

DREAM MAKER VS. DREAM TAKER: EFFECTS OF VENTURE CAPITAL INVESTORS AND
ENTREPRENEURIAL BOARDS

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ABSTRACT

Ting Yao: Dream Maker vs. Dream Taker: Effects of Venture Capital Investors and Entrepreneurial Boards
(Under the direction of Hugh O’Neill)

The venture capital (VC) business model significantly affects the startup companies they back financially. This study explores a phenomenon that is closely related to the VC business model and fund structure—VC-led time horizon differences among board members. VC-led time horizon differences are where directors are misaligned in terms of their preferred exit times. Since VC funds have a fixed lifetime, this finite horizon causes strong exit pressure toward the end of the fund’s lifespan. Although entrepreneurs and venture capitalists have similar long-term time horizons at the outset of the relationship, factors such as entrepreneurs’ aggressive goal-setting, time-bound VC funds, and the uncertain entrepreneurial process can shift the synchronous time horizons initially shared by the entrepreneur and the venture capitalists. This dissertation investigates three questions: 1) Why and how often do VC-led time horizon differences arise? 2) How do VC-led time horizon differences affect board dynamics and exit outcomes? and 3) How can startups effectively manage VC-led time horizon differences? The focus of this analysis is on the board of directors, whose members are the most important people in deciding exit strategies, whether through an initial public offering (IPO), merger and acquisition (M&A), or bankruptcy.

I conducted a field study to understand the origin of VC-led time horizon differences and their impact on board dynamics. I further tested the impact of VC-led time horizon differences on low-valued exits using a hand-collected dataset of U.S. VC-backed surgical device startups.

The findings show that VC-led time horizon differences significantly increase the chance of bankruptcy and low-valued M&As. More importantly, the results of the systematic quantitative analysis suggest how to effectively manage VC-led time horizon differences by selecting certain types of directors (i.e., serial-entrepreneur independent directors, experienced VC directors, and by avoiding investor-executives) as well as the importance of carefully managing stage improvement when facing VC-led time horizon differences. This research contributes to the extant literature on corporate governance, VC management, entrepreneurship, and time perception. The findings have important practical implications for entrepreneurs, venture capitalists, and policymakers.

*Dedicated to my family:
My grandfather, Shengpin Yao,
my parents, my sister and Tao*

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CHAPTER 1. INTRODUCTION

Venture capital (VC) is a dominant force in the financing of innovative startups. VC-backed companies profoundly influence the U.S. economy as they drive both economic growth and private sector employment (Kortum & Lerner, 2000). Venture capitalists help startups in two ways: they actively assist startup businesses (e.g., financial and marketing advice as well as vital contacts with legal and accounting advisors, investment banks, suppliers, etc.) (e.g., Gompers & Lerner, 2004; Sahlman, 1990; Sapienza, Manigart, & Vermeir, 1996) and they certify a startup's quality (e.g., Gompers & Lerner, 2004, 2001; Hochberg, Ljungqvist, & Lu, 2007; Hochberg, Serrano, & Ziedonis, 2018). Puri and Zarutskie (2012) find that VC-backed startups are less likely to fail than non-VC-backed startups, mainly due to careful selection by VC firms.

However, Hall and Woodward (2010) find that 75% of VC-backed startups ended with a liquidation value of zero. Intuitively, the high failure rate results from poor startup performance. But many entrepreneurs provide an alternate explanation. Entrepreneurs share stories about “VC insanity.”¹ For example, at times venture capitalists push aggressively for the sale of a promising portfolio startup, and at other times, they prevent sales even though the deal is sufficient to assure high returns for the founder and the investor. Moreover, some entrepreneurs comment that VC-backed startups often fail because they run out of time rather than running out of customers.²

¹ Read *VC insanity, explained* for more detail, available at <https://www.danshapiro.com/blog/2010/08/vc-insanity-economics/>

² Read *Raising 'Patient Capital' for Your Business* for more detail, available at <https://www.entrepreneur.com/article/171894>

The concerns expressed in these comments are fundamentally related to the VC business model and fund structure, and particularly the limited partnership and the fixed lifetime of VC funds.

VC firms raise capital from passive investors (aka limited partners) who do not participate in a fund's operational activities. VC funds have a limited lifecycle, generally a 10-year period fixed ex-ante, where the first five years are viewed as an investment period and the second five years as a harvest period. An exit is crucial to VC investing because startups do not pay dividends and the returns are realized at the exit stage. Therefore, exit performance at the end of the fund is an indicator of the VC manager's skill and determines the chances of raising a new fund (Kaplan & Schoar, 2005). As the funds age, venture capitalists face increasing pressure to exit. Guler (2007) indicated that older funds tend to terminate investment. In a theoretical study, Kandel et al. (2011) examined the impact of VC funds' finite horizon on continuation decisions and suggested that VC firms are likely to abandon good projects at the end of their fund. These findings indicate that VC funds' fixed lifetimes may partially contribute to the high failure rate of VC-backed startups. Although we have started to understand the impact of the fixed lifetime of VC funds on investment decisions (Barrot, 2017) and fund liquidation decisions (Masulis & Nahata, 2011), the impact of VC funds' finite horizon on startups has received little attention in academic research. This deficit in understanding is a crucial shortfall for those types of innovation which require a long-term gestation.

This dissertation aims to better understand the impact of VC funds' fixed lifetime on startups by considering the effect in the specific context in which VC firms directly interact with entrepreneurs and affect startup businesses—the board of directors. The work focuses on the key role of the new venture board, as the board balances the dynamic relationship between entrepreneurs and VC firms. More specifically, VC funds' fixed lifetimes affect venture

capitalists' behavior, but the emergent impact on startups depends on other decision makers' behavior. The board is the most influential and powerful group involved with startups. VC firms highly value board seats, and affect startups' businesses via their board positions (Feld & Ramsinghani, 2013). The board actively and significantly affects the startup business (Garg & Furr, 2017). The board has almost absolute power to initiate exit (Smith, 2005).

In the board context, how does the finite lifetime of VC funds affect the startup, especially at the end of the fund's life, and affect the decision that VC firms care most about—exit? At this period, VC board members and other board members may have different preferences on the timing of an exit and/or the type of exit. VC firms tend to face stronger pressure to exit, pressure that is driven by approaching fund termination. To capture these dynamics, this study focuses on the time period from these differences starting from when the formal board is incubated (its creation) to the period the differences become the most compelling (around the exit). Specifically, I investigate three questions: 1) Why and how often do time horizon differences arise? 2) How do time horizon differences affect exit outcomes? and 3) How can startups effectively manage time horizon differences?

This study builds on multiple streams of literature, including corporate governance, venture capital, and theories of time perception, all of which provide rich insights into the characteristics of venture boards, entrepreneurs' and venture capitalists' behaviors, VC business models, and the impact of temporal differences on team interaction and team outputs. This study has the potential to contribute to these fields. Specifically, unlike the abundant attention on public firm boards, there is limited research on new venture boards. Due to data limitations, research on venture corporate governance is largely conceptual, cross-sectional, and focuses on a small number of firms (Garg & Furr, 2017). Most research on venture capital focuses either at

the fund or VC firm level. Also, the research often suffers sample selection bias by including only surviving startups (Da Rin, Hellmann, & Puri, 2011). Additionally, time is still one of the most neglected critical issues in team research (Kozlowski & Bell, 2003). Researchers have identified time and temporal differences in teams as a key agenda for future research (Eisenhardt, 2004; McGrath & Tschan, 2004). Much of the research to date on temporal difference in teams is conceptual and cross-sectional (Mohammed & Harrison, 2013; Mohammed & Nadkarni, 2011). No study has examined the impact of temporal differences on venture board exit decisions, an important topic that significantly affects startups' growth and survival.

I developed an extensive dataset by hand-collecting data on U.S. VC-backed surgical device startups founded between 1986 and 2014. I tracked each startup from the formal board inception to the first firm exit event (i.e., IPO, M&A, or bankruptcy) through the end of 2017, including such factors as their board composition, director characteristics, financial history, and performance. The sample covers both successful startups and failed startups. The comprehensive dataset enabled me to investigate the impact of changing perspectives across time at the board level, as the new venture entered the period around fund expiration. This study's goal is to help us better understand venture corporate governance and to explain the changes in a VC firm's impact on a startup as the fund is close to expiring. I first conducted a field study to assess the validity of issues related to time horizon differences and to understand the impact of time horizon differences on board dynamics.

The findings from the field study and the quantitative analysis provide insights into VC's concerns about fund expiration, the origin of VC-led time horizon differences and its impact on low-valued exits, as well as how startups can manage this sensitive time by selecting certain types of directors and providing evidence of innovation success. This study highlights venture

capital boards' critical role in the embryonic stage of firm formation. A focus on these inaugural boards offers important insights about the perils of emergence for publicly traded firms.

In Chapter 2, I review the related literature on corporate governance, venture capital, and time. Next, Chapter 3 presents why the medical device industry is a proper context for this study. Chapter 4 introduces the procedure and the results of the field study. Chapters 5 through 7 report the systematic quantitative analysis, including hypotheses development, description of the data, methods, and results. Chapter 8 concludes by highlighting this dissertation's contribution, practical implications, and suggestions for future research opportunities.

CHAPTER 2. LITERATURE REVIEW

In this chapter, I review previous findings on corporate governance, paying particular attention to firms at different developmental stages (public, IPO, and VC-backed ventures). I also discuss the research related to time and temporal differences.

Board of Directors

Boards of directors hold the legal authority to monitor firm operations and performance. Publicly traded U.S. corporations are required to form a board of directors. Laws, such as the Sarbanes Oxley Act (SOX) of 2002, provide explicit directions about how boards should act. Despite many decades of study about boards, which led to the design restrictions in Sarbanes-Oxley, little is known about the embryonic stages of board development in newly emerging ventures. Before firms raise equity capital, they create small and informal boards composed of founders and advisors. When these early-stage firms obtain investment from venture capital funds, venture capitalists serve as active monitors and advisors and increase the formality of the board through board meetings (Gabrielsson & Huse, 2002). When a firm grows and professionalizes, especially after an IPO, the shareholders become more diverse and diffusive, which often creates well-known challenges in monitoring firms. But the challenges that exist in boards after they become fully public may not be the same as those that exist in the board's (and the firm's) early stages. In turn, the theories developed to understand the patterns of behavior and dynamics in major corporations may not provide an adequate lens for understanding the critical formative years.

Researchers have examined the impact of boards in different firm stages (Figure 1): public firm boards, transition period boards around an IPO, and venture boards in VC-backed startups³. The priority of the board shifts in the different stages. Most research on boards of directors focuses on public firm boards, or the period just before the venture registers for an IPO. This study will focus on the early stage of board development, specifically, the time between the first venture capitalist gains a board seat and the first firm exit. The next section reviews the primary theories and findings relating to the three firm stages as these theories provide some insight into the initial board formation challenges.

Public firm boards

Corporate governance scholars use multiple theoretical perspectives to explain board behavior and the impact of boards on a company's strategies and performance. The primary theories include agency theory (Jensen & Meckling, 1976), stewardship theory (Davis, David Schoorman, & Donaldson, 1997), resource dependence theory (Pfeffer & Salancik, 1978), and the behavioral theory of corporate governance (Westphal & Zajac, 2013).

Agency theory emphasizes control and ongoing monitoring. The key assumptions include managerial self-interest, risk aversion, bounded rationality, and information asymmetry (Eisenhardt, 1989). The agency perspective suggests effective governance can be achieved by monitoring agents, by aligning incentives via contract design, and by signaling. Empirical applications of agency theory suggest that board composition and board leadership structure affect governance outcome (Finkelstein & D'Aveni, 1994; Jensen & Meckling, 1976).

Specifically, a higher proportion of outsiders and the separation of CEO and board chairman

³ Early stage boards are advisory-focused with an informal structure, and whose ownership and control are combined, thus having little governance needs. This review focuses on firms where that ownership and control are separated and that have formally structured boards that perform both monitoring and advisory roles.

positions contribute to better governance. Agency theory emphasizes an under-socialized theory of board behavior. The recommendations based on agency theory have been challenged. For example, outsiders and insiders often have close relationships (e.g., Westphal & Bednar, 2005); CEOs, due to their high power and information brokerage positions, can often dominate outsiders in CEO-only boards (Joseph, Ocasio, & McDonnell, 2014). Even in conditions of “ideal” governance (a high proportion of outsiders), broad adoption of golden parachutes often occurs (Joshi, 2013).

Stewardship theory emphasizes cooperation and holds assumptions that are opposite to those found in agency theory. A key assumption is that managers are intrinsically motivated to act in the best interest of the principals (Davis et al., 1997; Donaldson & Davis, 1991).

Therefore, the stewardship perspective recommends a higher proportion of insiders (Sundaramurthy & Lewis, 2003) and CEO duality (Donaldson & Davis, 1991). Both theories address states of nature that can exist, in that managerial interests and owners’ interests can contrast at some times but not necessarily at all times. An important issue that requires further study is how and when and why boards shift from cooperating and monitoring roles.

Resource dependence theory (RDT) highlights another board role: strategic advisory and resource provision. Firm survival is dependent on its ability to procure resources from the external environment (Pfeffer & Salancik, 1978). Boards of directors help the firms minimize their dependence on the environment by providing preferential access to resources, legitimacy, advice and counsel, as well as channels for communicating information between external organizations and the firm (Hillman, Withers, & Collins, 2009; Pfeffer & Salancik, 1978). RDT suggests that board composition should change as environmental needs change (Boeker & Goodstein, 1991). Hillman, Cannella, and Paetzold (2000) identified three types of directors

based on the types of resources they bring: business experts, support specialists, and community influentials. RDT predicts that board composition and director characteristics influence governance outcomes. Specifically, RDT suggests that a larger board (Pfeffer, 1972), interlocking directors (Boyd, 1990; Davis & Greve, 1997), and directors with diverse backgrounds (Erhardt, Werbel, & Shrader, 2003; Hillman & Dalziel, 2003) are more likely to bring critical resources. However, scholars point out the effects of board composition and director characteristics are contingent on many factors, such as prior financial performance, a firm's strategy, and the external environment (Pearce & Zahra, 1992).

Agency theory, stewardship theory, and RDT center on a board's two roles: monitoring and advising. These perspectives informed empirical research that has examined the impact of board composition, director characteristics, and board leadership structures on firm performance (as a proxy of effective governance). The results are mixed. Meta-analyses show that there is little evidence on the impact of board structure (board independence, CEO duality, directors' characteristics and board diversity) on firm performance (Dalton, Daily, Ellstrand, & Johnson, 1998; Dalton, Daily, Johnson, & Ellstrand, 1999; Dalton & Dalton, 2011; Johnson, Schnatterly, & Hill, 2013). The link between a board and performance is indirect and complex. Recent research suggests that we should focus on the mechanisms and outcomes of discrete decisions taken by a board (Desender, Aguilera, Crespi, & García-cestona, 2013) and simultaneously consider multiple director characteristics (Hambrick, Misangyi, & Park, 2015). Agency theory, stewardship theory, and RDT adopt a composition-conduct-performance approach. A common assumption is that directors are able and willing to make their characteristics have an impact (Johnson et al., 2013). This assumption presumes a direct link between composition and conduct.

This research pays little attention to the underlying mechanisms and behavioral dynamics that lead to variances in the link between composition and conduct (Bromiley & Johnson, 2005).

In contrast, the *behavioral theory of corporate governance* (BTCG) is “a multi-level, mechanism-based theory of governance that is socially informed yet actor-centric” (Westphal & Zajac, 2013:607). BTCG considers the social structural relationships, institutional processes, and social cognition; it addresses both the macro- and micro-level of analysis in an attempt to understand mechanisms that link the two (Westphal & Zajac, 2013). Researchers propose many mechanisms explaining board dynamics and behavior, such as similarity-attraction, ingratiation, impression management, social learning, norms of reciprocity and social distancing. Specifically, Westphal and Zajac (1995) demonstrated that powerful CEOs favor board candidates who are demographically similar; in turn, this increased demographic similarity can lead to more generous CEO compensation. Westphal and Stern (2007) concluded that ingratiation behaviors toward peer directors increased the chance of gaining further board appointment, and that, therefore, demographic minorities must engage in a higher level of ingratiation behavior to get the same appointment. An outcome of the ingratiation behavior is increased management control. Westphal and Graebner (2010) found that negative analyst appraisals prompt impression management which is symbolic (i.e., the addition of CEO-friendly independent directors). Westphal, Seidel, and Stewart (2001) demonstrated social learning mechanisms by showing how board interlocks facilitate imitation in business strategies. Westphal and Zajac (1997) found that CEO-directors tended to support fellow CEOs by reducing board control, while CEO-directors supported increased board control if they have experienced it in their own companies, suggesting the norms of reciprocity. Westphal and Khanna (2003) found that directors experienced social distancing when they participated in governance changes that threaten managerial interests,

which explains how boards maintain the solidarity of corporate elites. In sum, the behavioral perspective investigates how informal structures (i.e., networks, power dynamics, and symbolic management) affect power, politics, behavioral patterns in board decision-making processes as well as the diffusion of strategy and technology across firms (See Westphal & Zajac, 2013 for a thorough review).

