stuart & Abetti, 1990) and are better able to understand the current industry dynamics (Arthur, 1994), the novel contacts brought by the outside board will be better understood and thus more valued by TMTs with industry experience. As such, we argue that TMTs with industry experience will benefit to a larger extent from the outside board's input. We offer the following hypothesis:

Hypothesis 3: There is a positive relationship between TMT industry experience and outside board service effectiveness.

3.2.4. Learning component 3: Interaction perspective

A third learning component pertains to the frequency of interaction between student and teacher. Indeed, for effective learning to take place, considerable time (Harlow, 1959) and intensity of effort (Cohen & Levinthal, 1990) are critical. Lane and Lubatkin (1998) indicate that interactive learning is the most appropriate to understand new external knowledge as students get close enough to learn not just the objective capabilities of their teachers, but also the related tacit knowledge. This requires face-to-face, direct and frequent interactions between student and teacher (Daft & Huber, 1987) in order to transfer both explicit and tacit knowledge (Nonaka & Takeuchi, 1995). Similarly, Nooteboom, Van Haverbeke, Duysters, Gilsing and Van den Oord (2007) indicate that, through interactions, individuals with different knowledge endowments stimulate each other to stretch their knowledge and to bridge knowledge fragments. Hence, in our board learning context, we argue that interactions between TMT and outside board will shape learning behaviors as these improve both the capacity of the teacher to transmit the knowledge and the capacity of the student to absorb it (Foss, Laursen & Pedersen, 2011). As frequency of interaction creates a unique language which facilitates knowledge transfer (Steensma & Corley, 2000), it enables the outside board and the TMT to share, refine and combine task-relevant knowledge (Van Der Vegt & Bunderson, 2005). The most common forum through which the outside board and the TMT

have face-to-face, direct and frequent interactions is the board meetings (Conger, Finegold & Lawler, 1998). As these interactions are likely to affect the effectiveness of the collective learning process (Hinsz, Vollrath, Nagao & Davis, 1988), we argue that more frequent board meetings relate to increased levels of outside board service effectiveness. We offer the following hypothesis:

Hypothesis 4: There is a positive relationship between the frequency of board meetings and outside board service effectiveness.

3.3. METHODOLOGY

3.3.1. Sample and data collection

In this paper we use a hand-collected dataset on early stage high-tech firms in Belgium. Three criteria for defining early stage high-tech firms were applied. First, these firms could not have existed for more than 10 years (Burgel & Murray, 2000) and were founded between 2001 and 2011. Second, we selected new ventures from multiple high-tech sectors, as classified by Burgel, Fier and Licht (2004). They use the high-tech industries of Butchart (1987), complemented by a number of high-tech service sectors. Third, only early stage high-tech firms with no single external shareholder holding a majority stake were selected (Burgel, Fier & Licht, 2004).

We identified all early stage high-tech firms in Belgium meeting these three conditions by using the official public database Bel-First, containing general, financial and board-related information on every Belgian company. Applying our selection criteria to this database resulted in a sample of 195 firms. Given the focus of our study on outside boards, we contacted all firms by telephone to check whether they had at least one outside board member. To qualify as an outside board member, an individual could not be part of the top management team, its associates or families, not be an employee of the firm or its subsidiaries, and not be a member of the immediate past top management group (Pearce & Zahra, 1991). In case the contacted firm did not have an outsider on the board, information on age, TMT, sector and funding were collected. Of the 195 firms, 55 did not have any outside board member and for 37 of these (67%), we received additional information, which is used in our analyses to correct for potential selection biases. As a result of this procedure, the sample of early stage high-tech firms with an outside board contained 140 ventures.

Subsequently, we conducted face-to-face interviews during 2012-2014 with the CEOs of firms having an outside board. Although being time-consuming, these face-to-face contacts were necessary to retrieve often confidential and sensitive information. Further, this personal approach resulted in a high response rate (64%), with 89 of the 140 firms willing to cooperate. Further, even though interviewing the CEO is relevant as he or she typically possesses the most comprehensive knowledge on the organization's history, strategy, processes and performance (Carter, Stearns, Reynolds & Miller, 1994), we deemed it necessary to collect information from multiple sources. As such, we obtained the contact information of all TMT and outside board members through the interviewed CEOs. Consequently, every member of the TMT as well as all outside board members received a request to fill out an online survey about their human capital profile. Out of the 256 TMT members in our dataset, 79 replied to our survey (31%), as well as 69 of the 326 outside board members (21%), which allowed us to partially validate the data provided by the CEO. Additionally, we double-checked all functional background profiles through secondary data on Linked-In (a professional social network website).

3.3.2. Measures

Dependent variable

Outside board service effectiveness. We used Minichilli et al. (2009)'s measure of service involvement and asked the CEOs to indicate how *effective* the outside board is in performing its service tasks. The items were as follows: "How effective is the outside board in (1) contributing on management issues (2) contributing on financial issues, (3) contributing on technical issues, (4) contributing on market issues, (5) contributing on legal issues and taxation, (6) providing linkage to important external stakeholders, (7) providing the firm with external legitimacy and reputation, (8) promoting strategic initiatives, (9) long-term strategic decision-making and (10) implementing long-term strategic decision-making?". Responses were recorded using a seven-point Likert scale, ranging from 1 (highly ineffective) to 7 (highly effective). The Cronbach's Alpha coefficient for the summated scale is .82.

Independent and moderator variables

Outside board functional diversity was computed by using Teachman (1980)'s diversity scale: $H = -\sum_{i=1}^{N} P_i(\ln P_i)$. Pfeffer and O'Reilly (1987) have shown that this formula can be used to index the heterogeneity in a system (*H*), where P_i *i*s the probability that the system will be found in state *i*, if there are *N* possible states in which the system can be. In our case, *P* represents the proportion of the outside board's years of working *experiences* assigned to management; marketing, sales and promotion; accounting, controlling and financing; engineering and R&D; production; or personnel (Cantner, Goethner & Stuetzer, 2010). The outside board diversity index ranges from 0 (indicating a very homogeneous outside board) to 1.56 (specifying a very diverse outside board).

TMT industry experience was calculated as the sum of the number of years of experience all TMT members had in the same industry as the current firm, at the moment of joining the firm. On average, the TMT has 32.24 years of industry experience.

Frequency of board meetings was measured as the number of board meetings that take place on a yearly basis. The firms in our sample on average reported 6.53 board meetings per year.

CEO duality was coded as a dummy variable, equaling 1 if the CEO of the firm was also the board chair, 0 otherwise. In 41% of our sample, this dual structure was in place, indicating that in 59% of the cases, the CEO and board chair were two different persons.

Firm underperformance was operationalized based on Fredriksen and Klofsten (1999) by asking the CEO to compare the current size of the firm, both in terms of sales and full time equivalents (FTEs), to what was foreseen in the business plan at start-up. Responses were recorded using a five-point Likert scale, ranging from 1 (the initial business plan had foreseen a much lower level of sales/FTEs respectively) to 5 (the initial business plan had foreseen a much higher level of sales/FTEs respectively). Afterwards, we reverse coded this measure in order to assess the impact of firm underperformance and used the summated scale for sales and FTEs. The Cronbach's Alpha coefficient for the summated scale is .88.

Control Variables

Several other factors may affect the hypothesized relationships. Hence, we control for firm age, firm independence, firm industry, venture capital ownership, outsider/insider ratio and economic crisis.

We control for *firm age* by taking the natural log of the number of years the new venture exists, to ensure that none of the identified effects are the result of age-related processes. The sampled early stage high-tech firms are on average 6.90 years old.

Firm independence is a dummy variable equaling 1 if the firm is an independent start-up and 0 otherwise. An independent start-up emerges from the ideas and knowledge of one or more independent entrepreneurs (Shrader & Simon, 1997), while dependent start-ups include corporate and academic spin-offs. Sixty eight percent of our sample are independent early stage high-tech firms.

Firm industry is controlled for by introducing two dummies: ICT industry and health and life sciences industry. These variables equal 1 if the firm belongs to this industry category, and 0 otherwise. The rationale for controlling for the technological domain lies in institutional theory, which suggests that organizational practices, including those relating to the outside board, may be related to industry-specific norms (Eisenhardt, 1988). Fifty two percent of the firms in our sample belong to the ICT industry and twenty percent operate in the health and life science industry. The category "other industry" is used as the reference category.

Venture capital ownership is a dummy variable (0/1) indicating whether the firm has raised venture capital (VC) or not. Forty four percent of the firms in our sample are VC-backed, which is high but not surprising, as this type of financing is often seen as one of the most appropriate ways of funding early stage high-tech firms (Gompers & Lerner, 2001). We control for VC financing as outside boards in VC-backed firms may be more actively involved in strategic decision making, which is one of the service tasks (Gabrielsson & Huse, 2002).

Outsider-insider ratio is the proportion of outsiders to insiders in the board room. The motivation to control for this variable is that boards with higher proportions of outsiders may have more weight attributed to the outsiders in board decision making (Haynes & Hillman, 2010). The boards in our sample on average have close to three times as many outsiders as insiders.

Economic crisis is a dummy variable equaling 1 if the early stage high-tech firm is founded after 2008 and 0 otherwise. Given that the start of the banking crisis has resulted in a weaker economic period (Haugh, Ollivaud & Turner, 2009), we control whether being founded after this economic crisis might impact the effectiveness of the outside board. On average, 24% of the ventures in our sample are founded after 2008.

Table 3-1 provides the descriptive statistics and correlations for all variables used, for those firms which have an outside board.

Table 3-1 Means, standard deviations and correlations

Variables	mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12
1. Firm age (ln)	1.83	0.48												
2. Firm independence [a]	0.68	0.47	**.21**											
3. ICT industry [a]	0.52	0.50	-.04	.11										
4. Health and life sciences industry [a]	0.20	0.41	-.17	**-.34**	**-.52**									
5. VC ownership [a]	0.44	0.50	-.09	**-.27**	-.14	**.41**								
6. Outsider/insider ratio	2.98	2.09	-.02	-.35	-.21	**.37**	**.39**							
7. Economic crisis [a]	0.24	0.43	**-.77**	-.10	.03	.09	.07	.05						
8. CEO duality [a]	0.41	0.49	.06	**.29**	.19	**-.20**	**-.25**	**-.28**	-.10					
9. Firm under-performance	3.67	1.08	.19	.06	.15	**-.26**	-.14	-.05	**-.22**	.15				
10. Outside board functional diversity	1.24	0.27	.11	.13	-.03	.09	-.01	.09	-.03	.08	.15			
11. TMT industry experience	32.24	26.49	-.03	**-.25**	-.19	**.49**	**.42**	**.28**	.18	-.11	-.06	-.01		
12. Number of board meetings	6.53	3.36	-.04	-.06	.03	-.01	-.05	.01	.04	-.01	-.08	-.07	-.18	
13. Outside board service effectiveness	4.12	1.12	-.06	.19	**-.33**	.16	**-.23**	-.07	.08	.03	-.11	-.06	.14	.16

*Pearson correlation coefficients (1-tailed), indicating significant correlations (p<.05) in **bold**.*

[a] Correlations of binary variables should be interpreted with care.

3.4. RESULTS

As we aim to examine outside board service effectiveness for early stage high-tech firms, we only incorporate these ventures with at least one outside board member. This may however give rise to potential selectivity biases as those firms without an outside board are excluded. Therefore, we use Heckman's selection procedure to assure that our results are not affected by any self-selection effect (Heckman, 1979). Essentially, this selectivity model entails a two-stage procedure. In the first stage or the selection equation, a probit regression is used to determine whether the early stage high-tech firm has an outside board or not. This dummy variable is a function of the venture's age, independence, industry, venture capital ownership, TMT size and firm size. Based upon the results of this first-stage model, we predicted and saved the value for the inverse Mill's ratio (λ_i), which is the monotone decreasing function of the probability that an observation is selected into our sample. In the

second stage or regression equation, which estimates the outside board service effectiveness model, the inverse Mill's ratio enters as an explanatory variable. This two-stage procedure generates consistent and asymptotically efficient estimates (Heckman, 1979).

Table 3-2 Selection equation

Selection equation (step 1) Outside board member 0/1	**Unstandardized coefficients**
Firm age (ln)	.19
Firm independence	-.30
ICT industry	-.15
VC ownership	.83**
TMT size	-.11
Firm size: number of full time equivalents	.07**
Constant	.00

*Significance levels: *p<.05, **p<.01, ***p<.001*

The selection step is presented in Table 3-2 and indicates that larger firms, as well as VC-backed firms are more likely to have an outside board. These outcomes are not surprising as larger firms need more structure and firm size is strongly associated with outside board size (Zald, 1969). Moreover, venture capitalists typically require the establishment of an outside board and get a seat on the board following their investment (Gompers & Lerner, 2001; Gabrielsson & Huse, 2002).

Next, the results of our main regression models (step 2) are presented in Table 3-3. The hypotheses were tested using multiple hierarchical regression analysis. In the first model, we only included the control variables. In the second model, we added the variables related to our set of direct hypotheses, namely outside board functional diversity, TMT industry experience and frequency of board meetings. The interaction variables are added in the third model, where mean centered observations of the independent variables are used to calculate interaction terms in order to avoid multicollinearity problems, which is a standard practice in multiple regression analysis (Kutner, Nachtsheim, Neter & Li, 2005). Moreover, Variance Inflation Factors were all below 2.33, indicating that multicollinearity indeed was no issue (Hair, Black, Babin, Anderson & Tahal, 2006). All three models are statistically significant.

Table 3-3 Regression equation

Regression equation (step 2) Outside board service effectiveness	Unstandardized coefficients		
	Model 1	**Model 2**	**Model 3**
Controls			
Firm age (ln)	-.09	-.30	-.33
Firm independence	.52*	.64**	.62*
ICT industry	-.70**	-.79**	-.80**
Health and life sciences industry	.44	.08	.11
VC ownership	-.62*	-.71*	-.74*
Outsider/insider ratio	.00	.01	.01
Economic crisis	.24	-.12	-.33
CEO duality			-.03
Firm underperformance			-.05
Independents			
Outside board functional diversity (H1)		-.38	-.62
TMT industry experience (H3)		.01**	.01**
Frequency of board meetings (H4)		.07*	.07**
Interaction terms			
Outside board functional diversity x CEO duality (H2a)			1.60*
Outside board functional diversity x firm underperformance (H2b)			.82**
Constant	4.40***	4.38***	4.85***
Inverted Mills ratio	.07	.31	.53
Number of observations	126	126	126
Number of censored observations	37	37	37
Number of uncensored observations	89	89	89
Wald chi²	26.61***	43.67***	59.25***

*Significance levels:*p<.05, **p<.01, ***p<.001; N=89*

Model 1 contains control variables only. We find that the firm independence (B=.52, p<.05) has a significant positive impact and the ICT dummy (B= -.70, p<.01) and VC ownership (B= -.62, p<.05) have a significant negative impact on outside board service effectiveness. Adding the independent variables (model 2) led to significant model improvements. In this model, the impact of outside board functional diversity on outside board service effectiveness is not statistically significant. On the other hand, the impact of TMT industry experience (B=.01, p<.01) on outside board service effectiveness is significantly positive. Additionally, we find that a higher frequency of board meetings (B=.07, p<.05) relates positively to a higher service effectiveness of the outside board. As such, we find **no support for H1**, but **support for H3 and H4**.

Finally, model 3 presents the full model including the interaction terms. We find that both CEO duality (B=1.60, p<.05) and firm underperformance (B=.82, p<.01) positively moderate the relationship between outside board functional diversity and outside board service effectiveness. Thus, our evidence **supports H2a and H2b**. We visualize the significant moderation effects of CEO duality and firm underperformance in Figures 3-2 and 3-3 respectively. Figure 3-2 indicates no distinct difference of the impact of low or high outside board functional diversity on outside board service effectiveness if there is no CEO duality. However, when the CEO also holds the board chair position, the outside board service effectiveness improves and this effect is even more pronounced for functionally more diverse outside boards.

Figure 3-2 Outside board functional diversity x CEO duality

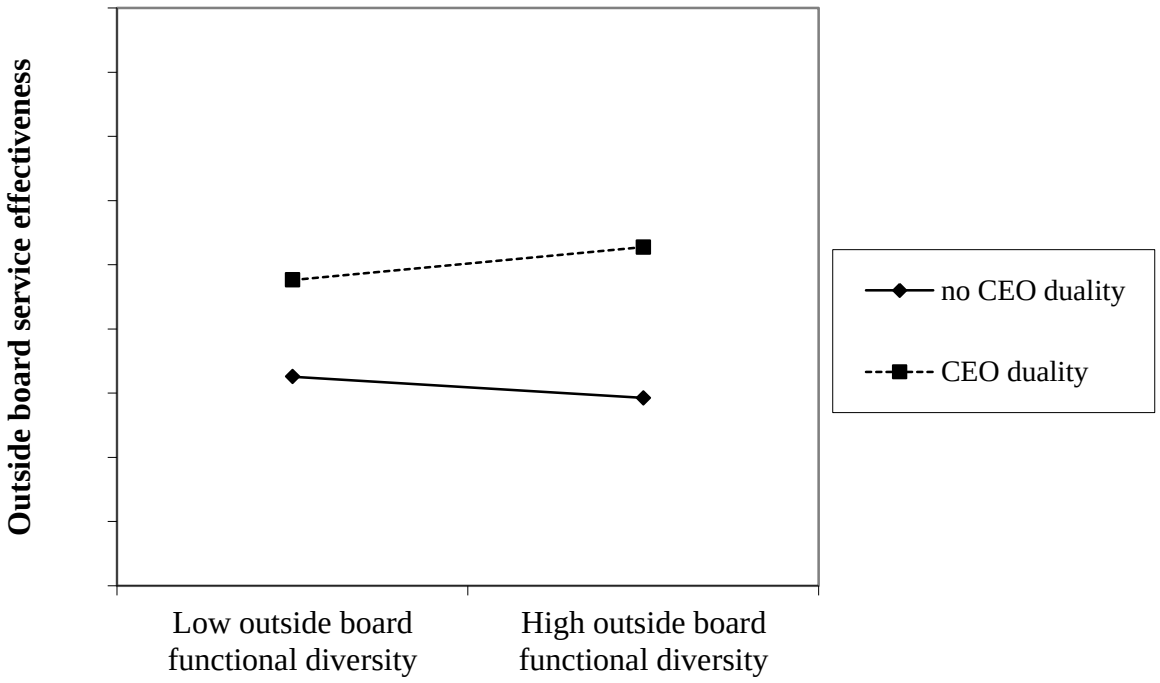
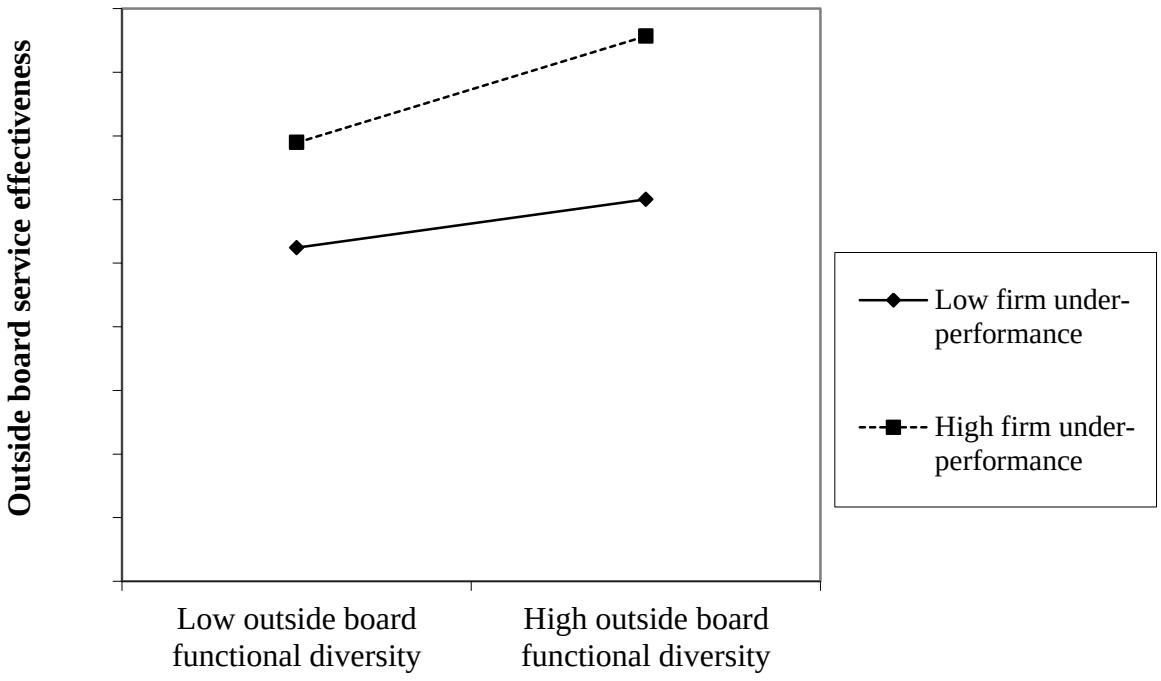


Figure 3-3 shows that, in case of low outside board functional diversity, the outside board is particularly effective in its service tasks when the firm is experiencing high underperformance. This effect is then strengthened as outside boards become more functionally diverse. In what follows, we discuss our findings and implications.

Figure 3-3 Outside board functional diversity x firm underperformance



3.4.1. Robustness check: marginal effect outside board functional diversity

Although the interaction coefficient of outside board functional diversity and firm underperformance is significant, we calculate the marginal effect as the interaction might not be significant for all values of the moderating variable (Brambor, Clark & Golder, 2006; Kam & Franzese, 2007). In an interactive model, the effect of any independent variable X on the dependent variable Y is not a single constant, but depends on the coefficients of X, the moderating variable Z and the interaction term XZ (Brambor, et al., 2006).