Faultline theory (Lau & Murnighan, 1998) is another emerging theory that provides insights into board dynamics, and that allows simultaneous consideration of multiple director characteristics. Faultlines are defined as “hypothetical dividing lines that may split a group into subgroups based on one or more attributes” (Lau & Murnighan, 1998: 328). Faultlines stimulate members with dissimilar demographics to differentiate themselves and potentially partition the group into several competing subgroups. Studies have shown that group processes and outcomes are strongly affected by subgroups (Bezrukova, Jehn, Zanutto, & Thatcher, 2009; Carton & Cummings, 2012; Lau & Murnighan, 2005). Subgroup differences may trigger lack of trust, behavioral disintegration, conflicts (including relationship conflicts, task-related conflicts, and process conflicts) and poor team performance (Bezrukova, Thatcher, & Jehn, 2007; Li & Hambrick, 2005). Meanwhile, similarity across members within the same subgroup may strengthen liking, social support, and job satisfaction (Lau & Murnighan, 2005).

Taken together, the key theories suggest that board structure and mechanisms affect board effectiveness (i.e., board task performance and board cohesiveness (Forbes & Milliken, 1999)). The empirical tests are focused on public firm boards. The IPO process requires a board to adopt a similar board structure as the public firm boards. However, startups are different from public firms in many significant aspects, which may make the findings on public firm boards less relevant for newly emerging boards. Even the theories that avoid under-socialized descriptions of

boards tend to build on assumptions of management guile and the boards' monitoring role, rather than the board's advisory role. In the next section, I review the important findings on the period of transition to and through an IPO; then I compare and contrast venture boards and public firm boards.

New boards: the transition to IPO

The IPO process is characterized by information asymmetry that reflects an imbalance of knowledge about the emerging firm. The entrepreneurs know more about the firm than potential investors, and this can lead to adverse selection and moral hazard (Ibbotson, Sindelar, & Ritter, 1988). At this stage, board composition signals the new firm's quality and potential, thus affecting the IPO and post-IPO performance. Researchers adopting agency theory, suggest that a high proportion of non-executive directors' social ties (Filatotchev & Bishop, 2002) and board prestige (Certo, 2003) decrease IPO underpricing (namely, greater wealth retention by founders), while the presence of a founder CEO (Certo, Covin, Daily, & Dalton, 2001) increases IPO underpricing. However, a recent study found that the ongoing information revolution (e.g., the rise of social media) reduces information asymmetry, thereby the above-documented board-related signals did not significantly affect IPO underpricing in the 2010-2013 IPO market (Park, Borah, & Kotha, 2017). Researchers also investigated the impact of board composition on the post-IPO performance in young entrepreneurial firms. Kroll, Walters, and Le (2007) found that boards with a majority of original executives outperformed in the first two years of post-IPO performance because the original executives possessed valuable tacit knowledge. Lungeanu and Zajac (2018) found that directors with both depth and breadth of prior experiences significantly shaped a newly public firm's strategic direction.

The IPO process significantly shapes the board composition and structure. In the IPO-seeking firm, a VC firm's ownership and the executives' power and ownership affect the selection of non-executive director (e.g., number and background) (Filatotchev, 2006). The IPO process also requires the board to create formal structures (i.e., committees and committee chairs). Garg and his colleagues indicated that if qualified directors are not appointed as committee chair or board chair, these undervalued directors lead to an unpleasant board climate, thus increasing the likelihood of turnover for outside directors and the CEO (Garg, Li, & Shaw, 2017), as well as increasing the likelihood of adding less qualified directors and having a poor financial performance (Garg, Li, & Shaw, in press).

While an IPO remains an important mark of transition in governance, the number of IPOs in the U.S. have reduced significantly since peaking in 1996 (Doidge, Karolyi, & Stulz, 2017). Many causes have been proposed, such as more regulation on public firms in early-2000s (e.g., SOX), global technological shocks that makes M&As more attractive (Gao, Ritter, & Zhu, 2013), and the deregulation of securities laws in the 1990s that facilitated raising private capital (Doidge et al., 2017; Ewens & Farre-Mensa, 2018). A recent study indicated that the IPO decline is the result of increases in founders' bargaining power vis-à-vis their investors and the lower cost of being private due to the deregulation of securities laws (Ewens & Farre-Mensa, 2018). Therefore, research focused on public firms and firms that seek an IPO may have limited the application to governance in early stage of board formation for two reasons: 1) the omission of increasing numbers of firms that stay private or seeking alternative exits (M&A and bankruptcy); 2) the significantly different board structure and focus in public firm boards (including IPO-stage boards) and venture boards (venture boards actively engaging in advisory role). While the insights built on studies of established firms provide good insight into what the boards should

look like or do after the firm achieves its public acclimation in the stock markets, little is known about the boards' formative stages.

New venture boards vs. public firm boards

The genesis of board development occurs in the early stages of a venture's development. While not all new ventures seek external funding, I focus on the boards in VC-backed companies because professionally funded entrepreneurial firms tend to have formal boards, which leads to specific requirements on information disclosure and formal board meetings. New venture boards are significantly different from public firm boards, and deserve direct study as a distinct form of governance challenges.

First, venture boards are composed of insiders (founders or other key executives), lead investors, and independent directors (Quinton, 2016). These boards expand in size over funding rounds and tend to be small (typical board size ranges from three to seven) (Feld & Ramsinghani, 2013; Lerner, 1995). About half of the boards are investor-directors, who represent the largest single category on venture boards (Kaplan & Strömberg, 2003). Public firm boards tend to be large (average board size in S&P 500 companies in 2018 was 11) and stable with a majority of independent directors.

Second, while new venture boards and public firm boards share the same roles (monitoring, advisory, and resource provision), there are differences in the emphasis of the roles. For new ventures, the advisory and resource provision roles are critically important in the early stages of the relationships. The new ventures have ambiguous performance goals, which shift as the firm develops. Early-stage firms often have limited financial performance. Startups aim to grow rapidly, and growth is more important than profits. These firms seek a valuable exit (Feld

& Ramsinghani, 2013). Public firm boards emphasize monitoring; they target ongoing good financial performance to maximize shareholder value in the long run.

Third, the level of directors' involvement also differs. Public firm directors are often passive and less involved in operational decision-making (Lorsch & MacIver, 1989), while venture board members are heavily involved and play a critical role in strategic and operational decision-making. For example, board members play key roles in the formulation of startups' strategies and innovation trajectories (Garg & Eisenhardt, 2017), alliance portfolios (Beckman, Schoonhoven, Rottner, & Kim, 2014), hiring or firing founders and executives (Boeker & Karichalil, 2002; Ewens & Marx, 2018), and exit planning (Pollock, Chen, Jackson, & Hambrick, 2010). Venture board members interact more frequently with startups. On average, S&P 500 companies met eight times per year in 2018 (EY Center for Board Matters, 2019). Gompers, Gornall, Kaplan, & Strebulaev (2016) found that 85% of VC firms interact at least once per week with their portfolio companies.

Fourth, venture boards lack formal structure (i.e., committees) and often do not appoint a board chairman (Garg, 2014). Board activities involve all board members. SOX and stock exchanges require that public companies form independent board committees and committee chairs (i.e., audit, compensation, and nominating/corporate governance committees). Each committee has specifically defined functions and develops correspondingly specialized expertise (Ellstrand, Daily, Johnson, & Dalton, 1999; Vafeas, 1999). Board responsibilities are commonly delegated to board committees. New venture boards lack this level of formality.

Fifth, financial incentives differ in new ventures. In venture boards, all directors (insiders and outsiders) have significant ownership in the venture. CEOs and employees hold common shares. Independent directors tend to be awarded common stock (Garg & Furr, 2017), while

investors often have preferred shares (Kaplan & Strömberg, 2003). Although entrepreneurs/CEOs are treated as agents in finance literature (Kaplan & Strömberg, 2004), the CEO-board relationship in startups reflects a principal-principal alignment. In public firm boards, directors represent shareholders, but they often own low levels of common stocks.

Lastly, directors in venture boards are well informed about the industry sector, although they may have different functional backgrounds (e.g., entrepreneurs are strong on product and technology, while investors are experts on finance and marketing (Pahnke, Katila, & Eisenhardt, 2015)). Directors on public boards often come from a different industries and have limited focal industry experience or knowledge (Garg & Furr, 2017). Further, unlike public firm boards where all directors represent the same company, venture directors represent different organizations (i.e., both startups and VC firms) and their diverse background may lead to different goals or incentives. For example, while entrepreneurs may prioritize innovation and enhancing their status in the scientific community, VC firms generally want to improve financial performance and generate revenue by switching emphasis from R&D to marketing and production (Sapienza & De Clercq, 2000).

Table 1 summarizes the key differences between venture boards and public firm boards. The next section reviews the extant literature concerning new venture boards.

New venture boards: only a few survive

New venture boards play a critical role in startups' growth and survival (Garg, 2013; Lerner, 1995). However, unlike the intensive attention on public firm boards and boards in the transition periods, there is little research on the new venture board, and most of that research focuses on those boards that file IPOs. Venture boards are significantly different from public firm boards, in terms of board composition, board structure, directors' background, and

interaction dynamics among directors. More importantly, ventures and venture boards face unique challenges (e.g., raising capital and exit) that are not shared by mature firms. Although limited by small sample sizes, conceptual studies, and the primary emphasis on the VC directors, extant literature provides insights into board composition, investor-directors' involvement, and the impact of the board on innovation and exit.

Specifically, while participation on a board is highly valued, not all VC investors can obtain board seats (Kaplan & Strömberg, 2003). VC investors who make greater investments, invest closer to startup, and have distinctive reputations are more likely to sit on board, although strong venture performance reduces that likelihood (Cumming & Johan, 2008; Cumming, 2008; Lerner, 1995; Park & Steensma, 2014). Further, the level of a VC firm's involvement is contingent on multiple factors, for example, firm stage, CEO's experience, the venture capitalist's experience, and the completeness of top management teams (Sapienza & Gupta, 1994; Sapienza & Korsgaard, 1996; Sapienza et al., 1996). Not all CEOs value a venture capitalist's input. The CEOs' attitude depends on the CEOs' background, the level of uncertainty the venture faces as well as the venture capitalist's status and experience (Barney, Busenitz, Fiet, & Moesel, 1996; Rosenstein, Bruno, Bygrave, & Taylor, 1993).

Studies adopting the RDT perspective demonstrate that VC firms are key resource providers and significantly reduce a startup's resource constraints. The value-adding activities performed by VC firms tend to benefit both the company and the founders. Besides financial capital, VC firms bring strategic guidance (Garg & Eisenhardt, 2017), professional expertise (e.g., marketing VP) (Hellmann & Puri, 2002), and prestige (Chen, Hambrick, & Pollock, 2008; Stuart, Hoang, & Hybels, 1999), thus contributing to faster growth (Puri & Zarutskie, 2012), employment growth (Engel & Keilbach, 2007), innovation (Kortum & Lerner, 2000), product

commercialization (Hellmann & Puri, 2000), alliance formation with established firms (Colombo, Grilli, & Piva, 2006; Gans & Stern, 2003), and valuable exits (Ozmel & Guler, 2015). However, VC firms also can negatively affect startups by leaking information to competitive firms (Pahnke, McDonald, Wang, & Hallen, 2015), providing poor advice when facing conflict among portfolio companies (Garg & Eisenhardt, 2017), or pushing for a premature IPO (Gompers, 1996).

Agency theory highlights the VC firm's monitoring role, which benefits the company, but may disfavor the entrepreneurs. A VC firm's oversight is significantly affected by geographical distance (Bernstein, Giroud, & Townsend, 2016; Lerner, 1995). VC firms tend to replace the CEO when misalignment arises (Bruton, Fried, & Hisrich, 1997). However, the assumption that VC principals want to maximize value does not hold in many situations. For example, inexperienced venture capitalists are motivated to pursue a premature IPO to impress potential investors (Gompers, 1996) or to use underpricing as a device for credibly establishing a reputation (Neus & Walz, 2005). Therefore, Garg and Eisenhardt (2017) suggested that the agency problem may be "flipped" in startups, where CEOs are aligned but investors are not. Additionally, researchers show that power dynamics rather than the agency framework explain why founders are replaced when startups perform well (Boeker & Karichalil, 2002; Wasserman, 2003). These findings indicate that agency theory may not predict the impact of ownership and control separation in the entrepreneurial business sector.

In sum, much of the venture board research is descriptive and cross-sectional, and the extant literature either treats boards as monoliths or emphasizes only VC directors (Garg & Furr, 2017). All directors on the venture board can significantly affect the decision-making process. However, very few studies go beyond VC directors to examine the impact of other types of

directors or the impact of the entire board on startups. One exception is the Katila, Thatchenkery, Christensen, and Zenios' (2017) study of board members who had experience in the use of the venture company's product. They demonstrated that the presence of user board members (i.e., physicians) leads to an inverted U relationship with startup innovation. This study hinted at the importance of further research on the composition of new venture boards to better understand how entrepreneurs, independent directors, and investor-directors affect the development of the new venture board and the range of potential outcomes. Also, although agency theory and RDT provide valuable insights into venture board governance, these theories overemphasize the role of outsiders, especially venture capitalists, while minimizing the impact that the entrepreneur and the board can have on performance outcomes. More research is needed to explain venture board dynamics and how venture boards affect strategy choices and performance at this sensitive emergence stage of the firm and its board.

Time Horizons and Shifting Expectation

A significant difference between new venture boards and established boards emerges due to the active involvement of venture capitalists. VC firms have a finite investment horizon due to the limited lifetime of VC funds. Therefore, VC-backed venture boards' time horizons become limited, and those limits shape the life expectancy of the new venture and its board in compelling ways. Next, I review the literature related to time.

Every strategic decision has a time dimension (Ewing, 1972). However, most empirical work treats time as a background phenomenon, which emphasizes time as flowing linearly, even-paced, and equal in impact and influence for all decisions and decision makers (Das, 1993). However, there are two dimensions in time: clock time and psychological time (non-linear, subjective feelings of the temporal experiences) (Fraisse, 1964; Jaques, 1982; McTaggart, 1988;

Nuttin, 1980). Time orientation reflects the psychological time. People have an inherent orientation toward the flow of time (Fraisse, 1964), which may differ among individuals with respect to their interpretation of the relative dominance of the near versus the distant future. The intermediation of these differences is not a trivial problem.

Time orientation is one of the fundamental parameters of individual differences (Bluedorn & Denhardt, 1988). People with a future time orientation tend to prefer identity over instrumental benefits and are relatively more idealistic (Kivetz & Tyler, 2007). Future time orientation motivates persistent effort for the present activities thereby enhancing performance (de Volder & Lens, 1982; Lasane & Jones, 1999). Researchers also show that future time orientation motivated by intrinsic benefits (e.g., self-development) improves learning, performance, and persistence, while future time orientation motivated by extrinsic benefits (e.g., financial rewards) can forestall positive outcomes (Deci, Eghrari, Patrick, & Leone, 1994; Reeve, Jang, Hardre, & Omura, 2002; Simons, Vansteenkiste, Lens, & Lacante, 2004).

Das (1987) finds that executives with a distant future time orientation prefer a longer planning horizon, while executives with a near future orientation prefer a shorter planning horizon. West and Meyer (1998) show that future time orientation facilitates strategic change. Time is also a scarce and valuable resource. A shorter time horizon signals a hectic pace of activity and demands additional resource commitment (Eisenhardt, 1989).

Therefore, decision makers' time orientation affects a specific project's time horizon, the strategic planning cycle, and the will toward resource commitments (Das, 1987). Time horizon reflects "a boundary which separates the foreseeable from the unforeseeable future" (Das, 1991:53). For a group, the relevant time horizon may be a negotiated result among all team members. However, the group may be blind to differences in time horizon. Managers may not be

explicitly aware of their temporal orientation, even though time orientation is evidently at play in the process of decision-making and negotiation (Waller, Conte, Gibson, & Carpenter, 2001). Das (1991) calls the process “the silent politics of time.” The persistent differences in how managers think about and value time can significantly affect project performance. Despite its importance, unlike other categories of individual characteristics (e.g., gender, ethnicity, personality traits, education, and functional background), time orientation differences/diversity have received limited recognition in the strategy literature.

The extant research on time orientation diversity refers to the theory of time, interaction, and performance (TIP theory) proposed by a social psychologist, Joseph McGrath (1991). Although TIP theory does not explicitly discuss temporal diversity, it suggests that time orientation differences lead to three generic temporal problems—temporal ambiguity, conflicting interests and requirements, and the scarcity of temporal resources, that create gaps in coordination and workflows and consequently inhibit team performance. Previous research leaned heavily on “in-sync preference” and the importance of entrainment, namely the harmonious internal temporal coordination (synchronization) of activities which match the demands of the task environment (Ancona & Chong, 1992; Bartel & Milliken, 2004; Blount & Janicik, 2002; Pérez-Nordtvedt, Payne, Short, & Kedia, 2008).

Although temporal diversity can lead to significant misunderstandings, conflict, and lower social integration (Price, Harrison, Gavin, & Florey, 2002), conceptual studies suggest that temporal diversity helps balance multiple team performance requirements (e.g., speed and quality, short- and long-term demands), thereby improving team effectiveness (Eisenhardt, 2004). Focusing on technology-based firms, West and Meyer (1998) studied 22 top management teams and concluded that temporal diversity facilitated strategic change; while Eisenhardt,

Kahwajy, and Bourgeois (1997) studied 12 top management teams and found temporal diversity improved firm performance.

The inconsistent findings motivate researchers to explore the boundary conditions that moderate the impact of temporal diversity. Mohammed and Harrison (2013) pointed out in a conceptual study that task characteristics may moderate the impact of temporal diversity on team performance. Specifically, temporal diversity may enhance performance in an uncertain and dynamic task environment because temporal diversity enables consideration of more valuable information, ensuring the attainment of both proximal and distal goals, as well as a balance between reckless action and indecision. Mohammed and Nadkarni (2011) surveyed 71 teams in a medium-sized Indian firm and identified another moderator: team temporal leadership (defined as “leader behaviors that aid in structuring, coordinating, and managing the pacing of task accomplishment in a team” (Mohammed & Nadkarni, 2011:492)). They conclude that strong temporal leadership amplifies the benefits and reduces the problems related to temporal diversity, thus maximizing team performance.

The time orientation of key decision makers affects a firm’s time horizon. Most studies examine time horizon at the firm level due to a lack of micro-level detail about decisions or decision makers. As a result, time horizon is commonly measured by data in accounting reports (e.g., asset life (Souder, Reilly, Bromiley, & Mitchell, 2016) and R&D expenditure (Chrisman & Patel, 2012)) or in text analyzing letters to shareholders, management discussions and analysis in 10-K reports, and executive conference calls with analysts (e.g., Nadkarni, Chen, & Chen, 2016). Only a few survey studies investigated time orientation at either the individual or the group level (Chen & Nadkarni, 2017; Das, 1987; Mohammed & Nadkarni, 2011, 2014).

For newly funded IPO firms, the concept of time horizon is gaining research attention due to the obvious impact of VC firms. Lungeanu and Zajac (2016) found that the misfit between VC firms' time horizons and the startups' time horizons reduces the likelihood of a successful IPO and leads to poor short-term post-IPO performance. Additionally, time horizon differences arise during the IPO process. The strong selling incentive and exit pressure horizon result in VC firms adopting a short-term horizon (Gompers & Lerner, 1998, 1999). Short-term horizons in IPO events are further confirmed by research showing that VC firms significantly affect CEOs' decision horizon by providing explicit short-term horizon incentives in the compensation contract (e.g., giving option grants before the IPO that vest soon after the IPO) (Cadman & Sunder, 2014). Arthurs, Hoskisson, Busenitz & Johnson (2008), without conducting an explicit test of time horizon differences, suggested that boards of directors play an important role in managing time horizon differences, thus affecting an IPO performance. These studies on the role of time horizon emphasize firms that sought to go public. Due to this emphasis, these studies fail to consider patterns in the emergence of time horizon differences, or in the role of contextual factors in the amelioration or exacerbation of time horizon differences.

Studies of early-stage startups do provide evidence of temporal differences between the VC firm and CEO. In a longitudinal study of one VC-backed startup, Gersick (1994) demonstrated that the CEO and VC firm paid attention to different issues in a startup business and adopted different pacing styles, a conflict that can lead to information asymmetry and different opinions on firm development. The presence of distinct opinions across key decision makers can lead to tension and chronic conflict, which could threaten the startup's survival (Bucciarelli, 1988; Van de Ven, Venkataraman, Polley, & Garud, 2000). To date, no study has

investigated time horizon differences using a large sample of early-stage startups. Thus, the impact of time horizon differences is still not well understood in the extant literature.

Some extant research does identify factors which affect the VC firm's time orientation in early-stage ventures. For example, a VC firm's time orientation is influenced by the fundraising cycle and fund age. VC funds have pre-determined, finite lifetimes, usually ten years, although extensions of between one and three years are possible (Gompers, 1995; Kandel et al., 2011). VC firms typically raise a new fund every three or four years. VC firms strategically delay writing-off failed investments during fundraising (Chakraborty & Ewens, 2018), which lengthens the investment horizon. VC firms' time horizons decrease as VC funds age due to their fixed lifetimes. Kandel, Leshchinskii, and Yuklea (2011) demonstrated that although VC firms, in general, are less likely to abandon projects than other types of investors, VC firms with an older fund are much more likely to abandon good projects. Barrot (2017) found that VC firms with an older fund were less likely to invest young and innovative companies.

Due to the limited fund life, VC firms typically have a five to ten year time horizon before expecting to cash in, and thus are often treated as long-term investors (Bygrave & Timmons, 1992). Guler (2007) found that VC firms syndicated as a group are less likely to terminate investments even when the expected returns decline. However, since the 1980s, some VC firms have emphasized the short-term profit and targeted "the liquidity of getting in and out" of an investment in two to four years (Bygrave & Timmons, 1992:47). Besides, more early-stage VC firms invest in an increased number of companies but provide a little capital and governance, and abandon most of the venture companies after the initial investment. This "spray and pray" approach has become increasingly popular in recent years (Ewens, Nanda, & Rhodes-Kropf, 2018) and reflects experimentation, low failure tolerance, and, consequently, a shorter

investment horizon that may make it harder for radical innovation and the development of complex technologies (Ewens et al., 2018). In sum, a VC firm's time orientation is significantly affected by the investment horizon. A venture capitalist's time orientation guides their behavior and their willingness to contributing resources, thus affecting startups' strategy, time horizon, and survival.

Despite the intensive research on the impact of VC, prior research does not pay attention to the differences of time orientation among the key decision makers (e.g., executives, independent directors, and other investors on board). Although VC firms are highly influential, venture capitalists and executives have the same impact on the final decision in 60% of startups (Kaplan & Strömberg, 2003). Therefore, independent directors could also play a decisive role. Previous results on how VC firms affect startup strategies and performance may understate the role of other board members due to the sole focus on the VC investment horizon and the exaggeration of venture capitalists' impact on board.

One key issue for this dissertation is that entrepreneurs and venture capitalists may have a different time orientation. Unlike venture capitalists whose time orientation is significantly constrained by the fund's investment horizon, entrepreneurs may have a relatively stable long-term orientation. A second (and perhaps more important issue) is that the VC time orientation is bounded by commitments to the fund, and shrinks as the new venture ages. The VC firm level or startup level analysis in previous research does not consider the effects of board dynamics resulting from director-level temporal differences on strategic choices and performance as suggested in TIP theory. The issues of how venture boards resolve these differences in time orientation are not well understood.

This dissertation aims to provide insight into the influence of time horizon differences on the new venture board from the board's inception through an exit event, where the exit event includes IPO, M&A, or bankruptcy. The study will identify the impact of time horizon differences on exit outcomes and address how venture boards accommodate these time horizon differences. The purpose of this study is to identify the role of the venture board in achieving successful intermediation in time horizon differences in this embryonic stage of firm formation.

CHAPTER 3. CONTEXT

The context of this study is medical device startups that have received venture capital investments in the United States. For the quantitative analysis, the sample focuses on surgical device startups.

The medical device industry is a proper context for four reasons. First, the R&D and commercial processes are costly so that early-stage medical device startups rely heavily on venture capital (Ackerly, Valverde, Diener, Dossary, & Schulman, 2009; Pahnke et al., 2015). For example, data indicates that surgical device firms spend at least \$40 million to introduce a new product, and the majority of startups receive some form of venture capital funding (Pahnke et al., 2015).

Second, because startups in this industry often have a long R&D and commercialization cycle, medical device companies are more likely to experience long time frames between the initial investment and investment exit. The information asymmetries between VC firms and entrepreneurs tend to be more pronounced; thus, intensive monitoring is crucial. This study emphasizes the impact of the passage of time on members of the board, and the impact of key milestones as time passes, with special regard to the potential for differences in the evaluation schema that might develop between board members (venture capitalists and the entrepreneurs). A survey of 885 venture capitalists from 681 VC firms, found that healthcare VC firms rank board control provisions in the least flexible terms (in terms of openness to negotiation) in their investment contracts. There is less flexibility regarding the concerns for VC board membership in this context than in the IT context (Gompers et al., 2016). Board seats are crucial for VC firms

as a means of affecting startup business strategies in healthcare startups. Therefore, the focus on this industry is appropriate for this study of the formative challenges of governance in an entrepreneurial company's embryonic stage.

Third, medical device companies share a similar set of innovation-related milestones. In addition, such a firm's assets tend to be intangible and transaction-specific. For example, new products require both patent approval and FDA pre-market clearance and approval. Prior research on the surgical device industry provides a solid basis to establish observable signals of quality. The literature has suggested reliable measures of technical innovation (patents) and commercial innovation (FDA clearances and approvals) for the surgical device industry (Pahnke et al., 2015; Pahnke et al., 2015).

Finally, many medical device entrepreneurs have a scientific background. Technically-oriented entrepreneurs often lack financial and commercial experience. This lack of managerial skills gives rise to the possibility for both high value-added benefits from the involvement of a VC firm and significant potential for conflict in entrepreneur-VC collaborations.

I conducted both a field study of VC-backed medical device firms and a systematic quantitative analysis with a particular focus on VC-backed surgical device startups in the U.S. to explore entrepreneurs' and venture capitalists' time orientation and its impact on board dynamics and exit strategies. The next chapter presents the details of the field research.

CHAPTER 4. INITIAL INSIGHTS FROM THE FIELD

Study Design

The research target of this study is the venture board that guides new ventures, as such boards directly affect startup operations and growth. Venture boards are composed of managers, investor-directors, and independent directors (Quinton, 2016). Directors are the most powerful group of people in the startup, with the ability to approve or block key transactions (Feld & Ramsinghani, 2013). This research investigates the era from the first formation of a board until the VC-backed company's exit (IPO, M&A, or bankruptcy). The exit outcome provides an indicator of the financial return for entrepreneurs and investors and is a widely-used venture performance measure (e.g., Cumming & Johan, 2008; Cumming, 2008; Cummings & MacIntosh, 2003). A board's evaluation of events across this time horizon is a fundamental aspect of strategic decisions made concerning exit (Das, 1987). The exit decision must occur within a specific time horizon for the VC firms because all such firms openly negotiate an expected exit before or around the end of their funds' lifespan when investing (Schwienbacher, 2008). The VC firm's time orientation and the strict external fund deadline affect the evaluation process as time passes. When faced with a strict deadline, the external time pressure can change decision makers' (i.e., the venture capitalists) temporal orientation/proclivity by mandating clear prescriptions for behavior (Mischel, 1968). Other directors (e.g., the entrepreneurs) may not feel or experience the pressures at the same level or pace. In this study, I use the term "time horizon" to describe the directors' temporal decisions about exit. In short, this dissertation investigates venture boards' time horizon differences toward exit relating to VC-backed startups, beginning

with the creation of a formal board and the appointment of its first VC director and ending with the first startup exit event, including the impact of time horizon differences on board dynamics and exit outcomes.

To first confirm the face validity of the time horizon construct and its effect on board dynamics and venture exit performance, I conducted extensive reviews of archival sources, including blog posts, books, and podcasts to gain a practitioners' view of the interaction dynamics among entrepreneurs, VC firms, and independent directors. I also conducted 15 semi-structured interviews with entrepreneurs and investors, who were likely to have different exit preferences.

The interviewees included entrepreneurs from seven medical device firms and nine investors (seven from VC firms,⁴ one family office investor, and one evergreen fund manager). Each interview lasted between 30 and 90 minutes. The interviews took place during August 2017 and February 2018. The entrepreneur interviewees had diverse experience levels (see Table 2 for background details): first-time vs. serial entrepreneurs, scientific vs. business background, and early (e.g., seed round) vs. late stage (series D) VC-backed companies. All the investor interviewees were highly experienced, and were responsible for all aspects of the venture process, from deal sourcing and negotiation to management of portfolio investments (see Table 3 for background details). All the investor interviewees served on multiple boards. The investor interviewees represented VC firms with different fund sizes, ranging from \$15 million to \$275 million, and differences in their firm's investment focus (life science sector exclusively or diverse portfolios). The interview questions concerned entrepreneurs' orientation to time; the VC firm's concerns about time and how these differences emerged as the VC-backed companies

⁴ One interviewee is an entrepreneur and an active venture capitalist. I asked him questions related to both roles.

progressed (or failed to progress) through the stages of early discovery and growth; and how concerns about time emerged on the board and how boards resolved these issues (if they did resolve them).

Results from the Field

Entrepreneurs and their comments on time

Each entrepreneur interviewed had founded one or more medical device startups, which was the first criterion used in selecting interviewees. For each VC-backed company, I interviewed the incumbent CEO since CEOs are the most senior executives and always hold board seats. Although all medical device companies originate from scientific ideas and tend to have scientific founders as part of the founding team, the scientists may not hold the CEO position, especially when the founding teams have a cofounder with a professional background. Four out of the seven entrepreneur interviewees lacked a scientific background (i.e., a science Ph.D. degree and intensive research experience). Scientists are typical “futurists” (Eisenhardt et al., 1997), who tend to have a long time horizon. The differences in the CEO backgrounds provided insight into whether the different backgrounds contributed to differences in the perception and evaluation of events across time.

I asked the CEOs of these new ventures to describe their goals. All respondents differentiated between distal and proximate goals. The two forms of goals also differed in specificity. The goals rarely included specific time components, although they clearly indicated differences in the instrumentality or permanence of activities. Proximate goals served as informal indicators of progress (or its lack) toward the longer-term goal. Six entrepreneurs described this long-term/short-term dichotomy, as they described long-term goals and short-term milestones. For example, the entrepreneurs stated,

Our goal is to build the best product and identify the market where we can differentiate and bring value.... We improve the product continuously. We want to have a sustainable business. In order to achieve the big goal, we have a few milestones along the way. (E4)

Our goal is to develop an instrument to safely separate tissues.... We look to make a big difference, not a small difference. We set goals aggressively as best as we can, but we always keep an eye open for new opportunities. Four months ago, we wanted to enter the European market first and had no plan for China. Now that has changed. (E3)

Our goal is to have a product that solves the problem and goes along with our mission.... It's hard to know where you are in technology development. So, we have annual goals and regularly do a landscape analysis: who else is there, what they are doing, what patents they have filed, etc. (E6)

The only exception to this pattern occurred with a CEO who was also an active VC investor in the startup. This interviewee is the startup's CEO and President, and a general partner of a VC firm. His answer emphasized short-term milestones:

Anytime I start a new company, I look at what milestones we need to hit to raise extra money. This model drives how we set up and reach the goal. For example, what is realistic to successfully complete each year? Is it possible to build partnerships with larger firms? Can we raise more capital or is this a year just to do the work?... We do not set goals for a whole year. Instead, we break it down into smaller segments. Some milestones can be finished in three to six months. (E5)

These comments were much more specific in terms of the goals and time frames and suggested a strong emphasis on relatively short-term periods.

The interviews indicated that entrepreneurs divided the future into long- and short-term components. The present was loosely guided by future product-oriented goals. The comments implied that, for the majority of entrepreneurs, the long time horizon was somewhat more important than the short term. This longer-term emphasis applied to entrepreneurs with a scientific background and to entrepreneurs who had a professional background. The entrepreneurs' long time horizon observed here matched findings reported by Graebner and Eisenhardt (2004). In studying 12 entrepreneurial firms, they found that entrepreneurs were interested in deals that offered a long-term fit. They paid limited attention to short-term personal

rewards or their jobs in the post-acquisition firm. However, in the case of this study's VC CEOs, when the entrepreneur was also an active VC investor, he/she paid more attention to the present and short-term goals, and, thus, had a shorter time horizon.