The marginal effect of X in our interaction model

$Y = \beta_0 + \beta_1 X + \beta_2 Z + \beta_3 XZ + \delta controls + \varepsilon,$

is $\frac{\delta Y}{\delta X} = \beta_1 + \beta_3 Z,$

with Y = outside board service effectiveness,

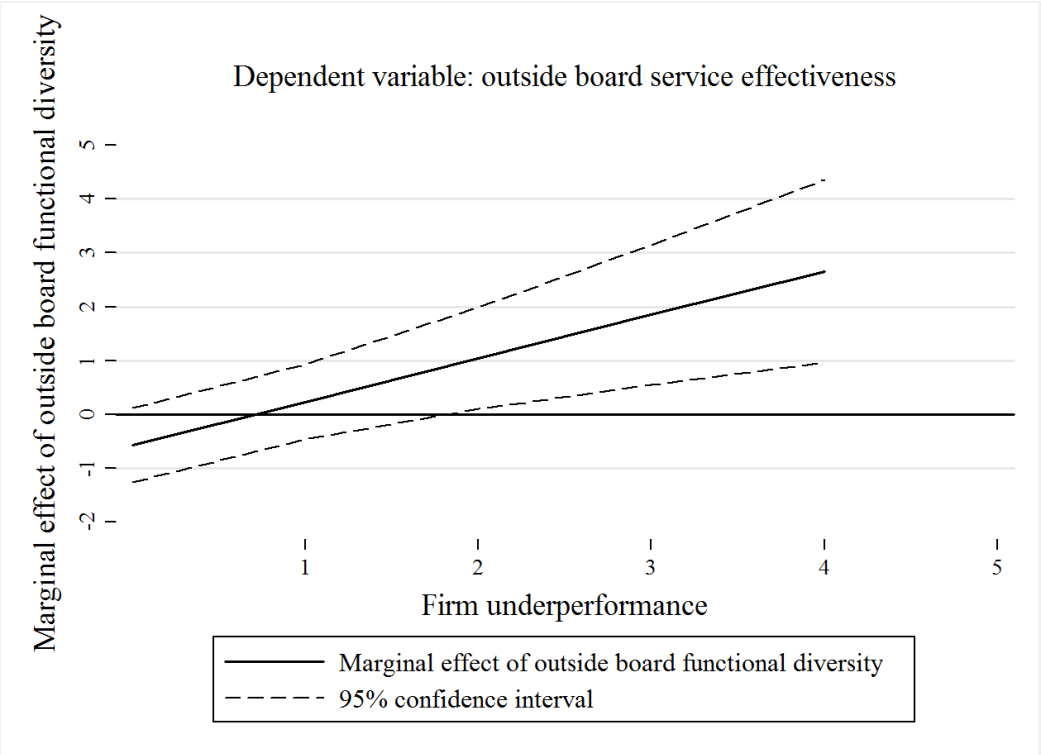
X = outside board functional diversity and

Z = firm underperformance.

In order to correctly interpret the marginal effect, we took into account the relevant elements of the variance-covariance matrix and recalculated the standard errors as suggested

by Brambor, et al. (2006). The solid line in Figure 3-4 shows the marginal effect of outside board functional diversity on outside board service effectiveness, the dotted lines represent the 95% confidence interval.

Figure 3-4 Marginal effect of outside board service effectiveness on outside board diversity as firm underperformance changes



Thus, the outside board functional diversity – outside board service effectiveness relationship is significant when both the upper and lower bounds of the confidence interval are above (or below) the zero line. At this point, it is clear that outside board functional diversity has a significant positive effect on the service effectiveness of the outside board when the level of firm underperformance is higher or equal to 2. Hence, a minimum level of firm underperformance is necessary in order to translate outside board functional diversity into higher levels of outside board service effectiveness which is in line with the arguments of learning theory.

3.5. DISCUSSION AND IMPLICATIONS

Prior research has focused on outside boards in large and established firms, hereby studying the importance of the outside board's control tasks. By investigating under which

circumstances the outside board in an early stage high-tech environment engages in its service tasks and is found effective by the TMT, we respond to recent calls by Krause et al. (2014) and Knockaert et al. (2014) to study the outside board's service involvement in an entrepreneurial context. Building on learning theory and the attention based view, we examined the impact of three learning components on outside board service effectiveness and considered the moderating effects of structural and contextual factors.

First, although outside boards with an extensive knowledge base can be highly valuable in advising the TMT (Kor & Misangyi, 2008), our results did not support our assumption that outside board functional diversity relates positively to outside board service effectiveness. However, while we did not obtain a direct effect between outside board functional diversity and outside board service effectiveness, we found that in combination with structural and contextual factors, outside board functional diversity affects the service effectiveness experienced by the TMT. Particularly, we observed that more outside board functional diversity was related to higher levels of outside board service effectiveness when CEO duality was in place, or when the firm was performing below expectations. By integrating learning theory and the attention based view of the firm, we contend that having outside board functional diversity is an insufficient condition for outside boards to contribute effectively to the TMT through their service tasks. The contribution of a diverse outside board is remarkably valuable if structural (i.e. CEO duality) or contextual (i.e. firm underperformance) factors direct the outside board's attention towards service engagement in the focal firm or in those service activities which are most relevant to the TMT. Second, we argued that the TMT needs a basic level of expertise, i.e. absorptive capacity, in order to learn from the service engagement of the outside board. Our results indeed show a positive relationship between TMT industry experience and outside board service effectiveness, indicating that the TMT itself should also have a basic understanding in order to understand the information provided by the outside board. Finally, we found that the frequency of board meetings plays an important role in the learning process. Through these interactions outside boards and TMTs are able to share relevant and often tacit knowledge, leading to higher levels of outside board service effectiveness.

Our research has important implications for academia, (high-tech) entrepreneurs and policy makers. For academia, our paper contributes to both entrepreneurship and corporate governance research that has primarily focused on the control function of the outside board, often in large corporations (e.g. Conyon & Peck, 1998). Yet, in an entrepreneurial (high-tech)

context, the contribution of the outside board through its engagement in the service tasks is particularly relevant, as early stage (high-tech) ventures need advice, strategic input and network access (Hillman & Dalziel, 2003; Huse, 2007) given the gaps in their human capital base and the demanding and rapidly changing environment they are operating in (Zahra & George, 2002). As such, a first contribution lies in the study of *how* and *when* outside boards contribute through their service tasks. Subsequently, by particularly focusing on outside board service effectiveness, and when outside board interventions matter as opposed to what outside boards do, we respond to a recent call by Machold and Farquhar (2013) to disentangle the relationships between outside board involvement, effectiveness and task performance. Second, this paper adds to the board capital literature by showing that merely adding human capital through the outside board may be a necessary, but insufficient condition for outside board service effectiveness. Indeed, so far, studies have typically looked at outside board structure and composition, applying a board capital perspective to examine the outside board service involvement (e.g. Hillman & Dalziel, 2003; Haynes & Hillman, 2010). We complement these studies by focusing on the *effectiveness* of the outside board service engagement on the one hand, and by unraveling the situations and contexts in which outside board capital is more or less beneficial to such effectiveness on the other hand. Third, our research contributes by integrating the TMT, often studied in entrepreneurship studies, and the outside board, often addressed in corporate governance literature. In doing so, we show that, in order to understand outside board service effectiveness in early stage high-tech firms, TMT and outside board characteristics are equally important. As such, we respond to calls to examine boards and TMTs together instead of considering them as standalone entities (Carpenter, Pollock & Leary, 2003; Boeker & Wiltbank, 2005; Nielsen, 2010; Machold et al., 2011). Finally, we contribute by showing how the attention based view can purposefully complement learning theory and lead to complementary insights. Particularly, we find structural and situational attention to be important mechanisms complementing the learning processes.

Our study has implications for (high-tech) entrepreneurs and their stakeholders too. Specifically, our results show that outside board service effectiveness will not necessarily increase if the outside board has higher levels of functional diversity, as this is dependent on specific structural and contextual factors. Indeed, as outside board members often hold multiple board positions (Ferris, Jagannathan & Pritchard, 2003), they have to distribute their time over these positions. Therefore, if they are kept informed by the CEO-chair and are

triggered by the firm's underperformance, highly diverse outside boards become more engaged in their service tasks. Moreover, TMTs should have sufficient absorptive capacity in order to benefit from the outside boards' engagement in their service tasks. Further, our findings point to the importance of face-to-face interaction between TMT and outside board in order for the outside board to share its knowledge and for the TMT to learn from the outside board's engagement in its service tasks.

Finally, our results are also relevant to policy makers. Although many governments have built schemes to assist firms in attracting outside board members (Conyon, Peck & Read, 2001), our research emphasizes the need for a more tailored approach when supporting high-tech entrepreneurs: the process of attaining new outside board members should take into account the learning capabilities of the TMT in order for outside board interventions to reach their full potential.

3.6. LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

Although our research has a number of implications, it also has limitations which may lead to future research directions. First, our research design was cross-sectional. Further research could adopt a longitudinal design to shed light on how outside board service effectiveness evolves over time and how TMT and outside board changes affect this service effectiveness. Second, our findings build on a sample of firms established in a specific country, namely Belgium. While exclusively focusing on Belgium had the advantage that face-to-face interviews with the CEO could be organized and a large percentage of the population could be surveyed, it has the disadvantage that the results could be more difficult to generalize to other regions. Future studies could therefore analyze the extent to which our results hold in other contexts. Third, our results indicated that face-to-face interactions are important. Therefore, it might be relevant to further explore board functioning and communication patterns, for example by investigating the type of board meetings, the specific agenda and how the outside board allocates its time. Additionally, while board meetings are the most prominent forum where the outside board and the TMT meet face-to-face, it could be interesting to study the impact of other ways of interaction, for instance by employing qualitative research designs such as action research or participant observation.

3.7. CONCLUSION

In this study, we examined the relationship between the learning components of an early stage high-tech firm, namely outside board functional diversity, TMT absorptive capacity and frequency of board meetings, and outside board service effectiveness. We further looked at the moderating effects of CEO duality and firm underperformance as important structural and contextual determinants of attentional focus. Our findings show that outside board service effectiveness is positively influenced by TMT industry experience and frequency of board meetings. Additionally, both CEO duality and firm underperformance positively moderate the relationship between outside board functional diversity and outside board service effectiveness. Our findings emphasize the importance of jointly studying TMT and outside board characteristics in order to understand outside board service effectiveness in early stage high-tech firms.

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CHAPTER IV

Outside board human capital and early stage high-tech firm performance

4. OUTSIDE BOARD HUMAN CAPITAL AND EARLY STAGE HIGH-TECH FIRM PERFORMANCE

ABSTRACT

Early stage high-tech firms are confronted with a number of challenges related to the homogeneous and technical nature of the start-up team. Attracting outside board members can alleviate these challenges and consequently enhance firm performance. Building on team production and human capital theory, we study how outside board human capital affects technological and market performance. Our results, based on a longitudinal panel dataset consisting of 562 firm-year observations in 80 young high-tech ventures in Belgium, show that outside board specific experience, diversity and tenure are important determinants of firm performance. We discuss implications for research and practice.

4.1. INTRODUCTION

Early stage high-tech entrepreneurship can contribute to innovation, employment generation and regional development (Oakey, 1995). Yet, early stage (high-tech) firms face a number of challenges, commonly referred to as the liabilities of newness and smallness (Henderson, 1999). The lack of track record and legitimacy makes it difficult for these firms to acquire the needed resources from the environment (Knockaert & Ucbasaran, 2013). Further, early stage high-tech firms (hereafter ESHTFs) focus on innovation and typically operate in highly uncertain and changing environments (Garg, 2013). It is hardly surprising therefore that high technology entrepreneurship is often a collective activity.

Although frequently founded by teams, many ESHTFs have significant gaps in their human resource and knowledge base (Han & Benson, 2010). While the top management teams (TMTs) in these firms typically have superior technical skills, they tend to have more limited business development and general management experience (Forbes & Milliken, 1999). These TMTs are likely to select team members from their own networks, resulting in teams which are often homogeneous in terms of education, industry experience, functional expertise and skills (Ensley & Hmieleski, 2005). At the same time, the strategic leadership of early stage entrepreneurial firms does not just comprise the TMT but also the board of directors which includes outside board members (Daily, McDougall, Covin & Dalton, 2002).

TMTs and boards are not standalone entities (Nielsen, 2010), especially in ESHTFs, where outside boards[7] can be considered part of the "extended TMT" (Vanaelst, Clarysse, Wright, Lockett, Moray & S'Jegers, 2006; Zhang, Baden-Fuller & Pool, 2011). Hence, ESHTFs can overcome the aforementioned challenges by drawing on inside TMT members *and* outside board members.