Within the sample, four founding entrepreneurs served as independent directors on other startup boards, including the three serial entrepreneurs. Their roles as independent directors provided insights into how independent directors might balance the difference in time horizon between founders and venture capitalists. Will Herman, a serial entrepreneur and experienced startup director, described,

Outside directors [independent directors] can fill a unique role on the board.... Unlike the investors on the board, the outside director has no limited partners to report back to or any other type of investment agenda. Additionally, the outside board member will often be the most operationally experienced board member.... the outside board member becomes the go-to adviser, working on operational issues and opportunities as well as emotional issues when the CEO or team members feel crushed under the day-to-day stress of running the company. Another important role of the outside director is that of the mediator or synthesizer of the parochial opinions of the insiders—those who invested in the company. Often, this means bridging the gap between the management team and the investors in the company. (Feld & Ramsinghani, 2013:36-39)

VC's time horizons and the rise of VC-led time horizon differences

All investors who were interviewed had extensive experience in private investment (a mean of 17.6 years). One venture capitalist interviewee was a serial entrepreneur. Two of the venture capitalists had scientific backgrounds, and three were former executives at life science companies. The VC firms they represented differed in size, focus, and performance. All the VC firms had raised multiple funds, with fund sizes ranging from \$15 million to \$275 million. The average VC firm age was 21 years. Five VC firms invested exclusively in life science firms. Although almost all the VC firms I interviewed were based in the Eastern United States and co-invested with VC firms in the West. I also asked the Eastern venture capitalists whether they behave differently compared to their Western counterparts. Additionally, I interviewed an

evergreen fund manager and a family office manager who served as startup directors. Evergreen funds have an indefinite fund life, and family offices do not have a fund structure. This allows both types of managers to pursue risky projects over a longer return cycle. Evergreen funds and family offices provide “more patient” capital when compared to time-bound VC funds.

Venture capitalists are venture capital fund managers who raise capital from limited partners. Limited partners (e.g., pension funds, insurance companies, university endowments, wealthy individuals, etc.) are venture fund owners but do not directly invest in startups. Limited partners commit the money for the life of the fund, typically ten years. Typically, 2% of the fund are paid to VC firms as a management fee and the rest of the fund is invested in startups. By the end of the fund, VC firms need to return capital to their limited partners in a liquid format, either as cash or public company shares. VC firms share a proportion of the profits, typically 20% (aka carried interest). Startup exit (either IPO or M&A) is the primary mechanism for VC firms to return capital to their investors. VC firms can use contractual rights to force an exit (e.g., redemption rights and liquidation rights) to ensure an on time return of money back to limited partners. As a result, an indefinite duration is not an option for VC funds. As Luke Kanies, founder of Puppet, described⁵,

Any company has four options: Go broke, go public, get bought, or stay private indefinitely. If you take VC money, that last option is off the table.

Another option is buyout investors at the end of the fund to avoid a firm exit. Startups can raise additional capital from new investors to buy out the time-urgent VC firms. Startups can also buyout time-urgent VC funding contracts by themselves. For example, Arkadium used its profits

⁵ Extracted from *If You Take Venture Capital, You're Forcing Your Company To Exit*, available at <https://medium.com/s/understanding-venture-capital/if-you-take-venture-capital-youre-forcing-your-company-to-exit-fc08fedb32cc>

to buy out their VC firm's investment in September 2018. Another company, Buffer, bought out its main Series A investors in July 2018. Figure 2 presents the VC business model.

The interviews demonstrated that the fixed fund lifetime significantly limits a VC firm's orientation to time, which is evident at multiple stages of the firm's development: deal negotiation, management of the startup, and active intervention when close to the end of the fund. VC funds share a similar structure, regardless of the VC firm's location (West or East). VC funds have a fixed lifecycle, typically ten years, although extensions of between one and three years are often allowed (Gompers & Lerner, 1999). The exit stage is a necessary part of the financing process, and the funds must be liquidated at the end (Schwienbacher, 2008). Investors (limited partners) receive proceeds in cash or liquid securities (Smith, 2005). There are five possible exit means: IPO, M&A, company buyback, secondary sale, or write-off/liquidation (Cummings & MacIntosh, 2003). Secondary sales and company buybacks are inferior forms of exits, which are avoided if at all possible (Cummings & MacIntosh, 2003). These rare and inferior exits generate much lower profits upon exit (Cumming, Fleming, & Schwienbacher, 2006; Cummings & MacIntosh, 2003). Hence, VC firms' exit plans focus on IPOs or M&As. VC firms often preplan the exit before contracting with the entrepreneur, although the preplanned exit strategy is not part of the contract (Cumming & Johan, 2008). Gompers, Gornall, Kaplan, and Strebulaev (2016) surveyed 885 venture capitalists and found that exit considerations were the most important factors in deciding valuation and structuring term sheets.

Consistent with the previous findings, all VC interviewees indicated the exit discussion was a necessary component when negotiating a deal. Before any investment, VC firms discuss exit strategies with entrepreneurs to assure an exit is possible within the fund's lifetime. One venture capitalist stated,

We talked about exit before making any investment. We don't make an investment with any company unless we are clear there will be an exit before our fund shuts down. (VC5)

Once VC firms and entrepreneurs sign the investment contract, they become partners. VC firms cooperate with company managers and play a supporting role by contributing valuable resources (Graebner & Eisenhardt, 2004). My interviews described a similar pattern of support. For example, one venture capitalist said,

Usually, entrepreneurs send us their plan or goal; we take a look at it. Management is in a much better position to outline the next step and the amount of money needed than VCs. We do not try to manage the company. We try to focus on the strategic directions and whether the goals fit with the financial resources available. (VC1)

Note that the VC firms appear patient in the early stages of the fund when the exit pressure is not high. They work with the startups with a tolerance for missed goals and exhibit patience, even though short-term performance may fall below expectation. As one venture capitalist commented,

It is not uncommon that a company misses its goals. Our relationship with entrepreneurs really doesn't change in that regard because it is not we made the investment in year one, we learned this problem in year seven. We walked with the company together, and we know that we are updating our own expectations that the original goal may be missed by a year. So, we manage expectations throughout the process and it does not change the dynamic. (VC6)

However, the cooperative relationship faces greater challenges due to stronger exit pressure as the fund nears its expiration date. A clear misalignment in exit preference is often observed among entrepreneurs, venture capitalists, and other types of investors (evergreen and family office). For example,

My fund is eight years old.... I want to sell the company. The CEO is concerned about losing his job, so he is not interested in the acquisition. But from the investor perspective, I don't care. (VC4)

I have a much longer time horizon and a lot more patience, and I am waiting for that bigger exit. (Evergreen fund manager)

The differences in the preferred exit time among various types of directors is evidence of differences in sensitivity to time pressure across the different types of board members. Similar differences in the level of sensitivity can also arise that result from misalignment among VC investors in the same firm because of the different fund vintages of the respective VC funds. Specifically, as one venture capitalist described,

Thinking about your investment, typically you want to exit at year five or seven. You typically invest for the first four or five years and you want the next four or five years to harvest a good return—you want to exit. If I invest in a company for five years (and the investment happens in my year four) and a new fund comes in, five years have passed and now I am in my year nine. The new fund comes in at year one or two, so clearly there is not an aligned interest. (VC4)

This type of misalignment in the preferred exit time arises when one VC firm's fund is close to its expiration date. The primary cause is strong exit pressure resulting from the end of the fund. This type of time horizon differences reflects a VC firm's strong exit incentive and a weak exit incentive for entrepreneurs and other types of investors who pursue a valuable exit without a specific time limitation. I label this difference in time horizon as *VC-led time horizon differences*.

Differences in thoughts about exit strategies can occur during an earlier period, long before the expiration of a VC's fund. But in this case, the VC's longer window may induce a preference to delay the exit. Dan Shapiro,⁶ a serial entrepreneur, described this situation:

They [VC firms] don't let you sell the company, even though it's enough to make everyone rich.

VC firms reserve money for a startup's follow-on investment to protect their ownership and their return. The return is calculated based on the amount the firm reserved to invest rather

⁶ Extracted from *VC insanity, explained*, which is available at <https://www.danshapiro.com/blog/2010/08/vc-insanity-economics/>. Dan Shapiro is also the author of *Hot Seat: The Startup CEO Guidebook*, published by O'Reilly.

than what they invested. An early exit can be less attractive than an additional round that increases a VC firm's ownership and future return. This type of time horizon difference is called an *entrepreneur-led time horizon difference*. Entrepreneur-led time horizon differences are likely to happen in the middle stage of a fund when VC firms want to grow the business for a higher return. The extent of the differences decreases as the fund ages. The entrepreneur-led time horizon differences tend to arise and disappear before VC-led time horizon differences as both entrepreneurs and venture capitalists may prefer an exit around the end of the fund. If an exit does not happen at the end of a VC' firms fund, a mutually acceptable exit is normally not available, VC-led time horizon differences arise as VC firms' strong exit motivations make them more likely to accept low-valued deals that entrepreneurs resist. Besides, entrepreneur-led time horizon differences probably may occur less frequently in medical device companies, due to the long cycles of development and approval. In this study, I have focused on VC-led time horizon differences.

These differences in approach to exit timing may vary with the venture investor's level of experience. For example, inexperienced and young venture capitalists may push for an exit before their fund ends to signal the VC-backed company's quality to potential investors in follow-on funds (Gompers, 1996). The quantitative study in the next chapter controls for venture capitalists' experience.

One purpose of this research is to investigate the incidence of these VC-led time horizon differences and to describe the contexts in which they occur. A second aim is to investigate if the board's composition plays a role in resolving these conflicts. The interviews hinted at the role the board might play.

Differences in time horizon⁷: what role does the board play in impact and management?

McGrath (1991) described how conflicts about time perception emerge due to temporal ambiguity, conflicting interests and requirements, and the scarcity of temporal resources. These three problems are reflected in the interviews. When I asked how time horizon differences affect startup operations, one VC said,

[Time horizon differences lead to] more conflict. Somebody may sue. In any institution, this misalignment [in time horizon] could mean trouble, and a successful exit could be more difficult. Maybe you [entrepreneurs] can survive it, but you need to put in more effort. When there is a misalignment, one board member tells you one thing, while other members tell you another thing. It becomes very complicated. I have never seen a positive impact that way. (VC3)

Also, one entrepreneur responded:

VCs are quite simple. The first two to three years are the honeymoon. After that, they want to exit.... We have to spend more time on negotiation and conflict resolution. (E2)

The strained relationships between entrepreneurs and VC firms may substantially reduce the probability of success. Time horizon differences have a significant impact on VC-backed startups, As Asheesh Advani, an entrepreneur and investor, stated,⁸

Most businesses fail because they run out of time, not because they run out of clients.... Venture capital firms are high risk, high return investors, and their limited partners expect high returns quickly. To them, patience is not a virtue.

The management of these time horizon differences becomes crucial to a startup's survival. When asked about how to address time horizon differences, the interviewees emphasized the prevention of time horizon differences and indicated limited options on the management of time horizon differences if they are not anticipated. For example, one venture capitalist said,

⁷ In this paper, time horizon differences mean VC-led time horizon differences unless otherwise stated.

⁸ Extracted from *Raising Patient Capital for Your Business*, available at <https://www.entrepreneur.com/article/171894>.

This is why it is important to think early on before you invest.... I not only think about whether it is a good company. I also think about who is going to invest in the company next, how many rounds they are going to have. I think about these problems before I put money into the company. I want to prevent misalignment. I cannot try to fix it if it's already there. If the problem comes, I cannot do much about it. The only way to do something about it is to prevent it.... I think about who else will invest with me, that is another reason why fund syndicates with another fund. Because once syndicated, together we have enough money to last a long time, and we may be OK. If I do it alone, I don't have the power due to a limited amount of money. When I syndicate, I consider the length of the other funds as well, so that all the co-investors have a similar length. (VC6)

Another venture capitalist added,

The only way is to change the board. You try to get rid of that investor [with an expired fund]. (VC2)

A board seat is necessary for affecting the negotiation. One venture capitalist stated,

If you do not force the issue and look for an exit, you will be in a very bad situation. To force the issue, you need to sit on the board.... After raising money, entrepreneurs do not solely control the firm. It is the whole board's decision. It is a lot of people. Who is on the board is very important. You want to have some influence or control about how the decisions are made. (VC3)

Venture capitalists will not leave the board unless they get their money back. A buyout situation for early investors can occur when a firm raises a new round from a big fund. One venture capitalist explained,

Sometimes, a big fund may help. ... For example, the company needs \$10 million, but the company looks for a fund who is interested in investing \$20 million. What the new investors do is to put \$10 million in the company and buy out \$10 million early investors. (VC4)

The evergreen fund manager added,

When we face a conflicted time horizon, there is really only limited help we can provide there. We don't want to damage the startup by letting it go out the door. We also don't want to poison the relationship with co-investors. So one way we can help is by introducing that investor to a secondary market where people are going to buy their stake in the company. We definitely know it is very difficult. But we try to persuade them [venture capitalists with an expired fund] and hope they can go that route. (Evergreen fund manager)

In sum, the field study explained why VC-led time horizon differences arise and provided preliminary evidence suggesting the significant impact of time horizon differences on a startup business. VC firms influence startups via their board position. Some investors point out that changing board composition by removing investors with an expired fund may solve time horizon differences. The board level analysis in this dissertation will consider how boards anticipate and manage time horizon differences. One path mentioned in these interviews is based on the use of sequential investments, as in the case of a later investor buying out the earlier investor. A second path mentioned in the interviews requires some success in achieving market legitimacy, as a necessary condition for raising more capital.

Certainly, the board can play some key role in the anticipation and resolution of issues related to the time horizon shifts as funds age. The interview findings provided rich insights, but they did not provide definitive evidence. In the next chapter, I develop in-depth hypotheses based on previous literature concerning boards and new ventures. I explore how newly formed boards contribute to the resolution of these issues as the firm goes through its embryonic stages. Within the fields of strategy and entrepreneurship, this focus on pre-IPO emergence is important, as most studies of new ventures focus on public firms. By definition, these studies exhibit a survival bias. Within the field of corporate governance, this focus is important, as these boards reflect elements of principal to principal conflict and the shift from entrepreneurial management (manager is a principal) to a form of professional management (manager is an agent).

CHAPTER 5. THEORY AND HYPOTHESES

Time Horizon Differences: Origins

The field study indicated time horizon differences create a misalignment in the preferred exit choices between entrepreneurs and venture capitalists, and between initial venture capitalists and venture capitalists who invest later. The differences emerge due to the different commitments and identities held by the venture capitalists and entrepreneurs, respectively. The venture capitalist has a strong commitment to the fund investors, and an identity linked to the long-term success of the VC firm. The entrepreneur has a strong commitment to their growing company, and an identity linked to the success of that firm. The often slow pace of the entrepreneurial process contributes to the rise of VC-led time horizon differences.

A fundamental cause of time horizon differences is the fixed lifetime of VC funds. The fixed lifetime is a control mechanism applied by limited partners to VC firms to assure the eventual redemption of their capital investment in liquid form (Neus & Walz, 2005). Limited partners also constrain new investments in the late period of the fund, typically after year five, to facilitate a successful harvest at the termination date and to avoid fund extension (Cummings & MacIntosh, 2003). Limited partner contracts often include protective covenants that prohibit or severely restrict the sale of shares to a VC firm's follow-on funds (Gompers & Lerner, 1996). The VC investing model is patient, but that patience is bounded by the funding contract with limited partners.

Therefore, setting a time for an exit is a necessary part of a VC firm's initial decision to invest in startups. VC firms invest in startups with the clear wish to exit before fund's expiration

date (Gompers & Lerner, 2004; Gompers & Lerner, 2001; Gompers et al., 2016; Smith, 2005). Some VC firms prefer a specific exit option, for example, either a preplanned IPO or a preplanned acquisition at the time of contracting (Cumming & Johan, 2008). VC firms may or may not share their exit plan with entrepreneurs (Cumming & Johan, 2008), since those that preplan exits tend to request more control rights and may justify the request by reasons unrelated to exits (e.g., the high risk in the high-tech industry and entrepreneurs' lack of managerial experience) (Cumming & Johan, 2008).

Specifically, to increase the chance of an exit at a VC-preferred time, VC firms can include control rights, liquidation rights, and protection provisions in the investment contract.