In this study we explore the link between the human capital of the outside board and performance in ESHTFs (above and beyond the human capital of the TMT), thereby contributing to the understanding of (technology) entrepreneurship as well as the governance of entrepreneurial firms. We focus on human capital for two reasons. First, human capital has been found to be particularly important for new venture performance (Unger, Rauch, Frese & Rosenbusch, 2011). An important source of human capital for new ventures is the TMT (Ucbasaran, Lockett, Wright & Westhead, 2003) and the human capital of the TMT contributes to superior firm performance (e.g. Amason, Shrader & Tompson, 2006; Colombo & Grilli, 2010). The role of the outside boards' human capital has however received more limited attention. We therefore study how outside board members could fill important gaps in the TMT's human capital base and subsequently influence firm performance. Second, although human capital is associated with firm performance, the performance of ESHTFs is a contentious issue. Traditional measures of new venture financial performance such as growth and business volume may be less useful for early stage high-tech businesses (Chandler & Hanks, 1993) as they might be loss-making while developing market presence (Dai & Liu, 2009). Thus, our second motivation is to understand the nature of the relationship between outside board human capital and early stage high-tech firm performance in particular. Building on Gans and Stern (2003) we argue that ESHTF performance is heterogeneous and that the appropriate performance indicator is contingent on the strategy being pursued by the firm. Accordingly, we differentiate between technological performance and market performance and ask "which aspects of outside board human capital matter to which aspects of early stage high-tech firm performance?". Before presenting our conceptual framework, we first elaborate on ESHTF performance and how it can be assessed.

[7] We refer to the outside board as the board of directors without insiders. Outside board members are defined following Pearce and Zahra (1991): they are (1) no members of the TMT, their associates or families, (2) no employees of the firm or its subsidiaries, and (3) no members of the immediate past top management group.

4.2. EARLY STAGE HIGH-TECH FIRM PERFORMANCE

Gans and Stern (2003) contend that early stage high-tech companies operate in either a market for ideas or a market for products, because they typically lack resources to pursue both strategies simultaneously (Bhide, 2000). Those operating in the market for ideas focus on building a strong technology position whilst allowing other parties to commercialize their technological developments. In contrast, those operating in the market for products concentrate on bringing new products to the market. It is important therefore to take into account that companies may follow different strategies, and to assess both *technological performance* which is appropriate for those operating in the market for ideas and *market performance* which is appropriate for those operating in the market for products. First, considering technological performance, both *speed to first patent* and *degree of patent activity* are important indicators. Given that windows of opportunity for ESHTFs close quickly (Knockaert, Ucbasaran, Wright & Clarysse, 2011), the speed at which technology is developed and patents are filed will be of major importance. Specifically, patents allow firms to sustainably differentiate themselves from competition (Cohen, Nelson & Walsh, 2000) and help gain competitive advantage (Audretsch, Keilbach & Lehmann, 2006). Patenting is one the most widely used methods of protecting gains from technological investments (Arundel, 2001). Levin, Klevorick, Nelson and Winter (1987) observe that patenting represents the most effective means of protecting new ventures' technological resources because other means may not be feasible and indicate patents to be the most marketable asset. Indeed, patent protection helps companies to appropriate the returns from R&D investments and facilitates technology commercialization (Cohen et al., 2000; Dechenaux, Goldfarb, Shane & Thursby, 2008) by delaying imitation by others (Teece, 1986). Second, considering market performance, both *speed to first product* and *degree of new product generation* are important performance measures. Bringing a first product to the market is a major milestone for new high-tech organizations; the speed at which such an organization manages to sell its first product is important to accelerate financial independence, to gain visibility, legitimacy and early market share, and to increase the likelihood of survival (Schoonhoven, Eisenhardt & Lyman, 1990). Yet, the ability to develop *multiple* new products is also crucial in high-tech industries (Loch, Stein & Terwiesch, 1996) as the rate at which a firm develops new products is critical for achieving and maintaining first-mover advantages (Dees & Hill, 1996). The number of products a firm markets has been frequently used as a measure of market performance (Tsai, 2001; Hitt, Hoskisson, Johnson & Moesel, 1996). We now outline the theories we use to

explain our hypothesized relationships between outside board human capital and early stage high-tech firm performance.

4.3. CONCEPTUAL FRAMEWORK

In selecting our conceptual framework we had two inter-related considerations: the theory should be fit for purpose (i.e. suitable to the context of ESHTFs) and should help us explain the relationship between the outside board and early stage high-tech firm performance. The relationship between the role and composition of the outside board and firm performance has been studied extensively, with agency theory being the dominant theoretical framework. Recent studies (e.g. Zhang et al., 2011; Garg, 2013) question the suitability of agency theory to explain the role and influence of the outside board in early stage entrepreneurial firms. For example, Garg (2013) argues that in entrepreneurial firms, there is much less separation of ownership and control and thus the agency problem of monitoring TMT members with misaligned financial incentives is less central than in large firms. Rather than a control role, outside board members are more likely to perform a service role (Zahra & Pearce, 1989; Forbes & Milliken, 1999; Hillman & Dalziel, 2003) in entrepreneurial firms. This service role involves providing access to resources (Deutsch & Ross, 2003; Hillman & Dalziel, 2003) and increasing the firm's legitimacy (Certo, Daily & Dalton, 2001). The hitherto dominant agency theory may, therefore, lack power when explaining the relationship between outside boards and performance in ESHTFs. We argue that the team production theory of the firm (Blair & Stout, 1999; Machold, Huse, Minichilli & Nordqvist, 2011) is a more appropriate theoretical perspective in the context of (high-tech) entrepreneurial firms. Team production occurs when several types of resources (information, talents, skills, and visions) are used and where the product is not just the sum of separable outputs of each cooperating resource (Alchian & Demsetz, 1972). According to team production theory, firms are viewed as a nexus of team-specific assets, invested by shareholders, board members, managers and other stakeholders who hope to benefit from team production (Kaufman & Englander, 2005; Gabrielsson, Huse & Minichilli, 2007). A central concept in team production theory is the *mediating hierarchy* whose function is to encourage firm-specific investment in team production (Blair & Stout, 1999). In a firm, this function is performed by the board which is at the apex of the firm's decision-making. In entrepreneurial firms where there is a critical need for resources, team production can be a valuable theoretical lens because each outside board member brings specific and firm relevant knowledge to the team (Kaufman & Englander, 2005).

Accordingly, outside boards can be seen as knowledgeable and cooperative team members that contribute to firms' value creation through their service role (Gabrielsson et al., 2007; Machold et al., 2011). Yet, because the ability to add value is a function of what resources team members bring to the team as well as the ability to share and combine these resources, we argue that team production theory needs to be supplemented with human capital theory.

Human capital and the knowledge embedded within (particularly tacit knowledge) has been presented as the most universally valuable and imperfectly imitable resource (Kogut & Zander, 1992; Crook, Todd, Combs, Woehr & Ketchen, 2011). Human capital consists of achieved attributes, work experience and habits which are linked to productivity and firm performance (Becker, 1975; Crook, et al., 2011). Therefore, in order to understand when outside boards in ESHTFs add value, it is important to take into account their human capital profile whilst controlling for the human capital of the TMT.

In what follows we use team production theory as an overarching conceptual framework to develop hypotheses on the relationship between outside board human capital and the performance of ESHTFs. We respectively focus on outside board specific experience, functional diversity and tenure which have been identified as major determinants of outside board human capital (Johnson, Schnatterly & Hill, 2013).

4.3.1. Outside board specific experience and ESHTF performance

Team production theory espouses that the ability of the outside board to contribute to the firm's value creating capabilities will be greatest when its members provide access to knowledge and skills that are specific to the firm and industry (Kauffman & Englander, 2005). This is in line with human capital theorists who argue that the more specific the human capital to the context of the work being performed, the greater the economic rents generated from that human capital (Hatch & Dyer, 2004; Dimov & Shepherd, 2005). In the context of the ESHTF, the service role of the outside board may relate to tasks oriented towards gaining technological or market presence by operating in the market for ideas or the market for products, respectively (Gans & Stern, 2003).

We first consider the relationship between outside board specific experience and technological performance. As intimated earlier, ESHTFs require outside board members who possess knowledge of the technological intricacies of their firm's products and their production and development (Forbes & Milliken, 1999). High technology ventures, particularly those seeking to gain technological presence in the market, require extensive new

knowledge creation and/or technological synthesis which call for high levels of technical expertise (Eisenhardt & Schoonhoven, 1990). Additionally, as a new venture needs to quickly gain technical capabilities to compete in rapidly changing markets, more technical expertise may enhance the firm's performance (McGee & Dowling, 1994). While the TMTs of ESHTFs tend to be populated by individuals with technical expertise, outside board members may supplement the ventures' internal knowledge and skills (Machold et al., 2011). As such, we expect outside board R&D experience to strengthen the task-specific human capital needed to reinforce technological performance, as demonstrated through both speed to first patent application and degree of patent activity. We offer the following hypothesis:

Hypothesis 1a: Higher levels of outside board R&D experience positively affect technological performance.

Firms operating on a market for products may benefit from other types of outside board specific human capital. In this case, outside board members are particularly likely to add value if they possess knowledge on how to serve product markets. Prior knowledge of ways to serve markets, acquired through sales and marketing experience, provides access to information about how a technology can be developed or packaged as a product or service that satisfies customer needs (Marvel, 2013). Indeed, investing in specific human capital tailored to the firm's competitive needs, allows the firm to create value by generating new products (Kaufman & Englander, 2005). As such, we argue that having outside board members with specific marketing and sales experience will enhance market performance. Such experience may help to reach the first milestone related to market performance, namely shipping the first product for revenues, and to build a product portfolio. We offer the following hypothesis:

Hypothesis 1b: Higher levels of outside board marketing and sales experience positively affect market performance.

4.3.2. Outside board functional diversity and ESHTF performance

An outside board that is formed following the principles of team production theory would comprise diverse members, each of whom brings important resources that contribute to firm value creation (Kauffman & Englander, 2005). Indeed, the knowledge and skills needed to

effectively manage an early stage high-tech business are unlikely to be contained within the TMT let alone a single entrepreneur. The presence of a diverse outside board might alleviate the burden on the TMT. The outside board's functional background diversity captures how much outside board members differ from each other in their experiences, competences, skills and perspectives (Minichilli, Zattoni & Zona, 2009). Group processes literature tells us, however, that capitalizing on this diversity is not straightforward. It is not surprising, therefore, that the evidence on the relationship between TMT diversity and performance (e.g. Simons, Pelled & Smith, 1999; Carpenter, Geletkanycz & Sanders, 2004) as well as outside board diversity and performance (Johnson et al., 2013) is not conclusive.

While diversity increases the aggregate level of resources at the group's disposal, it is a double edged sword; diversity is also associated with higher levels of conflict, communication problems as well as lower levels of information sharing and integration (Forbes & Milliken, 1999; Bunderson & Sutcliffe, 2002). These potential consequences of diversity may be particularly pronounced for outside boards because its members only interact periodically and thus have fewer opportunities to address the differences that separate them (Forbes & Milliken, 1999). In such circumstances, a certain degree of homogeneity might strengthen the relational fabric between group members.

Scholars are increasingly moving towards a contingency perspective to understand the relationship between diversity and performance, suggesting that environmental and task characteristics might influence this relationship (Joshi & Roh, 2009). House, Filley and Kerr (1971) found that routine problem solving is best handled by a homogeneous group, while ill-defined, novel problem solving is best handled by a heterogeneous group, in which diversity of opinion, knowledge and background allows a thorough airing of alternatives. While technological development can be hardly seen as a routine activity, it may require a more homogenous human capital profile as the development of technology is a largely technical challenge and requires extensive technical human capital. Michel and Hambrick (1992) argue that a common functional background helps develop "common schemata among team members and thereby increases cohesion by promoting a common premise for decision-making" (p.18). The common schemata associated with functionally homogeneous teams can increase communication, facilitate the ability to achieve consensus and reduce conflict, all of which contributes to speedy and efficient coordination (Hambrick, Cho & Chen, 1996; Carpenter, 2002). Therefore, we anticipate homogeneity, rather than diversity, of functional background to facilitate technological development. Evidence, although in different contexts,

suggests that technological output is strengthened when collaborating parties have similar backgrounds as it facilitates knowledge sharing (Ahuja, 2000; Sampson, 2007).

It follows that, although outside board diversity may bring more breadth of knowledge and different approaches to problem solving (Tuggle, Schnatterly & Johnson, 2010), it may have an adverse effect on team production (in this case technological development) by lowering group cohesiveness (Keller, 2001). Therefore, given that technological development may be seen as a task mainly requiring a highly technical skill set, we argue that, controlling for TMT human capital and diversity, outside boards bringing functional diversity are likely to have a negative impact on technological performance. We offer the following hypothesis:

Hypothesis 2a: Higher levels of outside board diversity negatively affect technological performance.

Outside board diversity is also likely to influence market performance albeit in a different way. Firms need a range of skills to bring products to market: they require experts in R&D, manufacturing and marketing in their organizational structure in order to quickly and successfully bring a first product to the market (Schoonhoven et al., 1990). Indeed, product development and marketing processes are made possible by diverse new product teams because they solve an information-processing problem by bringing together people from different disciplines with distinct expertise (Keller, 2001). As such, diversity in experience in the functional domains leads to a decrease in the time to commercialize new products and strengthens the product portfolio by allowing products to be technically developed and manufactured whilst also being designed to respond to customer needs (Schoonhoven et al., 1990). Since many high-tech TMTs are homogenous, comprising mainly of members with technical expertise (Mosey & Wright, 2007), we argue that functionally diverse outside boards can add value to the firm by bringing missing human capital to the early stage high-tech TMT, in turn promoting market performance. We offer the following hypothesis:

Hypothesis 2b: Higher levels of outside board diversity positively affect market performance.

4.3.3. Outside board tenure and ESHTF performance

As social systems, the ability of outside boards to contribute to firms' value creation is influenced by how well outside board members share knowledge and interact (Forbes & Milliken, 1999). Machold et al. (2011) argue that board development processes are essential in order to transform a collection of outside board members into a team that can contribute to firm value creation. During their tenure on the board, outside board members build up firm-specific human capital (Johnson et al., 2013). From a team production perspective, this firm-specific human capital allows them to make more valuable contributions to team production (Blair & Stout, 1999; Machold et al., 2011). Over time, outside board members develop a greater understanding of the company's needs and are better able to interpret the information provided by executive board members, allowing outside board members to enhance their monitoring and advising capabilities (Kor & Sundaramurthy, 2009). Changes in board composition can temporarily reduce team production (Machold et al, 2011) by influencing team coordination and information transfer (Summers, Humphrey & Ferris, 2012). Thus, with greater outside board tenure, we expect outside board members to develop firm-specific human capital and capabilities that can contribute to the performance of ESHTFs, both from a technological and market perspective.

First, we expect greater outside board tenure to positively affect technological performance. Positive team dynamics emerge through shared experience and time spent together (Foss, Klein, Kor & Mahoney, 2008). Accordingly, the longer the outside board members serve on the board, the better they can assess the needs of the firm and its engagement in the technology development process. Moreover, the firm-specific knowledge that accrues through greater tenure will help the outside board to make quicker and more informed decisions on technological issues, such as patent applications which represent an important way to show the firm's commitment to getting an idea commercialized (Hitt, Hoskisson, Ireland & Harrison, 1991). We therefore expect that greater outside board tenure will contribute favorably to technological performance, both in terms of speed to first patent application and the degree of patent activity, and offer the following hypothesis:

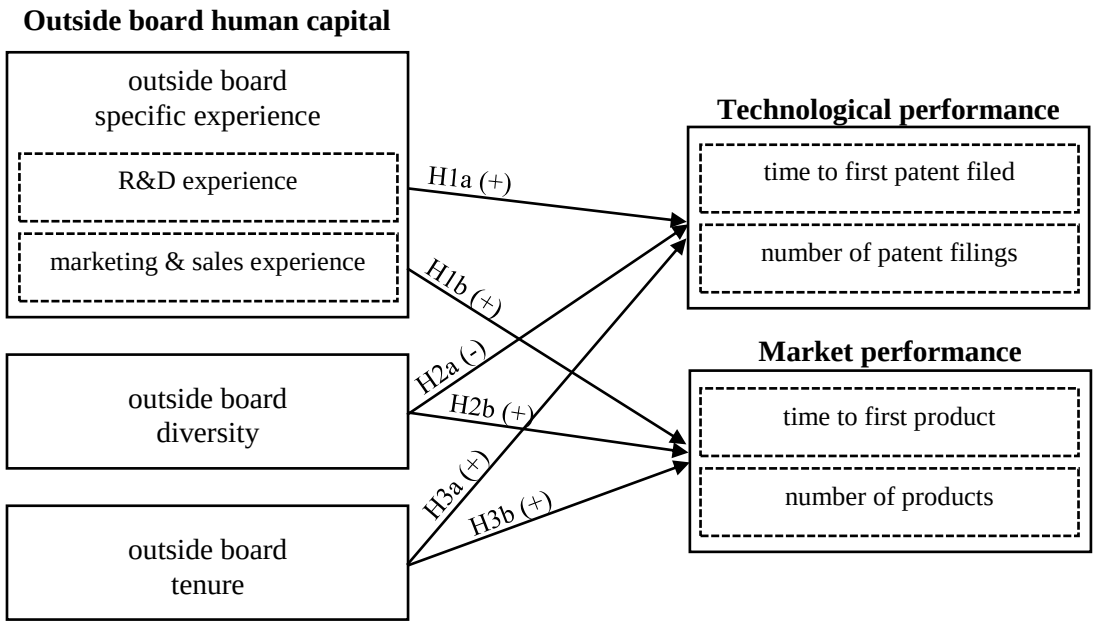
Hypothesis 3a: Higher levels of outside board tenure positively affect technological performance.

Likewise, we argue that firm-specific human capital in the outside board generated through tenure, will positively affect market performance. Developing new products and processes is learned by doing (Schoonhoven, et al., 1990; Delmar & Shane, 2002). As outside board members reside for a longer period on the board, they get more acquainted with the company and are better able to advise the company on first and subsequent product introductions. Further, outside board members will interact more frequently if they serve longer on the board, which leads to a more effective use of their knowledge base (Postrel, 2002), generates new knowledge (Rutherford & Buchholz, 2007), and leads to the generation of new ideas for product development (Tsai, 2001). These positive developments that result from greater tenure translate into quicker time to market for products (Datar, Jordan, Kekre, Rajiv & Srinivasan, 1997) and a higher level of subsequent product introductions. These arguments lead to the following hypothesis:

Hypothesis 3b: Higher levels of outside board tenure positively affect market performance.

Figure 4-1 summarizes our research hypotheses.

Figure 4-1 Conceptual framework



4.4. METHODS

4.4.1. Sample and data collection

Our study relies on a unique longitudinal data set of ESHTFs in Belgium constructed in 2011-2013. Using the official public database Bel-First, containing general, financial and board-related information on every Belgian company, we identified all ESHTFs in Belgium. These are ventures that were operating in high-tech sectors as classified by Burgel, Fier and Licht (2004), were no more than 10 years old (Burgel & Murray, 2000), and had no single external shareholder holding a majority stake (Burgel, et al., 2004). This process yielded a sample of 179 firms.

Given our focus on outside boards, we contacted all firms by telephone to check whether they had at least one outside board member – an individual who was not part of the top management team, its associates or families, not an employee of the firm or its subsidiaries, and not a member of the immediate past top management group (Pearce & Zahra, 1991). To correct for any potential selectivity biases, we collected data on the TMT, age, sector and funding for each firm irrespective of whether they had an outside board. As 50 firms did not have an outsider on the board, the usable population consisted of 129 ESHTFs.

The longitudinal data were collected during face-to-face interviews with the firms' CEOs in 2012 and 2013. While time-consuming, these interviews were necessary to retrieve often confidential and sensitive information. Further, this personal approach resulted in a high response rate (62%), with 80 of the 129 firms willing to cooperate. Specifically, the primary data contain longitudinal information on the outside board's human capital, the TMT's human capital, the new venture's performance and a number of firm-related variables, such as venture ownership. In addition, we obtained the contact information of all TMT and outside board members through the interviewed CEOs and requested them to fill out an online survey. Out of the 239 TMT members in our dataset, 83 replied to our survey (35%), as well as 75 of the 315 outside board members (24%), which allowed us to validate the TMT and outside board data provided by the CEO. Additionally, we verified the received responses with information gathered from other secondary sources such as Bel-First, Espacenet and LinkedIn, to ensure data reliability.

4.4.2. Measures

Dependent variables

Our dependent variables include technological and market performance to capture ESHTF performance. Technological performance includes time to first patent filing and number of patent filings. Given the early stage nature of the sampled firms, patent filings are more relevant than patents granted as it takes considerable time before a patent application translates into a patent granted. Further, in an early stage high-tech context, patent applications represent value before they turn into patents or before the technology is commercialized, through a signaling mechanism in which they signal patent race leads in the race for additional resources (Silverman & Baum, 2002). *Patent filed* takes a value of 1 when the first patent is applied for. *Number of patent filings* are measured as the number of patents that were applied for. Likewise, market performance comprises time to first product and number of products. *Product launched* takes a value of 1 when the first product is shipped for revenues. *Number of products* indicates the number of products the company has on the market.

Independent Variables

Outside board R&D experience measures the total number of years of experience the outside board has in engineering or R&D. *Outside board marketing and sales experience* is the total number of years of experience the outside board has in marketing or sales. These specific outside board experiences can vary yearly due to changes in the outside board's composition. *Outside board diversity* is calculated using Teachman (1980)'s diversity measure: $H = -\sum_{i=1}^{N} P_i(\ln P_i)$. Pfeffer and O'Reilly (1987) have shown that this formula can be used to index the heterogeneity in a system (*H*), where P_i *i*s the probability that the system will be found in state *i*, if there are *N* possible states in which the system can be. In our case, *P* represents the proportion of the outside board's years of working experience assigned to management; marketing, sales & promotion; accounting, controlling & financing; engineering & R&D; production; or personnel (Canter, Goethner & Stuetzer, 2010). The outside board diversity index ranges from 0 (indicating a very uniform outside board in terms of working experiences) to 1.70 (specifying a very diverse outside board). *Outside board tenure* is measured as the total number of years the outside board members have served on the board. For example, when four members sit on the outside board, their total tenure after the first year will be four, after the second year eight, etc. When a new outside board member

enters after some time, his/her personal tenure starts at one and will be added to the outside board tenure of the other members. If an outside board member leaves, the total tenure will reflect the tenure of the remaining outside board members.

Control Variables

Firm characteristics. We control for *firm age* by taking the natural log of the number of years the new venture exists, to ensure that none of the identified effects are the result of age-related processes. *Firm independence* is a dummy variable equaling 1 if the firm is an independent start-up and 0 otherwise. An independent start-up emerges from the ideas and knowledge of one or more independent entrepreneurs, while dependent start-ups include corporate and academic spin-offs. This control variable is necessary as the presence of a related corporation, university or public institute can influence the speed of technological development (Perez & Sanchez, 2003). *Firm industry* is controlled for by introducing two dummies: ICT industry and health and life sciences industry. These variables equal 1 if the firm belongs to this industry category, and 0 otherwise. The rationale for controlling for the technological domain lies in institutional theory, which suggests that organizational practices, including those relating to the outside board, may be related to industry specific norms (Eisenhardt, 1988).