The most relevant control right is the right of redemption. Redemption rights allow VC firms to force the startups to repay the original investment. In a survey of 681 VC firms, Gompers et al. (2016) found that redemption rights were granted 45% of the time. Smith (2005) further indicates that there are three types of redemptions rights: mandatory redemption (repurchase at a specified date), optional investor redemption (put options allow VC firms to force the repurchase at will), and optional company redemption (call rights allow the startup to decide the repurchase date). Among 367 VC-backed startups that completed an IPO between January 1997 and June 2002, 60% (219) had redemption rights; 9% (32) had mandatory redemptions; 43% (159) have optional investor redemptions; and 8% (28) have optional company redemptions (Smith, 2005).

Liquidation rights grant VC firms seniority payoff in liquidation. Typically, VC firms receive a one-time (1X) liquidation preference, in which a VC firm's seniority extends to the original investment. For 98.37% of the time VC firms receive a 1X liquidation preference (Smith, 2005), while 19% of the time VC firms receive a 2X or greater liquidation preference

(Gompers et al., 2016). Previous research suggests that VC firms are inflexible on control rights and liquidation rights (Gompers et al., 2016; Kaplan & Strömberg, 2003, 2004).

Other potential exit-related rights include anti-dilution and drag-along provisions, which give VC firms more bargaining power and enable them to force an exit without the agreement of minority shareholders. VC firms can also use protection provisions to prevent entrepreneurs from selling startups, especially at the early stage of their funds. Protective provisions contain veto rights, co-sale rights and a right of first refusal (Chemla, Habib, & Ljungqvist, 2007; Cumming, 2008).⁹

In sum, previous research on venture capital demonstrates that exit is a key element of the VC firm's investment. The concern for fund termination increases significantly as time passes, and affects the VC firm's desire for an exit event. VC firms can use contractual rights (e.g., control rights, liquidation rights, etc.) both to prevent early exit or force exit at the end of their fund. In the absence of an exit, these contractual rights can lead to a secondary sale or company buyback, in which only the VC fund exits, and is typically paired with the raising a new round of capital. But VC firms "(almost) never possess a contractual right to liquidate the portfolio company" (Smith, 2005:347). These contractual rights are often used as threat points in negotiation (Cumming, 2008). The interviews suggested a consistent pattern in which these rights serve as leverage in a negotiation, though the execution of these rights is difficult. Moreover, these contractual rights are not universal in all VC investments. Actually, most of the VC investments do not contain these investor-friendly rights. As a result, the pursuit of an exit relies on important negotiations between the VC, the entrepreneurs, and other board members.

⁹ Co-sale rights allow minority shareholders to participate if the founders or the majority shareholder sells their shares. The right of first refusal allows shareholders to buy the majority shareholder's stock if they decide to sell to another investor. Co-sale rights are usually paired with the right of first refusal, which allow investors to keep control of the firm if they do not like the potential investor.

The uncertain entrepreneurial process and challenges in evaluating progress in research endeavors also contribute to the origin of differences in concerns about the time horizon. Abundant literature demonstrates that the structure of VC investments is designed to reduce information asymmetries between the VC firm and entrepreneurs (e.g., Cumming & MacIntosh, 2001; Gompers & Lerner, 1996; Hellmann, 1998; Kaplan & Strömberg, 2003; Sahlman, 1990; Trester, 1998). Although entrepreneurs are aware of the time limitation resulting from the lifespan of VC funds, many studies suggest that entrepreneurs typically underestimate the challenges and time needed to develop the business as well as overestimate the value of their startups and their chance of success to attract external funds (Camerer & Lovallo, 1999; Cooper, Woo, & Dunkelberg, 1988; Landier & Thesmar, 2009; Moskowitz & Vissing-Jørgensen, 2002; Pinfeld, 2001; Sahlman, 1990). Further, extensive research highlights the unpredictability of the entrepreneurial process, so that very few entrepreneurs commercialize what they initially plan to develop in the original time-frame (e.g., Aghion & Tirole, 1994; Gompers & Lerner, 2001; Hsu, 2008; Lerner, 2002; Tushman & Rosenkopf, 1992). Not surprisingly, VC firms report that fewer than 30% of the startups meet projections (Gompers et al., 2016).

Given the ambiguity in the development of both science and markets for science, entrepreneurs often need more time to execute the plan, which can extend their preferred exit time and lead to different exit preferences between venture capitalists and entrepreneurs. Previous studies suggest that VC firms have a greater incentive to cash out earlier than does management (Cumming, Fleming, & Schwienbacher, 2005). Entrepreneurs' longer time horizon is evidenced by research showing that more startups choose to stay private longer due to founders' increased control over exit decisions (Ewens & Farre-Mensa, 2018). Specifically, Ewens and Farre-Mensa (2018) found that the presence of redemption rights has declined

sharply and in 2016 stood at just 15%. Researchers found that entrepreneurs often demonstrate strong personal commitments to their new ventures, and treat startups as their “baby” (Cardon, Zietsma, Saporito, Matherne, & Davis, 2005). Entrepreneurs’ preference for late exits may be particularly true in medical device startups (Mitchell, 1994).

Taken together, the literature suggests that entrepreneurs are likely to prefer to avoid exit even when VC firms prefer to exit at the end of their funds. In some situations, the presence of multiple VC firms will lead to differences in pressure to exit for the different firms if their respective funds have different vintages. Both situations lead to time horizon differences. Although the exit pressure is high around fund termination, multiple factors limit a VC firm’s ability to force an exit, such as the decline of the use of redemption rights and the increasing variety of drag-along rights¹⁰. Even if VC firms have these contractual controls, these rights are not absolute and are often used as leverage in negotiation (Cumming & MacIntosh, 2001; Cummings & MacIntosh, 2003). All these findings point to the importance of the negotiation within the most powerful group in the startup—the board of directors—who can approve or block key transactions.

Resolution of Time Horizon Differences: The Influence of the Board of Directors

Time horizon differences reflect different preferences about exit. A crucial resource for the resolution of these different preferences is the board of directors. Smith (2005) shows that substantial control rights typically reside in a board of directors. He found that “the board of directors possesses almost absolute power to initiate exit” (Smith, 2005:338). Similarly, prior

¹⁰ Drag-along enables a majority shareholder to force recalcitrant companies to participate in an exit. However, the trigger point is often higher than 51% (Cummings & MacIntosh, 2003). Voters are usually preferred stock holders. An early stage VC firm’s share may change to common stock due to the lack of capital for follow-on rounds. Besides, the trigger can include additional restrictions, for example, a board approval.

research has indicated that exit is a joint decision between entrepreneurs and venture capitalists who sit on the board (Bouzaidi, 2015; Xu, 2004).

Not all VC firms who invest in a company gain board seats. The lead VC firms are generally more active and sit on boards, while others are more passive (Gorman & Sahlman, 1989). VC firms have the most influence on startups when they do hold board positions (Feld & Ramsinghani, 2013; Gabrielsson & Huse, 2002). Such seats are highly valued, which enables them to influence a wide variety of strategic decisions and the startups' ongoing strategies and innovation trajectories (Garg & Eisenhardt, 2017). The interviews indicated how board seats are necessary to affect the startup business. As one venture capitalist described, "*one reason that you want to sit on board is you can force the issue.*" Board seats are particularly important in startups, given the high level of risk and the information asymmetry between the investors and the founders. Healthcare VC firms rank board control provisions as the least flexible term (less able to be open to negotiation), as compared to VC firms in the IT sector (Gompers et al., 2016).

The VC firms form one component of a venture board, which also includes entrepreneurs and independent directors (Quinton, 2016). Boards are a venture's most important decision makers (Graebner & Eisenhardt, 2004). The dominant governance mode in startups is shared control, where all directors play an important role (Feld & Ramsinghani, 2013; Kaplan & Strömberg, 2003). Given the variety of perspectives on the board, board members have different levels of sensitivity to a VC fund's expiration date. The impact of the fund expiration on the form of exit is directly affected by board processes and the firm's resource profile near the time window of the fund expiration date.

The Emergence of Differences in Preference Across Time: The Impact on Low-valued Exit

Differences in exit preferences emerge from the differences in the type and form of commitments among different board members, which can directly lead to conflicting opinions about the timing and form of exit. The time, interaction, and performance theory enumerates three problems in the interaction process: temporal ambiguity, conflicting interests and requirements, and scarcity of temporal resources (McGrath, 1991). These problems were evident in the interviews and are supported by the extant literature.

Specifically, interpretations about time differ, either between entrepreneurs and VC firms or among multiple VC firms and increase in salience as the VC fund approaches and passes its termination date. Entrepreneurs may tend to target an exit in the relevant longer term even as the date approaches, while VC firms with strong exit pressure are likely to focus on short time planning and an exit in the shorter term. Directors with a longer time horizon consider more tactics (Das, 1991), while directors with a shorter time horizon are likely to act rather than to deliberate (Das, 1987; Thoms, 2004). Directors' temporal preferences serve as cognitive biases, which may lead them to ignore or discount valuable information from directors with different time perspectives. Time horizon differences also generate temporal ambiguities about startup schedules (McGrath, 1991). Such ambiguity causes gaps and conflicts among directions in planning, coordinating, and executing tasks (Waller et al., 2001). These conflicts decrease productivity, the level of morale, and the level of satisfaction (Jansen & Kristof-Brown, 2005; Jehn, Northcraft, & Neale, 1999; Jehn, 1997). The process loss resulting from poor coordination and motivational failures can significantly reduce the likelihood of a valuable exit. In addition, directors have to spend considerable time and effort on resolving temporal conflicts (McGrath, 1991; Mohammed & Nadkarni, 2011), which reduce the time available to grow the startups and look for valuable exit opportunities.

As the startup ages without an exit event, time horizon differences arise and the confidence of some directors (especially the venture capitalist with an expired fund) is shaken, which alters their interpretation of past performance, current value, and the best path to future. The long time term passed without an exit prompts directors to generate explanations for their lack of success. Directors' surface-level characteristics (e.g., functional background (technology development vs. marketing & finance) and management experience) offer a convenient justification for negative feedback (Mohammed & Harrison, 2013). Venture capitalists who experience a sense of time urgency may be viewed as demanding by other directors, while entrepreneurs may be viewed as lazy and undisciplined (Waller et al., 2001) by outside investors. Therefore, the underlying cause of the delayed exit may be misattributed and may go undetected. These misattributions can create false theories about the cooperation between VC firms and entrepreneurs, resulting in severe conflict and negative performance cycles (Kaplan & Orlikowski, 2013; Mohammed & Harrison, 2013; Van de Ven et al., 2000). Further, the challenges in addressing the current concerns and agreeing on future projections make startups more vulnerable to subsequent unforeseen problems (Gioia, Corley, & Fabbri, 2002). All these factors significantly increase the chance of bankruptcy or premature sale.

Previous research suggests that temporal differences may increase performance because temporal differences may focus on both proximal and distal goals (Mohammed & Harrison, 2013) and may lead to a thorough analysis of competing perspectives (Eisenhardt et al., 1997). To reap these benefits, strong temporal leadership is necessary (Mohammed & Nadkarni, 2011). Temporal leadership requires the guidance of activities related to scheduling, synchronizing, and allocating temporal resources (McGrath & Kelly, 1986; McGrath & Rotchford, 1983). A leader at the top of the team hierarchy, such as a CEO or board chair, might guide and control temporal

leadership activities. However, venture boards often lack formal structure and often do not appoint a board chairman (Garg & Furr, 2017) and, as a result, lack effective temporal leadership. Therefore, time horizon differences are less likely to have a positive impact on startups.

Additionally, prior research has shown that VC firms contribute to startups by providing capital, resources, knowledge, and endorsement benefits (Gompers & Lerner, 2004; Gulati & Higgins, 2003; Hellmann & Puri, 2002; Ozmel & Guler, 2015). However, pressures to retire an expiring fund reduces the VC firm's willingness to provide additional capital and make venture capitalists focus increased attention on a quick exit. Specifically, the VC firms with expired funds lack the capital to invest. The resultant tensions on the board and the challenge of reaching consensus about future plans can discourage other investors from committing more capital or resources. Gersick's (1994) ethnographic research indicates that a VC firm's support efforts are time-limited. The factional differences on the board also make the startup less attractive to new investors. In turn, the increasing threat of resource constraints can negatively affect exit outcomes.

Taken together, time horizon differences can lead to failures in creating and enforcing schedules, coordinating activities, as well as failures in properly planning and allocating temporal resources. These failures not only cause conflicts, misunderstandings, and tensions but also detract the directors from the startup operation, all of which adversely influence both the quality and the speed of the output (Mohammed & Harrison, 2013; Mohammed & Nadkarni, 2011). Also, startups may face higher resource constraints due to time horizon differences. Therefore, time horizon differences may significantly increase the chance of a low-valued exit. Therefore, I hypothesize,

H1: Time horizon differences increase the likelihood of low-valued exits.

Minimizing the Impact of Time Horizon Differences: the Role of the Board and Past Performance

Time horizon differences may create a crisis on the board. Some boards will manage the crisis more effectively than others. Both the characteristics of the decision makers and the decision context affect efficient management of time horizon differences. This study's remaining hypotheses consider the impact of board member backgrounds and the ventures' research success, and ask two specific questions: What types of directors exacerbate or alleviate the impact of time horizon differences? Moreover, is there any event in the startup's development process that can trigger a stronger effect of time horizon differences? The hypotheses related to time horizon differences management cover three types of directors: executives, VC directors, and independent directors, as well as to one of the most common events discussed on boards: achieving a credible milestone.

Investor-executives

Investor-executives are those who invest in the startup and also simultaneously play an important insider role such as cofounder or startup executive. Investor-executives are increasingly common in the medical device industry. For example, KKR and Aisling Capital created a medical device investment platform called Ajax Health. Ajax was an innovative way to fund and manage tech companies. Ajax provided both capital and senior management to portfolio firms. Investors restructured the top management team and held key executive positions in startups to help the startups build a value-added and capital-efficient business model. The dual identity of investor-executives may improve their ability to resolve time horizon conflicts. Investor-executives' dual identity guides the venture board's preference on scheduling,

coordinating, and allocating temporal resources as well as their willingness to help startups overcome resource constraints.

Specifically, many startups not only need capital but also lack operational expertise and guidance. Investor-executives are valuable because their insider/executive identity not only motivates investors to contribute their resources but also signals the close relationship between investors and entrepreneurs. Besides, investor-executives have a better understanding of startups so they are in a better position to negotiate with VC firms facing strong exit pressure. If investor-executives are the time-urgent venture capitalists, they might be more motivated to negotiate with limited partners to extend the fund. Therefore, investor-executives may reduce the impact of time horizon differences on a low-valued exit.

However, their investor identity may motivate investor-executives to take advantages of their executive positions and push for exits. Investors do not operate in a vacuum. They are embedded in various networks, including co-investors and limited partners, which can significantly affect their behavior. Social psychology literature shows that a common group membership provides an opportunity for a group to identify shared interests, develop normative expectations, and thus develop a group identity (e.g., Turner, 1987). When group members' personal incentives violate the collective interests of the group, the deviant behavior triggers social sanctions against the group members who violate the collective interest (Coleman, 1994; Gibbs, 1981). If investor-executives violate their investor identity, they may face a penalty in future collaboration with other investors. The opportunity cost of backing startups with time horizon differences is high because the investor-executives have and will have many investments in other startups. Therefore, investor-executives may coordinate in a way that prioritizes the preference of time-urgent venture capitalists. Moreover, investor-executives may be less willing

to make an additional investment in the startup and actively look for an exit opportunity. Other potential investors may interpret the failure to reinvest as a negative signal regardless of the real quality of the startups (Broughman & Fried, 2012; Cumming & Dai, 2013). The lack of capital will exacerbate the threat of resources constraints. The strong desire of exit, the threat of resource constraints, and the negative quality signal to the market strengthen the impact of time horizon differences on low-valued exits.

No research provides direct evidence for the likelihood of investor-executives' priority emphasis on either insider or investor identity. But the interviews highlighted that the investor-executives tend to have a shorter-term orientation than executives who are not investors, which suggest a higher chance of following the investor identity. Therefore, I hypothesize,

H2: A higher number of investor-executives strengthens the impact of time horizon differences on the likelihood of low-valued exits.