Board characteristics. The *frequency of board meetings* is measured as the number of board meetings organized on a yearly basis (Vafeas, 1999). The more frequently board meetings are held, the better informed outside board members are about the firm, which is necessary for both monitoring performance (Demb & Neubauer, 1992) and providing tailored support. We further control for *CEO duality* because by creating a centralized representative, duality can enhance clarity and flexibility particularly in a dynamic high-tech environment (Gabrielsson, 2007). CEO duality equals 1 if the CEO of the company is also the board chair, 0 otherwise. *VC ownership* is a dummy variable (0/1) indicating whether the company has raised venture capital financing or not. We control for VC ownership as VC-backed ESHTFs have been found to outperform non-VC-backed firms (Baum & Silverman, 2004).

TMT characteristics. Previous research has shown that TMT human capital may affect firm performance (Amason, Shrader & Tompson, 2006; Colombo & Grilli, 2010). Consequently, we control for TMT specific experience, diversity and tenure. *TMT R&D*

experience is the total number of years the TMT is skilled in engineering or R&D. *TMT marketing and sales experience* is the total number of years the TMT is experienced in marketing or sales. We control for *TMT diversity* calculated by Teachman (1980)'s diversity measure: $H = -\sum_{i=1}^{N} P_i(\ln P_i)$. In line with the calculation of the outside board diversity, P represents the proportion of the TMT's years of working experience assigned to management; marketing, sales & promotion; accounting, controlling & financing; engineering & R&D; production; or personnel (Canter, et al., 2010). *TMT tenure* is measured as the total number of years the TMT members belonged to the TMT.

Table 4-1 provides the descriptive statistics for all variables used.

4.4.3. Analytical techniques

For every ESHTF in our sample, we created observations for each year of the firm's existence, starting from the founding year. As these ventures were established between 2001 and 2011, we have a maximum of 11 observations per venture. The later the venture was founded, the fewer the number of observations available. In total, our dataset consists of 562 firm-year observations.

Because our dependent variables include continuous and dichotomous variables, we used two different analytical techniques. First, for the continuous dependent variables ("number of patent filings" and "number of products"), we used pooled OLS panel data regression analysis and report the robust standard errors for each regression coefficient (models 2 and 4 in Table 4-2). Besides being heteroskedasticity consistent, these standard error estimates are robust to general forms of cross-sectional and temporal dependence (Discoll & Kraay, 1998). Given our longitudinal unbalanced dataset, the Stata *xtscc* program is the most appropriate (Hoechle, 2007). As causal inference is facilitated by the temporal precedence of the independent variables to the dependent variables, we lead the dependent variables by one year (Finkel, 1995; Katila & Ahuja, 2002). As such, we assume that outside board characteristics will only have an impact on firm performance in the next year, thereby limiting potential endogeneity issues (Brav, 2009).

Table 4-1 Means, standard deviations and correlations

Variable	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Firm age (ln)	1.29	0.71																		
2. Firm independence [a]	0.69	0.46	.06																	
3. ICT industry [a]	0.52	0.50	-.05	**.13**																
4. Health & life sciences industry [a]	0.20	0.40	-.04	**-.32**	**-.52**															
5. Frequency of board meetings	6.32	3.18	.00	.01	-.04	.06														
6. CEO duality [a]	0.41	0.49	-.00	**.25**	**.22**	**-.12**	.00													
7. VC ownership [a]	0.39	0.49	**.14**	**-.17**	**-.09**	**.36**	-.08	**-.14**												
8. TMT R&D experience	17.36	16.17	.03	**-.21**	**-.14**	**.46**	**-.09**	**-.14**	**.25**											
9. TMT marketing and sales experience	5.02	7.78	**.13**	-.07	-.04	.03	**-.11**	**-.12**	**.27**	**.13**										
10. TMT diversity	0.94	0.49	.08	**-.17**	**-.09**	**.19**	**-.27**	**-.09**	**.33**	**.15**	**.42**									
11. TMT tenure	10.41	9.38	**.62**	-.06	**-.09**	**.12**	**-.10**	**-.14**	**.30**	**.31**	**.40**	**.39**								
12. Outside board R&D experience	13.59	14.51	**.13**	**-.40**	**-.14**	**.29**	**-.12**	**-.16**	**.39**	**.29**	**.12**	**.16**	**.22**							
13. Outside board marketing and sales experience	6.23	7.37	**.10**	**.14**	.01	**-.11**	.04	-.03	.04	.00	.07	.02	**.09**	.04						
14. Outside board diversity	1.11	0.49	**.27**	-.06	-.07	**.15**	**-.11**	-.02	**.25**	**.21**	.07	**.20**	**.24**	**.32**	**.29**					
15. Outside board tenure	12.44	12.67	**.56**	**-.19**	**-.17**	**.15**	**-.17**	-.06	**.23**	**.28**	**.16**	**.21**	**.60**	**.49**	**.16**	**.40**				
16. Patent filed [a]	0.32	0.47	**.12**	**-.21**	**-.27**	**.44**	.08	**-.21**	**.24**	**.37**	.06	.08	**.16**	**.28**	.02	**.13**	**.25**			
17. Number of patent filings	1.96	6.01	**.18**	**-.28**	**-.18**	**.29**	-.07	**-.12**	**.23**	**.27**	**.15**	**.19**	**.34**	**.30**	-.04	**.11**	**.40**	**.48**		
18. Product launched [a]	0.66	0.47	**.31**	**.18**	**.29**	**-.57**	**-.14**	**.19**	**-.20**	**-.25**	**.09**	.06	**.14**	**.09**	**.16**	**.22**	**.13**	**.26**	**-.15**	
19. Number of products	1.29	1.60	**.36**	.04	.02	**-.25**	-.05	.05	.01	**-.08**	**.25**	**.13**	**.30**	-.03	**.20**	**.27**	**.31**	-.02	.05	**.57**

*Pearson correlation coefficients (1-tailed), indicating significant correlations ($p<.05$) in **bold**.*

[a] *Correlations of binary variables should be interpreted with care.*

Second, for the dichotomous dependent variables ("patent filed" and "product launched"), we used Cox proportional hazard models. Cox proportional hazard models are frequently used for event-history analysis with censored data. In our analyses, the event takes into account the occurrence of either a product introduction or patent filing while estimating the effect of other variables. The cases are however right censored, as some firms may not have either products or patent filings by the end of the observation period. The dependent variable in this study then becomes the waiting time before the event takes place. In Table 4-2, we therefore report hazard ratios for the variables in models 1 and 3. A hazard ratio greater than 1 implies that the variable reduces the waiting time until the event, while a hazard ratio lower than 1 points to an increase in the waiting time.

In addition, as we excluded firms without an outside board from our analysis, selectivity biases may drive our results. In order to assure that our results are not affected by such biases, we applied Lee's (1983) generalization of Heckman's (1979) two–stage estimator. Specifically, we estimated a selectivity model using a logit analysis and used the selection variable derived from it as an instrument in the further analyses. The selectivity model used outside board formation (dummy) as a dependent variable, and, in line with previous research (e.g. Clarysse, Knockaert & Lockett, 2007), firm age, sector dummies, a VC dummy and TMT size as independents. The selectivity model was statistically significant and pointed to VC presence affecting the likelihood of outside board establishment. We used the results from this model to compute the selectivity instrument (also called Mills ratio), which is included in our models (and labeled "selectivity instrument").

4.5. RESULTS

The results are presented in Table 4-2. All models are statistically significant. Variance Inflation Factors are all below 4 (max. 3.18; average 1.90), indicating that multicollinearity is not an issue (Hair, Black, Babin, Anderson & Tahal, 2006).

In each of the full models, adding outside board human capital to the base models led to significant improvements. First, we assess the impact of specific outside board experience on firm performance. We find no indication of a positive impact of R&D experience on either time to first patent filing (model 1) or number of patents filed (model 2). We further find that higher levels of outside board marketing and sales experience does significantly affects speed to first product (model 3) and leads to more products on the market (model 4). Hence, the

results provide **no support** for **H1a** and **support H1b**. Second, we evaluate the impact of outside board diversity on our performance variables. We do not find a significant impact on waiting times to first patent filing (model 1), but find that outside board diversity negatively affects the number of patent filings (model 2). As expected, we find that higher levels of outside board diversity lead to shorter waiting times to first product (model 3) just as more products on the market (model 4). Thus our evidence **partially supports H2a** and **fully supports H2b**. Finally, we assess the impact of outside board tenure on ESHTF performance. We find that outside board tenure has a significant positive impact on (i.e. reduces) waiting time till first patent filed (model 1) and on the number of patent filings (model 2). Moreover, the impact of outside board tenure on the time to first product is not statistically significant (model 3), though significantly positive for the number of products (model 4). As such, we find **full support for H3a** and **partial support for H3b**.

4.5.1. Post hoc analyses and robustness checks

We conducted a number of post hoc analyses to assess the robustness of our results and to provide more fine-grained insights. First, we used outside board size as a proxy for outside board human capital. Replacing the outside board human capital measures by outside board size shows that outside board size has a significantly positive impact on the number of patent filings and on the market performance. While this asserts the assumption that larger outside boards bring more human capital and subsequently enhance firm performance, it also shows that by unfolding outside board size into core human capital variables, such as specific experience, diversity and tenure, more fine-grained results can be obtained. Second, if outside board members are indeed part of the "extended TMT" (Vanaelst et al., 2006), we can expect that the specific experience, diversity and tenure of this *extended* TMT – incorporating both TMT and outside board human capital – will affect performance. Replacing outside board and TMT human capital with the combined measures, largely confirms this assertion. We find that *extended* TMT diversity has a significantly negative impact on technological performance. Longer *extended* TMT tenure is beneficial for the number of patent filings and the number of products. Lastly, *extended* TMT marketing and sales experience and diversity lead to superior market performance, thereby endorsing the results of our main model. These outcomes highlight the value of looking beyond the *limited* TMT human capital when studying the link between TMT and firm performance.

Table 4-2 Results of Cox proportional hazard models and pooled regression analyses

	Time to first patent filed: Model 1		Number of patent filings: Model 2		Time to first product: Model 3		Number of products: Model 4	
	Base Model	Full Model	Base Model	Full Model	Base model	Full Model	Base Model	Full Model
Control								
Constant	-	-	4.38*** (.96)	1.53*** (.32)	-	-	.21 (.23)	.34* (.14)
Firm age (ln)	-	-	.53 (.31)	-.26 (.26)	-	-	.57*** (.05)	.35*** (.05)
Firm independence	.94 (.34)	1.18 (.48)	-3.06*** (.53)	-1.99*** (.34)	.99 (.28)	.80 (.22)	-.29*** (.04)	-.43*** (.08)
ICT industry	.67 (.31)	.65 (.33)	-.91*** (.21)	-.47* (.19)	.99 (.19)	1.14 (.21)	-.49*** (.06)	-.42*** (.02)
Health & life sciences industry	2.48 (1.49)	2.12 (1.44)	1.06 (1.69)	1.29 (1.65)	.11** (.09)	.11** (.09)	-1.36*** (.13)	-1.42*** (.15)
Frequency of board meetings	1.04 (.05)	1.07 (.05)	-.09 (.06)	.00 (.05)	.98 (.03)	.99 (.03)	.01 (.01)	.02 (.01)
CEO duality	.64 (.24)	.63 (.24)	.21 (.56)	-.08 (.56)	1.35 (.28)	1.32 (.25)	.28*** (.04)	.22*** (.03)
VC ownership	1.51 (.66)	1.34 (.68)	.00 (.54)	-.07 (.37)	.69 (.24)	.46* (.15)	.02* (.09)	.07 (.08)
TMT R&D experience	1.01 (.01)	1.01 (.00)	.02 (.03)	.01 (.02)	.99 (.01)	.99 (.01)	.00 (.00)	-.00 (.00)
TMT marketing and sales experience	1.02 (.02)	1.02 (.02)	-.01 (.02)	.01 (.03)	1.02 (.02)	1.03 (.02)	.04*** (.01)	.04*** (.01)
TMT diversity	.79 (.31)	.83 (.32)	-.02 (.35)	.21 (.29)	1.53 (.35)	1.32 (.29)	.29* (.11)	.13 (.12)
TMT tenure	.96 (.04)	.94 (.04)	.14*** (.02)	.06*** (.00)	.99 (.04)	.98 (.04)	.01*** (.00)	-.00 (.00)
Selectivity instrument	.70 (.74)	.61 (.68)	-3.31*** (.81)	-3.01*** (.57)	1.83 (1.01)	.96 (.65)	.80 (.23)	.22 (.24)
Independent								
Outside board R&D experience		1.00 (.01)		.02 (.01)		1.01 (.01)		-.02*** (.01)
Outside board marketing and sales experience		.95 (.03)		-.05*** (.01)		1.02* (.01)		.02* (.01)
Outside board diversity		1.03 (.38)		-.79* (.35)		2.18** (.50)		.66** (.21)
Outside board tenure		1.05* (.03)		.15*** (.02)		.99 (.03)		.03*** (.01)
No. of observations	419	419	482	482	254	254	482	482
No. of groups	80	80	80	80	80	80	80	80
R^2	-	-	.2243	.2673	-	-	.2439	.3208
F-statistic	-	-	8929366***	2844.26***	-	-	6369.87***	7036.65***
Chi^2	39.93***	50.10***	-	-	43.22***	83.11***	-	-

*Significance levels:*p<.05, **p<.01, ***p<.001; N=562*

Models 1 and 3: hazard ratios of the Cox proportional hazard models are displayed.