Prior fund management experience of time-urgent venture capitalists

Time-urgent venture capitalists are those whose fund is older than ten years, and who face strong pressure for repayment. The urgency of fund expiration is the driver of the impact of time horizon differences across the board. Although time-urgent venture capitalists are eager to exit, their past experience with fund management affects their attitude and behavior (Gompers, 1996; Gompers & Lerner, 2001; Neus & Walz, 2005; Sørensen, 2007; Tian & Wang, 2014), their bargaining power with entrepreneurs (Bengtsson & Sensoy, 2011; Cummings & MacIntosh, 2003), and their ability in helping startups exit (Hochberg et al., 2007; Lerner, 1994; Nahata, 2008; Sørensen, 2007). These three factors directly influence the difficulty of managing time horizon differences and achieving better exit outcomes.

Specifically, experienced VC firms may have sufficient capital supply (Gompers & Lerner, 2001), while inexperienced venture capitalists face more pressure to exit on time because they have to signal their quality to potential investors in follow-on funds (Gompers & Lerner, 1999). Inexperienced venture capitalists are less likely to deviate from their original investment plan (Cumming, Fleming, & Schwienbacher, 2009). When facing time horizon differences, inexperienced time-urgent venture capitalists may have a strong desire to exit¹¹ and be less willing to negotiate with entrepreneurs, which lessens the chance of resolving time horizon differences. Research has documented the “grandstanding” phenomenon¹² where inexperienced venture capitalists hope to develop a reputation by rushing startups to the IPO market (Gompers, 1996; Lee & Wahal, 2004). Tian and Wang (2014) found that less experienced venture capitalists were likely to be less failure tolerant, and therefore, more likely to liquidate startups prematurely upon the initial unsatisfactory process.

However, experienced venture capitalists often take the entrepreneurs’ preference into consideration when choosing the fund’s exit strategy, even if this leads to a compromise about the form of exit (Cummings & MacIntosh, 2003). Experienced venture capitalists tend to have a broader network, which increases the chance of successful exits for their portfolio startups (Hochberg et al., 2007). When the quality of startups cannot be directly observed, external actors rely on startups’ affiliates as a signal of startups’ quality (Megginson & Weiss, 1991; Stuart et al., 1999). Abundant research has demonstrated that startups backed by experienced venture

¹¹ Investors often leave boards along the unilateral exit (i.e., secondary sale or company buyback). In this case, time horizon differences will not arise and instead focuses on firm exit (i.e., IPO, M&A, or bankruptcy).

¹² If an early exit because of “grandstanding” happens before the end of a VC’s fund, the exit may be low-valued. The startup may exit before fund termination. In this case, time horizon differences do not arise. However, if such an early exit does not happen, inexperienced venture capitalists’ willingness to develop and protect reputation and their desire for exit are still strong at the later stage of their fund. This discussion focuses on the period when time horizon differences have emerged and how VCs’ experience affects time horizon differences management. The analysis controls the experience of VCs.

capitalists are more likely to exit successfully (e.g., Lerner, 1994; Nahata, 2008; Sørensen, 2007).

In sum, previous research suggests that the experience of time-urgent venture capitalists can significantly affect the management of time horizon differences because venture capitalists tend to be supportive and tolerant. Such experience can also lead to a stronger ability and broader network, which can help startups exit successfully more quickly. Therefore, I hypothesize:

H3: Time-urgent venture capitalists' experience alleviates the impact of time horizon differences on low-valued exits.

Serial entrepreneurs as independent directors

Serial-entrepreneurs who are independent directors have founded multiple startups. Due to their identity as independent directors and as experienced entrepreneurial founders, these board members play an important role in addressing time horizon differences.

Independent directors are impartial and objective because they do not represent specific investors or entrepreneurs (Bagley & Dauchy, 2008). Independent directors can bring balance to a board and are crucial to conflict resolution (Feld & Ramsinghani, 2013). Kaplan and Strömberg (2003) indicate that board control is typically shared—more than 60% of the time—with an independent director holding the tie-breaking vote in the VC-backed companies. Therefore, when time horizon differences arise, independent directors may facilitate coordination between entrepreneurs and venture capitalists, which may alleviate the impact of time horizon differences.

Serial entrepreneurs are experienced entrepreneurs able to develop strong human capital, accumulate social ties, and have a track record which outsiders can use to infer their quality. Affiliated experienced entrepreneurs can serve as an important signal of startup quality (Spence, 1974). Hence, experienced entrepreneurs are a valuable resource for startups, as they can provide

business development advice, facilitate access to financial resources, and reduce the reliance on a VC firm's value-added services (e.g., identifying strategic alliance partners and locating follow-on capital) (Hsu, 2007; Shane & Stuart, 2002). Moreover, valuations of early-stage startups are often negotiated rather than calculated (Hsu, 2004). Experienced entrepreneurs are in a better bargaining position to negotiate startup valuation, and startups supported by experienced entrepreneurs tend to have a higher valuation (Hsu, 2007). Therefore, experienced entrepreneurs may efficiently help the startup reduce the threat of resource constraints. Additionally, experienced entrepreneurs are more likely to observe or experience time horizon differences, thus gaining knowledge and experience in time horizon differences management.

Taken together, serial-entrepreneur independent directors not only facilitate time horizon differences management but also help overcome resources constraints, thus alleviating the impact of time horizon differences on low-valued exits. Therefore, I hypothesize:

H4: A higher number of serial-entrepreneur independent directors alleviates the impact of time horizon differences on low-valued exits.

The attainment of a milestone

Board context can also affect the pattern of response when time horizon differences emerge. Directors regularly meet to review past performance, engage in strategic deliberation, and approve strategic plans. One dynamic signaling event for a venture board is the accomplishment of a credible milestone. Milestones represent short-term goals, and the collection of milestones indicates the progress of the startup in its pursuit of its targeted long-term goal (e.g., IPO). Examples of milestones include a crucial hire, a patent approval, a product launch, attracting a certain number of customers, first revenues, first profit, etc. Completing a milestone stimulates project reevaluation, reduces information asymmetry and increases

investors' confidence (Giot & Schwienbacher, 2007; Gompers, 1995). Hence, achieving a milestone affects both the likelihood of raising additional capital and the chance of an exit (Sahlman, 1990).

In surgical device startups, patent approvals are a common milestone which is both credible and visible (Pahnke et al., 2015). Researchers have found that having more patents increases the startups' chance of obtaining VC funding (Engel & Keilbach, 2007; Mann & Sager, 2007), the chance of receiving venture debt via patent collateral (Hochberg et al., 2018), receiving higher valuations (Hsu & Ziedonis, 2013), and having a successful exit (Cockburn & MacGarvie, 2009). When a startup experiences time horizon differences, patent approvals can motivate financing and exit discussions. If an additional outside round is available and outside investors are willing to buy out the time-urgent VC funds, time-urgent venture capitalists leave the startup and time horizon differences are resolved.

However, if this ideal situation does not happen, time-urgent venture capitalists remain on the board and the crisis of time horizon differences persists. Time-urgent VC firms tend to look for an exit actively. The pressure reduces time-urgent venture capitalists' willingness to negotiate, which can significantly impair the resolution of time horizon differences. Further, time-urgent venture capitalists' strong exit desire may create a negative signal of the startups' quality (Broughman & Fried, 2012; Cumming & Dai, 2013), which makes raising external fund more difficult thus increasing the threat of resource constraints. Therefore, patent approvals in surgical device startups may exacerbate the impact of time horizon differences on low-valued exits.

H5: Patent approvals strengthens the impact of time horizon differences on low-valued exits.

The next chapter details the collection of data and the research design. The following chapter discusses the results of the statistical analysis.

CHAPTER 6. DATA AND METHODS

I tested the hypotheses with a unique, hand-collected sample of VC-backed U.S. surgical device startups. The dataset is based on a list of VC-backed U.S. surgical device firms founded from 1986 to 2014 in PitchBook (accessed in April 2017) that provides data on board composition and has the best quality in terms of coverage and completeness when compared to such sources as CB Insights and CrunchBase. However, the PitchBook board data are incomplete. For a majority of firms, data was missing on insiders and independent directors. Two assistants conducted deep online search and collected the complete board composition data from the Securities and Exchange Commission (SEC) filings (Form D and S-1), company websites, LinkedIn, and news announcements. I manually checked all the data for each startup to confirm that the data reflected the right composition and included the accurate dates when directors started and left. I also collected startups' former firm names, if any, and the names of VC firms and VC funds from SEC filings, which facilitated the collection of fund data. I excluded firms with no boards, no disclosed board data, and no venture capitalists on boards of directors. The final sample included 220 startups founded from 1989 to 2014 and 1,898 directors. For each startup, I tracked their board composition from the time of the first venture capitalist joining the board to the first firm exit event through 2017. The final sample has 1,899 board-years and 11,018 director-years from 1991 to 2017.

In Step 2, for each identified director, I first downloaded biographical and personal data from PitchBook and CrunchBase. Two assistants collected and corrected personal characteristics that include directors' roles (management, independent, or investor), entrepreneurial experiences,

investing experience, and primary title. Based on their results, I manually checked all the director data. The checking included reading people's bios in multiple sources (e.g., PitchBook, CrunchBase, Bloomberg, Equilar, 4 Traders, and Corporation wiki) as well as checking people's profiles on LinkedIn and Relationship Science. Given the breadth of data sources, the last round of checks took more than 1,000 hours. This careful check also further verified data gathered about board composition and the directors' tenure in Step 1.

Steps 1 and 2 identified 976 investors on boards of directors; 866 of them were traditional venture capitalists, while the remaining 110 were investors without a fixed-life fund, such as representatives of corporate venture capital firms, evergreen funds, and family offices. I matched the deal information and venture capital firm data from PitchBook and VentureXpert. For traditional VC firms with a closed-end fund, the fund vintage data were primarily collected from PitchBook, VentureXpert, and SEC filings (Form D). Missing items of information were carefully and thoroughly searched online by myself and another assistant. The sources included, but were not limited to, the VC firm's website, Palico.com, PSEPS, Privatefunddata.com, and Massinvestor.com.

Step 1 identified a complete list of startup names, including the former names if any. Lastly, patent data, FDA approvals, and SBIR/STTR¹³ funding were collected from PATSTAT¹⁴, FDA premarket approval databases, and SBIR/STTR API, respectively, using firm names.

¹³ SBIR stands for the Small Business Innovation Research program, which is a competitive awards-based program to enable small businesses to explore their technological and commercialization potential. STTR stands for the Small Business Technology Transfer. The STTR program is similar to the SBIR program, but requires the small business to formally collaborate with a research institution.

¹⁴ PATSTAT is EPO Worldwide Patent Statistical Database.

Dependent Variable: Low-Valued Exits

The dependent variable is an event indicator—low-valued exits. Low-valued exits include bankruptcies and low-valued M&As. The low-valued M&As have been described as “hidden failures” (Puri & Zarutskie, 2012). Following previous research (e.g., Chakraborty & Ewens, 2018; Sahlman, 2010), I defined low-valued M&A exits by deal value. If an M&A value is lower than either the total amount raised or the latest valuation, it joined the category of low-valued exits. For example, Eleme Medical had a low-valued exit because the selling price was \$2.47 million, while it raised a total of \$48.13 million and the latest valuation before the exit event was \$48.35 million. There is no doubt that this exit was a failure for both the entrepreneurs and the investors. The other types of exits included an IPO or an M&A that exceeded historical costs, which varied on their level of success and their returns to early and late investors. Investors buy venture stocks at different times and at different prices, so the evaluation of success was based on the initial price paid by the investor. With its focus on low-valued M&A exits and bankruptcies, this study identified the obstacles that startups face in their development process, and how firm boards affect the impact of the obstacles.

Among the 220 startups in the sample, I studied 100 exits through 2017. Fourteen startups were acquired for an undisclosed amount. I evaluated the remaining exit outcomes based on their valuation records, past fundraising performance, and tone of the news reports. For example, Medtronic acquired Intact Medical quietly in August 2016. Intact Medical was valued at more than \$70 million in May 2006. However, the valuation dropped to about \$20 million in 2008. The latest valuation was about \$23 million in November 2013. Intact Medical raised another \$0.75 million in September 2015, the last round before the exit and the smallest round in its history, which may signal difficulty in getting additional funds. Before the exit event, Intact Medical raised a total of \$65.65 million. Considering the significant drop in valuation and the

potential difficulty in raising more funds, I treat the exit as a low-valued exit. In the final sample, I observed 40 low-valued exits during my study period, including 18 bankruptcies and 22 low-valued M&A exits.

Independent Variable: Time Horizon Differences

The primary independent variable is a measure of time horizon differences. The measure is developed based on the fixed life of VC funds. VC funds typically have ten years. This is the clearest demarcation point for a test of the impact of differences in time horizons across the board members. VC firms may negotiate a fund extension with limited partners, but it is true that a VC funds' exit pressure increases as the fund ages.

Time horizon differences, at the board level, reflect directors' different time pressure. So I first calculated the time pressure faced by each director. For the traditional VC firm with a closed-end fund, I used the following formula,

$$TP_{vc} = a_{vc} - 10$$

where TP_{vc} is a VC director's time pressure; and a_{vc} is that VC's fund age. Time pressure was coded as fund age minus ten because typically a fund has ten years. A negative time pressure indicates that the VC fund has not expired. Time pressure turns positive when a fund is over ten years old. A larger value indicates a stronger pressure. If a VC firm invested in the same startup from multiple funds, the age of the most recent founded fund is used, as the later investment from the new fund reflects venture capitalists updated expectation and acceptance that the startup needs more time. Such cases are rare because the limited partners for different funds are often different. Thus, investments in the same startup from different funds can lead to a "conflicted general partner," as one venture capitalist described, since the buying prices are different for the limited partners of different funds, which can damage the relationship between general partners

and limited partners. The focus on board level analysis captures situations in which a VC director leaves the board, either pushed out or bought out via secondary deal or company buyback.

Venture capitalists without board seats have limited impact on startup decisions, although they may still hold stock.

For the non-VC directors (entrepreneurs, independent directors, and investors without a closed-end fund), time pressure was calculated using the following formula,

$$TP_{nvc} = \begin{cases} TP_{lvc} & \text{if } TP_{lvc} < 0 \\ 0 & \text{if } TP_{lvc} \geq 0 \end{cases}$$

where TP_{nvc} is a non-VC director's time pressure; and TP_{lvc} is the latest VC's time pressure.

The field study and the literature support that entrepreneurs, independent directors, and investors without a closed-end fund tend to have a long-term orientation. If the latest VC fund has not expired, the deal aligned the venture capitalist with other directors who did not face fund termination pressure. If all VC funds were expired, all venture capitalists had a strong and positive time pressure. The time pressures of entrepreneurs, independent directors, and investors without a closed-end fund were set as zero, which is equivalent to the state when a VC fund's age is 10. This indicated the time pressure faced by entrepreneurs, independent directors, and investors without a closed-end fund. It reflected the point at which they need to think about the VC firm's serious need to retire the expiring fund, even though the pressure to terminate the startup venture was not as strong as that faced by the venture capitalists who had a hard deadline set by limited partners.

Time horizon differences indicated the extent of difference across the board was based on each directors' time pressure. Following previous research on temporal differences and temporal diversity (e.g., Mohammed & Harrison, 2013; Mohammed & Nadkarni, 2011), time horizon

differences were calculated as the standard deviation of each director's time pressure¹⁵. Also, following previous research (e.g., Robinson & Sensoy, 2013), the fund's expected life was assumed to be ten years. If at least one VC firm has an expired fund (older or equal to 10 years old), exit pressure increased, and affected board dynamics. When there were no VC firms with expired funds, the time horizon differences might be less material, so that time horizon differences were coded as zero. Thus, the measure focused on the heterogeneity of time pressures on the board at the point of expiration of the first VC's fund. Specifically, time horizon differences were calculated using the following formula,

$$THD = \begin{cases} \sqrt{\frac{\sum_{i=1}^n (TP_i - \overline{TP})^2}{n}} & \text{if } \exists TP_i \geq 0 \\ 0 & \text{if } \forall TP_i < 0 \end{cases}$$

where *THD* is the time horizon differences on a startup board; *i* represents each director (including VC directors and non-VC directors); *TP_i* is the time pressure each director faces; \overline{TP} is the mean time pressure of all directors; and *n* represents the total number of directors on board.

In the sample, 67.7% of the startups (149 out of 220) experienced time horizon differences. Figure 3 indicates the distribution of time horizon differences. There are no obvious outliers. Although time horizon differences are more likely to happen at a late stage, they can occur in young startups. Figure 4 is a scatter plot of firm age and time horizon differences.