Please note that, even though we also have 562 firm-year observations for the Cox analyses, these observations are not further considered by the models once respectively a first product has been shipped or a first patent has been filed in any previous year.

Models 2 and 4: coefficients of the panel regression analyses are displayed.

4.6. DISCUSSION

Building on team production and human capital theories, we examined the fit between outside board human capital and ESHTF performance, whilst controlling for TMT human capital. An important premise of our study is that outside boards, which perform a service role in this context, can be considered part of the "extended TMT". We further acknowledged that ESHTFs may choose between competing on the market for ideas or the market for products (Gans & Stern, 2003) and as such we differentiated between technological performance and market performance. The consistent main finding of this study is that the outside boards' human capital is significantly related to the performance of ESHTFs but that the human capital profile of outside boards that positively contribute to technological performance looks different to that of outside boards that contribute positively to market performance.

First, although it is known that task performance improves when more specific human capital is attributed to the task being performed (Dimov & Shepherd, 2005), our results show this only holds for ESHTFs seeking market performance. In this case, it is useful to incorporate outside board members with higher levels of marketing and sales experience. However, higher levels of outside board R&D experience do not significantly affect technological performance. Since ESHTFs consider technological innovation to be their lifeblood (Acs & Audretsch, 1990), they need sustained and regular input into the technology development process and may incorporate such core technological knowledge in the TMT. The value added by outside board members who meet with the TMT less frequently, therefore, may be limited.

Second, outside board diversity is not universally beneficial to ESHTFs. Our findings suggest that they benefit from the heterogeneous human capital brought by a diverse outside board when pursuing market performance. In contrast, less diverse outside boards appear to favor companies seeking superior technological performance. This is because the communication and information integration needed to develop a technological (i.e. patent) strategy are more likely to be available within homogeneous groups.

Finally, we argued that, irrespective of the strategy a company follows, it benefits from having higher levels of outside board tenure. As outside board members continue to reside on the board for a longer period, they build firm-specific human capital, enabling them to make more valuable contributions to team production and to provide more tailored advice to the TMT. Our results show that outside board tenure is beneficial to technological performance,

whereas its impact on market performance is more nuanced; tenure positively affects the number of products, but not necessarily the speed to first product.

4.6.1. Implications for theory

By responding to calls by Nielsen (2010) and Machold et al. (2011) to study boards and TMTs together, our research makes a number of contributions to the entrepreneurship, corporate governance and group processes literatures. First, our study has implications for the (early stage high-tech) entrepreneurship literature by further nuancing our understanding of the relationship between human capital and firm performance. While we offer further support for the important role played by human capital in explaining new venture performance, we also highlight that rather than concentrating solely on the human capital of the TMT, it is also valuable to consider the human capital of the outside board. At the same time, with respect to the performance of ESHTFs, our results attest to the importance of aligning performance measures with firm strategy.

Second, our study contributes to the corporate governance literature. This body of research has studied the link between outside board composition and performance in large, established ventures, but has largely neglected to examine this relationship in ESHTFs, wherein the outside board extensively engages in a service role. Our study provides an opportunity to assess the value of (the relatively new) team production theory as applied to the setting of (high-tech) entrepreneurial firms. We show that the outside board can indeed operate as a "mediating hierarchy" (Blair & Stout, 1999) facilitating team production (i.e. firm performance). At the same time, by studying outside boards in the hitherto largely overlooked setting of ESHTFs, we are also able to contribute to the development of team production theory itself. Specifically, by demonstrating that the outside board's ability to contribute to performance (i.e. team production) is dependent on its human capital profile as well as the type of performance being pursued, we offer insights into the boundary conditions of this theory. Exploring existing theories in new settings allows us to know more about the boundaries of these theories and their robustness, in turn allowing us to assess the usefulness of focal theories (Zahra & Newey, 2009).

Finally, our study contributes to the group processes literature by providing insights into the contingent effects of diversity. Specifically, when firms play on a market for ideas, outside board diversity may be detrimental, whereas it may be valuable for firms playing on a market

for products. As a result, our study helps to explain the contradicting results found in diversity studies (Jackson, Joshi & Erhardt, 2003).

4.6.2. Implications for practice

Our research has implications for high-tech entrepreneurial ventures and their stakeholders, such as TMTs and outside board members. First, we show that setting up a well composed outside board early on is useful as longer outside board tenure tended to lead to increased firm performance. Further, we suggest that considerable attention should be given to the establishment of an outside board that is aligned with the company's strategy. Specifically, our findings suggest that, when firms compete on a market for ideas, in which they often do not market products themselves but are seeking to develop a technology platform, a less diverse outside board incorporating higher levels of R&D experience may be advantageous. If ESHTFs are competing on a market for products, they are better off building diverse outside boards and outside boards that contain higher levels of marketing and sales experience. Our results are also relevant to policy makers. Although many governments have built schemes to assist firms in attracting outside board members (Conyon, Peck & Read, 2001), our research emphasizes the need for a more tailored approach when supporting high-tech entrepreneurs; the process of attaining new outside board members should take into account, and aim to align outside board characteristics with the ESHTF's strategy.

4.6.3. Limitations and directions for future research

While our study is the first to consider the relationship between outside board human capital and ESHTF performance, it has a number of limitations which point to future research opportunities. First, our findings build on a sample of companies established in one country. While exclusively focusing on Belgium ensured that we could survey a large percentage of the population, it has the disadvantage that the results could be more difficult to generalize to other countries. Future studies could therefore analyze the extent to which our results hold in other international contexts. Second, while our longitudinal research deliberately focused on the added value of outside board human capital, it would be interesting to reveal the processes through which the outside board deploys its human capital to enhance firm performance. Future research could purposefully use qualitative or observational designs to uncover underlying board mechanisms (e.g. nature of communication in board meetings). Finally, we studied the relationship between outside board human capital and firm performance. Future

research could complement this study by assessing the impact of outside board human capital on particular firm behavior and decisions, such as internationalization, business models or mergers and acquisitions. Alternatively, future studies could assess how other internal (e.g. ownership distribution, CEO duality) and external (e.g. competitive rivalry, environmental turbulence) contingencies affect the outside board-performance relationship.

4.7. CONCLUSION

In this study, we examined the impact of outside board human capital on ESHTF performance whilst controlling for the human capital of the TMT. Our study's findings suggest that ventures operating in the "market for ideas" may need to structure their outside boards differently as compared to their counterparts operating in the "market for products".

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CHAPTER V

General conclusion

5. GENERAL CONCLUSION

The main objective of this dissertation was to provide insights into the service role of the outside board members for early stage high-tech firms. Where the first and second study drew upon cross-sectional data, the third paper employed a longitudinal data design. Furthermore, a mixture of statistical analyses was used, including mediation analysis, hierarchical regression, cox proportional hazard models and pooled regression, in order to build a model for understanding the outside board members' involvement, effectiveness, and link with firm performance in an early stage high-tech environment. This final chapter summarizes the main findings of the three studies, outlines the key academic contributions, highlights the practical implications and suggests avenues for further research.

5.1. MAIN FINDINGS

The first study explored outside board service involvement. Particularly, the interpersonal dynamics between the outside board and the TMT were investigated. Building on conflict theory, we focused on the influence of task conflict between the TMT and the outside board. Combining linear regression and mediation analysis, and using a sample of 70 early stage high-tech firms with both a TMT and outside board in place, we found that task conflict between these decision-making entities resulted in higher outside board service involvement. We did not observe a curvilinear effect, which could be due to our sample of early stage high-tech firms, which may be so resource-dependent that any intervention by the outside board is deemed to contribute, irrespective of the level of task conflict it brings. Moreover, this relationship was indirectly influenced by TMT – outside board relationship conflict. As such, both TMT and outside board need to avoid task conflict from spilling over into relationship conflict.

The second paper studied the outside board service effectiveness, and particularly how effective the TMT perceives the service involvement of the outside board. Drawing upon learning theory and the attention-based view, this study explored which learning components and contingencies affect the effectiveness of the outside board's service interventions. Our findings were based on a dataset of 89 early stage high-tech firms. First, we provided empirical evidence that both the learning capabilities of the TMT as well as the frequency of interaction between outside board and TMT significantly improve the outside board service effectiveness. Moreover, our analysis highlighted that outside board functional diversity was

related to higher levels of outside board service effectiveness when CEO duality was in place, or when the firm was performing below expectations.

In the third study, we identified which aspects of outside board human capital matter to which aspects of early stage high-tech firm performance, building upon team production and human capital theory. In so doing, we distinguished between market and technological performance. Our findings were based on a longitudinal panel dataset of 80 early stage high-tech firms, of which we had information since their founding. Through the use of cox proportional hazard models and pooled regression analyses, we demonstrated that the outside board's human capital is significantly related to the performance of early stage high-tech firms. However, the human capital profile of outside boards that positively contribute to technological performance looks different from that of outside boards that contribute positively to market performance. Early stage high-tech firms seeking technological performance may benefit from having a less functionally diverse outside board, whose members stay on the board for a longer period. Alternatively, those ventures pursuing market performance may benefit from having outside board members with specific marketing and sales experience, who continue to reside on the board for a longer period and whose functional experience is quite diverse.

5.2. ACADEMIC CONTRIBUTIONS

The dissertation primarily makes a number of contributions to the *corporate governance and entrepreneurship literatures*.

First, both corporate governance and entrepreneurship literatures have mainly focused on the control tasks of the outside board, often in large corporations (e.g. Conyon & Peck, 1998). Yet, the outside board *service* tasks are equally important, definitely in early stage (high-tech) ventures, where advice, strategic input, and network access are crucial (Hillman & Dalziel, 2003; Huse, 2007) given the encountered liabilities of newness and smallness (Henderson, 1999), the gaps in their TMT human capital bases (Ensley & Hmieleski, 2005), and the demanding and rapidly changing environment they are operating in (Zahra & George, 2002). Specifically, the first study provides insights into the service *involvement* of the outside board and the second study centers on the *effectiveness* of the outside board service interventions. As such, this dissertation gives a more fine-grained understanding of how (effective) outside

boards contribute through their service participation. Additionally, by differentiating between outside board involvement and effectiveness, this doctoral thesis responds to a recent call by Machold and Farquhar (2013) to consider these concepts as distinct, hence recognizing the difference between which service tasks the outside board accomplishes and which interventions matter the most.