¹⁵ Time horizon differences are fundamentally a type of group diversity in terms of time pressure faced by each director. Specifically, time horizon differences represent separation diversity (Harrison & Klein, 2007). According to Harrison and Klein (2007: 1203), separation diversity means "composition of differences in (lateral) position or opinion among unit members, primarily of value, belief, or attitude." Standard deviation is a viable measure of separation diversity (Harrison & Klein, 2007). Technically, time horizon differences also reflect the board dynamics between time-urgent directors and non-time-urgent directors, which can be measured by subgroup analysis. However, time-urgency is not a fixed attribute, namely, a director can be non-time-urgent in early years but become time-urgent once the fund is expired. Extant literature on subgroup analysis or faultline analysis has not incorporated dynamic characteristics. Besides, faultline analysis simultaneously considers multiple characteristics of directors (Lau & Murnighan, 1998), which may obscure the impact of time attribute. Therefore, standard deviation is the most appropriate measure in this study.

Figure 4 shows that time horizon differences are not a phenomenon specific to a firm's age group, although most startups experience time horizon differences after five years.

Moderators and Control Variables

Investor-executives capture the number of investors on boards who are also startup executives or cofounders. Twenty-two percent (48 out of 220 firms) of the sample had investor-executives. The experience of time-urgent VC firms (that is, those that held expiring funds) was measured by the number of funds that the time-urgent VC firms had raised (Barrot, 2017). It would equal zero if a startup did not have time-urgent venture capitalists. I measured the number of independent directors who are serial entrepreneurs, that is someone who had founded more than one startup. In this sample, 25% (55/220 firms) had serial-entrepreneur independent directors.

Many surgical device startups do not have a market-ready product at the time of exit, and obtaining a patent is an important milestone indicating potential market success (Mann & Sager, 2007; Pahnke et al., 2015). I measured the amount of milestone progress based on the number of patent applications that were subsequently granted to a startup in a given year.

I included several controls to account for factors previously demonstrated to affect exit outcomes. First, I controlled for board composition, which includes the proportion of investors, the proportion of independent directors, and board size. Startup boards make exit decisions so that the composition of these boards directly affects the outcome (Garg & Furr, 2017).

Startups' survival often depends on sustained access to the capital market (Cassar, 2004; Davila, Foster, & Gupta, 2003). I included a set of controls representing different capital sources. Specifically, I controlled the age of the youngest VC firm (that had the most recently founded fund). VC firms reserve capital for a client firm for follow-on investments (Guler, 2007) so that

the age of the most recent fund affects the likelihood of raising additional money from the incumbent investors. I also controlled the amount of the grant awarded by SBIR/STTR. SBIR/STTR are U.S. government programs that provide funds to small businesses that conduct research and development. Startup companies that are not majority owned by a single VC firm are eligible, although the competition is fierce. In addition to controlling the experience of time-urgent venture capitalists, I included the experience of non-time-urgent venture capitalists (similarly measured by the number of funds raised) to control for the likelihood that non-time-urgent VC firms help the startup raise additional funds. I used a dummy variable to control whether independent directors had investing experience. I also included a dummy variable to control whether the board had patient investors who did not have a strict exit deadline (corporate venture capital divisions, family offices, and evergreen funds). Their long time horizon, high tolerance of risk, and network connections might help the startup attract capital and thereby prevent fire sales.

Surgical device startups typically do not have revenue and the quality of startups is reflected by milestone performance (Pahnke et al., 2015). In addition to the number of patents, I controlled the number of FDA pre-market approvals. Some startups bootstrap and grow organically to avoid undervalued deals (Ebben & Johnson, 2006). I controlled the firm age, which also signals startups' quality by reflecting the startups' accumulated capability in shielding against risks.

Startups with founders on boards may be less likely to accept low-valued exits for two reasons. First, founders tend to be overoptimistic (Camerer & Lovo, 1999; Lowe & Ziedonis, 2006) and have a strong psychological attachment to the startups (Gimeno, Folta, Cooper, & Woo, 1997; Hoang & Gimeno, 2010). Second, founders hold common shares that are paid with

the proceeds left after all preferred shareholders are fully paid so that a founder's return from a low-valued exit is low or zero. I controlled whether the founders are on boards (dummy variable). Venture capitalists who are serial entrepreneurs and may have more empathy, so I controlled the number of traditional venture capitalists who are serial entrepreneurs. Lastly, I controlled for market conditions and startup geographic location. Specifically, market condition was measured by the number of annual IPOs (data were collected from Jay Ritter's website) (Giot & Schwienbacher, 2007). Two geographical location dummy variables were created to represent startups in the West (California) and the Northeast (Massachusetts, New York, and Pennsylvania).

Econometric Models

I used competing risk models (Fine & Gray, 1999), which allow for a joint analysis of exit type and exit timing as well as their dynamic interplay. Specifically, competing risk models consider multiple types of exits. In the model, the competing events are the other 60 exits, including IPOs and M&As with a value above investment cost. Competing risk models use a generalized gamma density distribution, which allows non-monotonic increasing or decreasing hazard functions (Lee & Wang, 2003). In contrast to OLS estimations, duration models explicitly consider the information provided in the right-censored cases (startup exits have not occurred). Further, a competing risk model provides a more accurate estimation compared to binary hazard models (e.g., Cox model), and has been applied in previous research that investigated exit outcomes (e.g., Giot & Schwienbacher, 2007). The robust cluster estimators are reported.

CHAPTER 7. RESULTS

Descriptive statistics and correlations are reported in Table 4. The independent variable, time horizon differences, is not highly correlated with other variables. Because competing risk models do not allow for variance inflation factors (VIF), I used a linear model to assess VIF. The mean VIF for a linear model was 1.50 with a maximum of 2.67. These numbers are well below the maximum acceptable threshold of 5, where multicollinearity may cause problems. The mean time horizon difference was 0.81, which included the firm-years in which there were no time horizon differences. Among the firm-years with time horizon differences, the mean was 2.56 (S.D. =1.33), and the maximum is 6.34. The descriptive statistic also revealed that the mean board size was 5.8. Investors held a majority of the board seats (54%).

Table 5 reports the estimated coefficients of the competing risk models. Model 1 included all the control variables. Models 2-6 examined Hypotheses 1-5. Model 7 is a robustness check model that contained all interactions. It was difficult to interpret the coefficients as a conditional effect to evaluate the hypotheses in Model 7. Hence, I referred to the partial models to discuss conditional effects and then to the full model as a robustness check. The differences between partial models and full model are discussed.

I found support for Hypothesis 1, which proposed that time horizon differences increase the probability of low-valued exits. The coefficient of time horizon differences in Model 2 was positive and significant. Figure 5 illustrates the impact of time horizon differences at multiple time horizon differences quantiles across time. Regardless of the extent of time horizon differences, the impact of time horizon differences on low-valued exits increased over time. The

level of the increase became larger as time horizon differences grew. Where there were no time horizon differences from a board that had its first venture capitalist member through year ten, the risk of low-valued exits was 0.034. The corresponding probabilities of low-valued exits at the median and upper quartile of time horizon differences were 0.084 and 0.116, respectively, which represent a 148% increase $((0.084-0.034)/0.034)$ and a 241% increase $((0.116-0.034)/0.034)$. On average, startups exited eight years after the first VC board members invested (mean=8.17, median=8). Figure 6 plots the cumulative incidence of low-valued exits at different levels of time horizon differences by year eight. The cumulative incidence of low-valued exits grew from 0.03 to 0.24 when time horizon differences changed from zero to six.

The positive and significant interaction term in Model 3 supported Hypothesis 2, which speculated that investor-executives tend to follow their investor identity and push for low-valued exits when the board experiences strong time horizon differences, thus strengthening the impact of time horizon differences. Figure 7 plots the impact of time horizon differences for two situations: no investor-executives vs. one investor-executive at the average exit year. The figure demonstrates that having an investor-executive dramatically increased the risk of low-valued exits, and the impact became stronger as time horizon differences increased. When there were no investor-executives, the risk of low-valued exits increased from 0.03 to 0.12 as time horizon differences increased from 0 to 6; but when there was one investor-executive, the corresponding risk of low-valued exits increased from 0.02 to 0.73. Therefore, having investor-executives significantly exaggerated the impact of time horizon differences on low-valued exits.

Hypothesis 3 predicted that the experience of time-urgent venture capitalists negatively moderated the relationship between time horizon differences and low-valued exits. The results in Model 4 supported this hypothesis. To better interpret the results, I plotted the interaction effect

in Figure 6 at the average exit year and at two experience levels of time-urgent venture capitalists: experience with one fund vs. the average. As shown in Figure 8, if time horizon differences were stronger than 1.5 (representing 74% (111/149) of the startups who experience time horizon differences), having a less experienced time-urgent venture capitalist further increased the risk of low-valued exits. When faced with strong time horizon differences (i.e. THD=6), the probability of low-valued exits was 0.17 if there was an average experienced time-urgent venture capitalist; while the probability of low-valued exits was 0.38 if there was a little experienced time-urgent venture capitalist, which represents a 55% decrease $((0.38-0.17)/0.38)$. Hence, the experience of time-urgent venture capitalists alleviated the impact of time horizon differences on low-valued exits.

Hypothesis 4 suggested that independent directors who were serial entrepreneurs alleviated the impact of time horizon differences on low-valued exits. The coefficient of the interaction term was negative and significant in Model 5, which supported Hypothesis 4. Similarly, Figure 9 plotted the predicted impact of time horizon differences for two situations: no serial-entrepreneur independent director vs. one serial-entrepreneurial director at the average exit year. Figure 9 reports an ascending impact of time horizon differences when there were no serial-entrepreneur independent directors, while there was a diminishing impact of time horizon differences when there was one serial entrepreneur. Having a serial-entrepreneur independent director significantly reduced the risk of low-valued exits even when time horizon differences were strong. For example, when time horizon differences were six, the probability of low-valued exits when having a serial-entrepreneur independent director was 0.003; while the corresponding probability was 0.31 when having no serial-entrepreneur independent directors. Therefore,

independent directors who are serial entrepreneurs can significantly reduce the impact of time horizon differences on low-valued exits.

Lastly, the results in Model 6 supported Hypothesis 5, which predicted the moderating impact of passing a milestone. In the surgical device context, a common milestone is winning patent approvals. The coefficient of the interaction term was positive and significant. The first order effect, reflected by the coefficient of the number of patents, was negative and significant. The combination of the first order effect and the second order effect indicated that having a patent can greatly reduce the chance of low-valued exits; however, as time horizon differences rose, having a patent significantly increased the risk of low-valued exits. Figure 10 plots the predicted impact of time horizon differences on the cumulative incidence of low-valued exits at different levels of patent success (0 and 1) at the average exit year. The probability of low-valued exits increased as time horizon differences rose at both patent levels. However, the extent of the increase was much greater if the startup had one patent. Two lines intersect when time horizon differences were around 3.7. When time horizon differences were greater than 3.7, the risk of low-valued exits if a startup had one patent was higher than the risk of low-valued exits if a startup had no patents. Among the startups experience time horizon differences in the sample, 23% (35/149), faced time horizon differences greater than 3.7. When time horizon differences were high (e.g., equal 6), the probability of low-valued exits is 0.78 if a startup had one patent, while the probability of low-valued exits was 0.43 if a startup had no patents, which represented an 83% increase $((0.78-0.43)/0.43)$. Thus, the impact of time horizon differences on the chance of low-valued exits was stronger when a startup gets more patent approvals.

The results of the full model that contained all interactions (Model 7, Table 5) were qualitatively consistent. The magnitudes of the coefficients of the key variables were similar to

the individual models. The interaction term with investor-executives and the interaction term with the experience of time-urgent venture capitalists became marginally significant in the full Model 7. This may be due to the inclusion of the interactions of time horizon differences with several other variables. Overall, the full model results supported the hypotheses.

Among the controls, I found three variables that significantly affected the chance of low-valued exits. Specifically, having a higher proportion of investors on boards, firm age, and raising the most recent investment in an older VC fund led to a higher probability of low-valued exits. All these were consistent with the reasoning in the control variable section, except for the firm age. The initial inference was that older firms might have a stronger bootstrapping ability, which can decrease the chance of low-valued exits. The unexpected opposite finding may be based on the possible difference in the power gap between venture capitalists and founders. Older startups may develop a stronger organizational culture under the leadership of founders. Founders are more confident about their judgment and ability, which can impede the negotiation process and stimulate conflict between venture capitalists and founders when VC firms hold differing perspectives, thus increasing the chance of low-valued exits. This explanation is consistent with venture board literature that shows venture directors tend to have conflicting interests, such as the enhancement of their own status (Garg, 2013).

Supplementary Analyses

I conducted additional analyses to address potential endogeneity concerns due to omitted variables and sample selection bias. First, to examine whether the impact of time horizon differences on low-valued exits is attributed to omitted variables, I calculated the impact threshold of a confounding variable (ITCV) (Frank, Maroulis, Duong, & Kelcey, 2013), which had been applied in prior strategy research (Hubbard, Christensen, & Graffin, 2017; Oliver,

Krause, Busenbark, & Kalm, 2017). The ITCV was 0.025, which implies that an omitted confounding variable would have to be correlated at 0.16 ($=\sqrt{0.025}$) with low-valued exits and at 0.16 with time horizon differences to overturn the results. According to Table 4, it would take an omitted confounding variable with an impact nearly as large as the strongest variable in the model to overturn the results. Also, the ITCV indicated that the relationship between time horizon differences and low-valued exits would be statistically insignificant only if replacing 34.88% of the observations that were randomly drawn from the sample with the effect of zero. These results suggest that the findings are not likely driven by an omitted variable.

Second, the model may be affected by the sample selection bias. Time horizon differences apply only to VC-funded ventures. Only VC-backed firms are affected by this form of time horizon conflict. Accordingly, I ran two-stage Heckman probit models to account for this selection bias. I estimated the likelihood of a match between a VC firm and a startup using probit regression in the first stage. Following previous studies (Ozmel & Guler, 2015; Sørensen, 2007), the sample in the first stage included all possible pairs between VC firms and startups (both realized and unrealized, a total of 38,759 observations). The dependent variable was a dummy variable, which equaled 1 if a realized pair occurred, meaning that a VC firm invested in a startup in its first investment round. Previous research used the availability of VC firms in the local geographic market as exclusion restriction¹⁶ to address the nonrandom match between VC firms and startups (e.g., Hellmann, Lindsey, & Puri, 2008; Ozmel & Guler, 2015). The distribution of the VC firms in the market is exogenous, and the availability of VC firms in a market influences the chance of being backed by venture capitalists (Sorenson & Stuart, 2008).

¹⁶ “Exclusion restrictions are exogenous variables that predict whether or not an observation appears in a sample” (Certo et al., 2016:2649). Exclusion restrictions are conceptually similar to instruments, but they are different in two ways (see Certo et al. (2016) for detailed explanation). Heckman two-stage models require exclusion restrictions in the first stage.

Hence, I chose the number of VC firms in a state as the exclusion restriction. I also included several control variables that might affect the chance of raising money from venture capitalists: the number of patents, the number of FDA pre-market approvals, SBIR/STTR funding, firm age, board size, whether founders are on board, market conditions, and region dummies. The correlation between the independent variable, time horizon differences, and the inverse Mills ratio was 0.02. The low correlation indicates that the selected exclusion restriction was good (e.g., Bushway, Johnson, & Slocum, 2007). Also, lambda (the coefficient of the inverse Mills ratio) was not significant in any of the second-stage models, which suggests that the results did not suffer from sample-induced endogeneity (Certo, Busenbark, Woo, & Semadeni, 2016). Finally, the results of Heckman two-stage models reported in Table 6 were qualitatively consistent with the results of competing risk models.

The next chapter will discuss the theoretical and practical implications of this research.

CHAPTER 8. DISCUSSION AND CONCLUSION

This study aimed to provide a better understanding of an important phenomenon in VC-backed startups that directly affects startups' growth and survival: time horizon differences due to a VC funds' finite lifetime. By tracking startups from the formal board inception through the first firm exit event and using both a field study and a systematic quantitative test on surgical device startups, this study describes why time pressures arise, how time pressures create conflicts that affect board dynamics and exit outcomes, and most importantly, how startups might manage through this sensitive period. In this chapter, I will summarize the contributions and implications of this dissertation and discuss its limitations and avenues for future research.

Theoretical Contributions

This dissertation reviewed literature on entrepreneurship, venture capital, corporate governance, and time perception and attempts to contribute to these fields.

First, the characteristics and dynamics of failed startups are a rarely studied aspect of VC-funded entrepreneurial startups (Bouzaidi, 2015; Puri & Zarutskie, 2012). In a thorough review article on venture capital research, Da Rin, Hellmann, and Puri (2011:46) comment “(y)et by far the biggest knowledge gap concerns the reasons for, timing of, and dynamics around company failures. There is relatively little information about failure.” The main work about failure was a study by Puri and Zarutskie (2012). They found that VC-backed startups were less likely to fail, and the failure rate differences between VC and non-VC-backed startups was largely driven by the selection effect. They did not comparatively study VC-backed successes and VC-backed failures.