Second, in order to better understand the service participation of the outside board, we go beyond merely studying outside board demographics (or "the usual suspects") in explaining the outside board service involvement and effectiveness, and subsequently firm performance. Following Zona and Zattoni (2007), this dissertation contributes by *opening up the black box of outside board demographics* as such adding to the current state-of-the art which mainly constitutes of input-output studies. Particularly, outside board interpersonal relationships rather than demographics have the greatest influence on outside board service involvement (Neill & Dulewicz, 2010). Given that the interactions between the outside board and the TMT may influence the functioning of the outside board (Kor, 2006), the first study unfolds conflict-related interpersonal dynamics between TMT and outside board in understanding outside board service involvement. Furthermore, the usual suspects do not provide understanding of *how* the outside board can contribute to organizational value creation (Finkelstein & Mooney, 2003; Huse, 2007). Therefore, the second study examines *what* drives outside board service effectiveness by unraveling the situations and contexts in which outside board capital is beneficial to such effectiveness. Subsequently, given that corporate governance literature has typically looked at large, established ventures, the third study takes the opportunity to explain the influence of outside board human capital (above and beyond the human capital of the TMT) in early stage high-tech firms, as such demonstrating that the outside board's ability to contribute to early stage high-tech firm performance is dependent on its human capital profile.

Third, this dissertation contributes by *integrating the TMT*, often studied in entrepreneurship studies, *and the outside board*, often addressed in the corporate governance literature. Pettigrew (1992) argued that research on boards should be incorporated with studies on the TMT, given that these can be considered a collective working together to reach a firm's full potential. Moreover, this definitely holds in an early stage high-tech environment, where outside boards and TMTs can be seen as "collective entrepreneurs" (Zhang, Baden-Fuller & Pool, 2011). Hence, this dissertation responds to several calls to study outside boards and

TMTs together instead of considering them as standalone entities (Carpenter, Pollock & Leary, 2003; Nicholson & Kiel, 2004; Boeker & Wiltbank, 2005; Nielsen, 2010; Machold, Huse, Minichilli & Nordqvist, 2011), as such extending both literatures in multiple ways. Specifically, the first study shows that interpersonal dynamics between TMT and outside board may impact the outside board service involvement. The second paper explains that in order to understand outside board service effectiveness, both TMT and outside board characteristics are important. Lastly, the third study highlights that rather than concentrating solely on the human capital of the TMT, it is also valuable to consider the human capital of the outside board in explaining new venture performance.

Fourth, by investigating outside boards in the largely overlooked setting of early stage high-tech firms, this doctoral research indicates that the outside board's ability to continue performance is dependent on the pursued type of performance. Particularly the results of the third study attest to the importance of aligning performance measures with firm strategy. Moreover, traditional measures of new venture financial performance such as growth and business volume may be less appropriate for early stage high-tech firms (Chandler & Hanks, 1993) as they might be loss making while developing market presence (Dai & Liu, 2009). Therefore, this dissertation also adds to the entrepreneurship literature by identifying more appropriate performance factors for early stage high-tech firms, depending on whether the ventures strive for technological or market performance.

In parallel, the collection of papers integrates other theoretical lenses and concepts in the study of corporate governance and entrepreneurship. As such, each study of the dissertation additionally contributes to a different kind of research stream. The first study enriches the *conflict literature* by gaining a better insight into the association between task and relationship conflict and their direct and indirect effect on group involvement. Moreover, while both types of conflict have mainly been studied in an intragroup setting (De Dreu & Weingart, 2003), our research shows that it is beneficial to investigate conflict in an intergroup context, i.e. between organizational decision-making groups. The second paper enhances the *learning literature* by further exploring learning concept at the team level, where we consider the TMT as the "student" and the outside board as the "teacher" (Audretsch & Stephan, 1996). Additionally, we contribute by showing that the attention based view can purposefully complement the learning theory given the significance of both structural and situational attention mechanisms. Lastly, the third study assesses the value of *team production theory* as applied to the setting of

high-tech entrepreneurial firms. We exemplify that the outside board can indeed operate as a "mediating hierarchy" (Blair & Stout, 1999), facilitating team production (i.e. firm performance). Moreover, by illustrating that this propensity is dependent on the outside board human capital profile and the type of performance being pursued, we offer insights into the boundary conditions of this theory.

5.3. PRACTICAL IMPLICATIONS

In this section, we discuss the implications of the dissertation for high-tech entrepreneurs, outside board members and their stakeholders, such as venture capitalists. Additionally, our research is also relevant to policy makers.

First, this doctoral research calls for increased attention to the formation of the board since outside board members have the potential to add value not just by monitoring the company, but also by performing their service tasks. Attracting outside board members may be particularly pertinent to early stage high-tech firms, as they are likely to enhance the firm performance (Zahra & Pearce, 1989). We suggest that considerable attention should be given to the establishment of an outside board that is aligned with the company's strategy. Specifically, when entrepreneurial high-tech firms compete on a market for ideas, in which they often do not market products themselves but are seeking to develop a technology platform, a less diverse outside board incorporating higher levels of R&D experience may be advantageous. If early stage high-tech ventures are competing on a market for products, they are better off building diverse outside boards and outside boards that contain higher levels of marketing and sales experience. Further, this dissertation provides evidence that while composing the board of directors, entrepreneurs should carefully evaluate and target outside board members who match their own needs and those of the firm. Having experienced outside board members is crucial, but the TMT must also consider its own competences, skills and human capital base. In order to benefit from the outside board's engagement in the service tasks, the entrepreneurial TMT itself should also have sufficient absorptive capacity to be able to comprehend the information provided by the outside board.

Second, next to having qualified outside board members, specific structural and contextual factors need to be taken into account in order to reach outside board service effectiveness. As outside board members often hold multiple board positions (Ferris, Jagannathan & Pritchard,

2003), they have to distribute their time over these positions. Therefore, if they are kept informed by the CEO-chair and are triggered by the firm's underperformance, highly diverse outside boards become more engaged in their service tasks. Additionally, the importance of interactions and discussions between TMT and outside board should not be neglected. Primary, face-to-face interaction between these two decision-making bodies enables them to share relevant knowledge, which allows the TMT to value the outside board's engagement in its service tasks. Further, in stimulating both parties to share different perspectives, conflicts among TMT and outside board may arise. Consequently, we reveal that the participants in such discussions should be cautious in order to avoid task conflict from spilling over into relationship conflict. Therefore, it is important to make sure that discussions are not perceived as personal critique. For example, harmonious personal relationships are highly important in minimizing relationship conflict (Neill & Dulewicz, 2010).

Finally, this dissertation offers insights to *policy makers* to be better able to guide the board of directors in improving organizational functioning. Partly due to the governmental efforts to compose corporate governance codes, organizations have been convinced of the importance to integrate and apply these recommendations. However, additional actions might be required to achieve good – or even better – corporate governance and to enable the outside board members to create value for the firm. Code Buysse, for example, still provides rather general recommendations as such failing to incorporate the broad range of types of private firms and their strong mixture of governance needs (Uhlaner, Wright & Huse, 2007). Hence, although many governments have built schemes to assist firms in attracting outside board members (Conyon, Peck & Read, 2001), this doctoral research emphasizes the need for a more tailored approach when supporting high-tech entrepreneurs. We resonate the call by Bjornali and Gulbransen (2010) to support new ventures by establishing and financing networks of outside board members. This process of attaining new outside board members should take into account and aim at aligning outside board characteristics with the entrepreneurial high-tech firm's strategy, and should consider the learning capabilities of the TMT in order for outside board interventions to reach their full potential. Additionally, next to the importance of assisting the entrepreneurial firm in selecting outside board members, constituting guidelines for outside board evaluation might be essential. Hence, early stage high-tech firms get the opportunity to become more professionalized and will obtain a better insight into the outside board effectiveness, which enables them to learn and improve, and subsequently deliver high-class outcomes.

5.4. AVENUE FOR FURTHER RESEARCH

This dissertation has explored a relatively understudied area within the domain of governance in entrepreneurial firms, namely the influence of outside board members in early stage high-tech firms. While the results of the empirical papers provide new insights into the corporate governance and entrepreneurship literatures by thoroughly investigating the service involvement and effectiveness of the outside board, and subsequently the influence of the outside board human capital profile on firm performance, these studies are not without insufficiencies. In this final section, we elaborate on main limitations of the dissertation and discuss some avenues for future research.

A first limitation may be situated in the *generalizability of the results to other populations or situations*. Our findings build on a sample of companies established in one country. While exclusively focusing on Belgium ensured that face-to-face interviews with the CEO could be organized and that we could survey a large percentage of the early stage high-tech population, it has the disadvantage that the results might be more difficult to generalize to other countries. Future studies could therefore analyze the extent to which our findings hold in other international contexts, where different regulations related to board composition and functioning may apply. Moreover, while the outside board service tasks are particularly important in an early stage high-tech environment, it could be interesting to study whether our outcomes withstand in larger and more established organizational settings, in which firms may be less dependent on the outside board service participation.

Second, not all studies in this dissertation took a longitudinal approach. Hence, it would be very interesting to follow-up the identified early stage high-tech ventures in order to further explore how the examined outside board concepts evolve throughout the start-up process, as such being able to distinguish between short-term and long-term effects. Specifically, it would be of great interest to use qualitative or observational research design to further uncover the underlying *board mechanisms*. In particular, given that our results point to the importance of face-to-face interactions, the nature of communication in board meetings would be thought-provoking, as such revealing the processes through which the outside board deploys its human capital base to perform its service tasks and to subsequently enhance firm performance.

Third, future research could assess how other *internal and external contingencies* affect outside board service functioning and the outside board-performance relationship. Internally, the specific role of the board chair could be of great consequence. He or she sets the agenda, has a strong liaison with the CEO and – most importantly – is responsible for board leadership, as such being able to impact the outside board service participation to a larger extent given his/her impact on board dynamics (Kakabadse & Kakabadse, 2006; Vandewaerde, Voordeckers, Lambrechts & Bammens, 2011). Additionally, the effects of ownership distribution and the remuneration policy, as well as specific characteristics of the outside board members, such as their cognitive styles, could shed a different light on the outside board service involvement, effectiveness and ultimately firm performance. Furthermore, organizational behavior scholars underlined the importance of subgroup behavior and the faultlines concept (Bezrukova, Thatcher, Jehn & Spell, 2012). Applied to our research setting, hypothetical dividing lines may be present between TMT and outside board members. Hence, given that little is known about the impact of faultiness on (board) performance (Almandoz, 2012), it may be worthwhile to further investigate this research concept. Important external contingencies might be the competitive intensity and environmental turbulence. In an early stage high-tech setting, the occurrence of external unforeseen events may possibly have a direct impact on the functioning of the outside board and the necessary competences of the outside board members.

Fourth, this doctoral research specifically centers around understanding the determinants and outcomes of outside board service tasks. Nevertheless, outside board members also carry out control tasks as part of their 'duty of care' towards the company (Blair, 2012). Although this dissertation provides novel insights into the outside board service participation, future research may benefit from integrating outside board *service and control tasks*, as such incorporating different theoretical perspectives and identifying the inter-relationship between these functions (Hung, 1998; Pugliese, Minichilli & Zattoni, 2014). Additionally, the different sets of tasks can be further specified within this broader definition (Minichilli, Zattoni & Zona, 2009). By applying the alternative board task typology suggested by Huse (2007), follow-up studies will be able to provide an in depth understanding of the specific characteristics of the sub-tasks.

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