Moreover, researchers do pay intensive attention to factors leading to investment termination or exit outcomes from the venture capitalist perspective (e.g., Cumming & MacIntosh, 2001; Gompers, 1995; Guler, 2007; Ozmel & Guler, 2015). The focus on VC firms or VC-venture pairs does not fully capture how startups make decisions. Therefore, our knowledge about startup failures is still limited. This study identified an important factor that leads to startup failure—time horizon differences that can lead to conflicts due to expiration limits on VC funds. This dissertation’s field study and systemic quantitative analysis provide insights into the reasons for and the dynamics around time pressure differences as well as their impact on low-valued exits. The results show that 68% of the sample experienced time horizon differences due to VC funds’ fixed lifetimes. For the sample studied, an average level of time horizon differences increased the probabilities of low-valued exits by 48%.

Second, the issue of the VC funds’ fixed time horizon has attracted more attention in recent literature (Barrot, 2017; Kandel et al., 2011; Masulis & Nahata, 2011). This research has demonstrated that older funds are more likely to abandon a good project (Kandel, Leshchinskii, & Yuklea, 2011), sell companies cheaper (Masulis & Nahata, 2011), and invest in less innovative firms (Barrot, 2017). As these limited fund life can lead to unintended consequences (Ewens & Strebulaev, 2016), more research is needed to understand how a limited fund life affects a startup business from the perspectives of both the VC firm and the founder. However, the level of analysis has been restricted, until now, to the fund. The fund level analysis does not consider the startup decision context or differentiate between lead venture capitalists and follow-on venture capitalists.

A similar limitation is also reflected in other VC research, such as the impact of VC firms on innovation (Dutta & Folta, 2016; Kortum & Lerner, 2000, 2001; Pahnke et al., 2015), R&D

and commercialization (Hsu, 2006), strategic alliances (Burt, 2009; Lindsey, 2008), venture performance (Baum & Silverman, 2004), startup exits (Cumming & MacIntosh, 2001; Giot & Schwienbacher, 2007; Gompers, 1995), financing (Guler, 2007), and legitimacy (Chen et al., 2008; Stuart et al., 1999). These studies lack insights into the board context and how startups with shared governance (that is, founders and investors on boards of directors) make decisions (Garg & Furr, 2017). The single focus on VC firms may provide a biased estimate of the impact of venture capitalists on startups. Researchers have called for more research to understand venture corporate governance and board decisions (e.g., exit outcomes) (e.g., Hsu, 2008).

The level of analysis in this study is the startup board of directors where exit decisions are made. The field study demonstrates that entrepreneurs and venture capitalists tend to have different opinions due to their different time orientation, which highlights the importance of the board level analysis. The negative impact of time horizon pressures on startups may not be surprising. An important question is how to manage time-related conflicts. My board level analysis further investigated the effects of director characteristics and the how the board's make-up affected board dynamics as the time pressures built, which provides a more nuanced explanation than a sole focus on fund level analysis.

Third, this study contributes to the corporate governance literature. The literature review indicated that there are substantial studies on public boards and boards around the IPO stage, but venture boards are significantly different in structure and impact compared to VC-backed businesses (Garg, 2013). Despite the wealth of research on startups, we still know little about venture boards (Garg, 2014). The lack of research on venture board is mainly due to data limitations. I overcame this limitation by creating a unique dataset that tracks each surgical

device startup since the embryonic stage of firm formation—when the first VC firm gains a board seat—to the first firm exit event through 2017.

Moreover, as Garg and Furr (2017) pointed out in their venture board review article, much of the venture board research is descriptive and cross-sectional, and the extant literature either treats boards as monoliths or emphasizes only the VC directors. One study was by Katila, Thatchenkery, Christensen, and Zenios (2017), who researched the impact of user board members (i.e., physicians) on startup innovation.

This current study joins a growing body of research on exploring the impact of non-VC directors. Specifically, by controlling the impact of founder directors and patient investors (representatives of CVC, family offices and evergreen fund managers), this study highlights the moderating impact of two types of non-VC directors, the investor-executives and serial-entrepreneur independent directors, on the relationship between time horizon differences and low-valued exits. This study also directly addresses Garg's (2014) call for more research to unpack how venture boards affect venture performance and Hsu's (2008) call for more research to understand how venture corporate governance affects exit outcome.

Additionally, two influential theories that have been used in explaining a boards' impact are agency theory and resource dependence theory (Garg & Furr, 2017). Garg and Eisenhardt (2017) suggested that the classic principal-agent relationship in agency theory may be flipped in startups, where CEOs are well-aligned, while investor-directors tend to pursue self-interest at the expense of the startups. This study shows that when facing time pressures, investor-executives can be misaligned, while experienced time-urgent venture capitalists are likely to be aligned. This study adds more nuance to the prior literature by demonstrating that the alignment of

different types of directors not only depends on their identity (insider vs. investor vs. independent director) but also depends on the background or experience level of each director.

Resource dependence theory highlights outside directors' resource provisioning role (Hillman et al., 2009), which contributes to startup performance. However, the presence of outside directors is not a guarantee of resources. For example, Ozmel and Guler (2015) found that a VC firm's willingness to contribute resources is contingent on a startup's relative standing in a VC portfolio. This study extends this literature by identifying a factor that affects a VC firm's willingness to share resources—the age of the VC fund. This is particularly important and thought-provoking because entrepreneurs often recognize venture capitalists' time and attention limitations so that entrepreneurs may try to convince venture capitalists to take executive roles to guarantee more commitment. However, this study finds that having more investor-executives can exacerbate the impact of time horizon differences, thus increasing the chance of low-valued exits.

Lastly, time is an essential dimension of strategic planning and the resulting strategic behaviors (Das, 1987, 1991; Ewing, 1972). Though vastly important, temporal characteristics often remain understated in studies on planning processes (Das, 1987; Mohammed & Harrison, 2013). The lack of knowledge about the shifting patterns of perception across time is problematic because temporal characteristics tend to be misattributed by observers to more visible individual differences (e.g., functional buckhound and gender) (Mohammed & Harrison, 2013). This issue is particularly important in VC-backed startups. The VC funds' fixed lifespan significantly constrains the VC firm's time horizon. The fund termination pressure pushes VC firms to abandon good projects and sell them cheaper (Kandel et al., 2011; Masulis & Nahata, 2011). However, entrepreneurs also affect the exit decision, especially due to the increase in

entrepreneurs' control (Ewens & Farre-Mensa, 2018). It is not clear how, or if, entrepreneurs can effectively respond to the VC firm's time pressures. The field study presented here confirmed the effect of a VC fund's limited lifespan on startup planning and board dynamics.

Then, the quantitative analysis further tested the impact of VC-led time horizon differences on boards. Few researchers have studied how temporal differences affect strategic decisions (Eisenhardt, 2004; Mohammed, Hamilton, & Lim, 2009; Mohammed & Nadkarni, 2011). TIP theory explains how temporal differences negatively affect team performance (McGrath, 1991). Researchers, though, have identified some potential benefits of temporal differences, for example, the thorough consideration of both long- and short-term demands and the balance of speed and quality (Eisenhardt et al., 1997; Mohammed & Harrison, 2013). But much research on temporal differences is conceptual and cross-sectional, and the findings on the impact of temporal differences are mixed (Mohammed & Harrison, 2013; Mohammed & Nadkarni, 2011). This study provides evidence that as boards experience time horizon differences, the chance of a low-valued exit increased. Importantly, the choice of venture capitalists and the selection of board members can ameliorate the effect of these pressures. In sum, this study contributes to this stream of research by examining the high-frequency temporal differences in VC-backed startups, which is important and relevant due to the increasing popularity of VC financing.

Practical Implications

This dissertation helps us to better understand VC pressures to exit, which may have practical implications for entrepreneurs, VC firms, and policymakers.

First, this study identifies the significant negative impact of time horizon differences for VC-backed startups. Entrepreneurs who plan to seek VC financing and who are currently

supported by VC firms may need to take actions to prevent and alleviate this negative impact. How can entrepreneurs manage the impact of these pressures? The results suggest entrepreneurs may consider selecting more serial-entrepreneur independent directors, avoiding appointing investors as startup executives, and raising money from experienced VC firms. Moreover, entrepreneurs should recognize that milestones signal some success. For example, patent approval may cause VC firms to push harder for a low-valued exit. Indirectly, this signals that the entrepreneur needs to pass sales level milestones, as well. The sales-related milestones indicate even more about the startup's performance, thus reducing the chance of misinterpreting a startup's real quality for outsiders.

The findings also signal a potential side effect of securing a VC firm's attention and resources by asking them to take executive roles in a startup. The use of venture capitalists as executives may increase exit pressures as time horizon differences increase.

Previous literature highlighted the importance of temporal leadership and the benefits of actively managing temporal differences (Mohammed & Nadkarni, 2011). The lack of a formal board structure (i.e., board chair and committees) inhibits effective management of temporal differences. It may be worth considering creating a formal structure early, which may strengthen the potential benefits of time horizon differences.

Allan Wille, a cofounder and CEO, wrote¹⁷,

VC investors expect the 'exit' to happen in about seven years – give or take a year or two. Most companies on their own expect it will take 10 years to get to the point where they can be bought. So that means companies with VC money will face extra pressure to come to an exit sooner.

¹⁷ Extracted from *Six things startups need to know about venture capitalists*, available at <https://venturebeat.com/2019/04/17/airbnb-leads-150-million-investment-in-real-estate-and-hospitality-startup-lyric/>

The comment reflects that although entrepreneurs recognized the limited fund time and VC firms' exit pressures, venture capitalists and entrepreneurs tend to misalign in terms of a preferred exit time. How can entrepreneurs prevent time horizon differences? Entrepreneurs need to hit the milestones on time and within budget to avoid the need to raise additional capital so that the original plans come true. But due to the uncertain entrepreneurial process, the most effective strategy may be to raise capital from a VC firm as late as possible or use alternative financing, for example, raising from angels, government-sponsored programs (e.g., SBIR/STTR), banks, corporations, and crowds. Angels, SBIR/STTR, and corporations are well-recognized channels among life science entrepreneurs. Two additional areas that provide funds include banks and crowds. Patents are a common milestone in life science startups. Although debt seems poorly suited for high-risk life science companies at initial startup stages, trading in the secondary patent market expands financing options and startups can receive loans via the patent collateral channel (Hochberg et al., 2018). Additionally, the passage of the Regulation Crowdfunding Act (RegCF) in May 2016 permits a startup to raise up to \$1,070,000 through crowdfunding offerings in a 12-month period. The amount is comparable to SBIR/STTR programs.

Second, the systematic examination of the impact of time horizon differences resulting from VC funds' fixed lifetime may stimulate thinking on fund structure and encourage efforts on increasing fund structure flexibility in the VC business. Many VC firms try to be founder-friendly. However, their contracts with limited partners forces them to limit their exposure. If limited partners and general partners were motivated to create a more flexible fund structure, that new structure might provide a way of preventing time horizon differences. Top VC firms are actively looking for late-stage solutions. For example, Kleiner Perkins and New Enterprise

Associates, Inc. (NEA) launched new teams to acquire late-stage stakes, a form of self-buyout. However, this type of solution is not available for the majority of VC firms. In addition, according to PitchBook data, there were just 108 secondary investments in VC-backed companies in 2018, the lowest annual figure since 2009. The secondary deals rarely occur other than for unicorns, such as Uber, Credit Karma, and LegalZoom. The findings here may further encourage the development of the secondary market, which provides options for more time-urgent venture capitalists and startups to reach better outcomes.

Apart from these long-term suggestions, a few VC firms already are taking actions to address the concerns of the fixed fund horizon by adopting a new approach that shifts away from the fund/limited partner structure. For example, on October 31, 2018, Social Capital, a venture capital firm based in Palo Alto, announced that it would only rely on its own permanent capital for all future investment, which allows them to invest with an uncompromising conviction for the long run.

Finally, we face potentially significant social and economic loss resulting from the fixed fund lifetime, especially in the life science industry. The government may consider creating special funds for startups experiencing time horizon differences, which can reduce the threat of time horizon differences and encourage more people to become entrepreneurs.

Limitations and Future Research

The limitations of this study present several promising avenues for future research. First, this study only focuses on firms in the surgical device industry. A characteristic of this industry is its long R&D and commercialization cycle, so time horizon differences are more likely to emerge. I expect this study's findings can apply to other subsectors in the life science industry, but future research may profitably explore the impact of time horizon differences in other

industries that generate revenue faster. For example, in computer technology, how often do time horizon differences emerge? Do time horizon differences have a significant impact on exit and other performance dimensions (i.e., profitability)? Do startups' profits offset the impact of time horizon differences?

A second opportunity arises to incorporate the impact of the VC firm's portfolio of firms (Ozmel & Guler, 2015). Venture capitalists respond to the broader portfolio needs of their firms. For example, Pahnke et al. (2015) found that VC firms may leak information to other competitor firms in their portfolio, thus impeding a focal firm's innovation. A VC firm's behavior when facing time horizon differences may be contingent on the size of the portfolio and the performance of other portfolio firms. A smaller portfolio allows venture capitalists to spend more time negotiating with entrepreneurs. A better-performing portfolio may reduce the incentive to sell the firm quickly. Future work can explore in more detail the impact of a VC firm's portfolio on attitude and tolerance of time horizon differences.

A third opportunity emerges from studying other types of time horizon differences on boards. Some VC firms, for example, Correlation Ventures, do not take board seats. This suggests that some VC-funded startups lack venture capitalists on their board, although this type of VC board structure is rare. It is unclear whether these VC firms are more patient at the end of their funds. This study focuses on venture capitalists on boards so that it does not incorporate the impact of time horizon differences driven by influential venture capitalists eschewing a board seat. Moreover, this study assumes that entrepreneurs, independent directors, and investors without a closed-end fund have a similar time pressure response. Although the interviews with entrepreneurs and investors indicated support for this assumption, the assumption may not be

universally true to all startups. Future researchers may investigate the nuances of different party's time orientations and explore other types of time horizon differences.

Fourth, low-valued exits (i.e., bankruptcy or low-valued M&As) may be preferred in some situations. From the entrepreneur perspective, when startups encounter difficulties, entrepreneurs may choose to exit immediately or work on a turnaround. When entrepreneurs do not see the possibility of a successful turnaround, they may prefer a low-valued exit rather than struggling in the market. This study includes a set of controls on startup performance. The exit decision can also be affected by entrepreneurs' personality characteristics (e.g., tolerance for pressure), entrepreneurs' family and friends support, and the availability of new career opportunities (DeTienne & Wennberg, 2014; Wennberg & DeTienne, 2014). Future study can benefit from a thorough analysis of factors leading to exit. From the VC firm's perspective, Cumming and MacIntosh (2003) suggested that VC firms should exit when the projected marginal costs (e.g., overhead costs and opportunity costs associated with alternative deployments of capital) are higher than the projected marginal value-added resulting from the stewardship efforts. The VC firm's optimization strategy may not be the best strategy for startups. However, allocating valuable and limited resources to other startups where these resources can create more value may be the best outcome in the long run and at the macro society level. More research should explore the causes and consequences of low-valued exits in the long run.

A fifth opportunity arises from examining the detailed mechanisms of how different types of directors address board tension and resource constraints. I proposed and tested the impact of three types of directors, investor-executives, time-urgent venture capitalists, and serial-entrepreneur independent directors, in moderating the relationship between time horizon

differences and low-valued exits. The results show the magnitude of their impact. More research is needed to uncover the mechanisms.

Lastly, although this research includes various robustness checks to alleviate endogeneity concerns, it may not eliminate endogeneity issues. Ideally, an experiment among two sets of similar startups (one group experiences time horizon differences while the other does not) is the best way to test the impact of time horizon differences on low-valued exits. However, it is not possible to find two groups of startups that only differentiate on the extent of time horizon differences. Therefore, the results should be interpreted with caution.

Limitations notwithstanding, this study identifies a common and high-impact phenomenon—time horizon differences—due to time pressures of VC fund expiration on venture boards, investigates its impact on low-valued exits, and explores how to manage the negative influence of the time horizon differences. The findings resonate with the folk wisdom: *“good things come to those who wait.”* The results do not mean waiting or that more time reduces the chance of low-valued exits. The critical message is that good startups may make the wait worthwhile, but few firms get the chance to make the wait worthwhile. Further work is necessary to understand how many of the exited firms might have created more value, and how much value might have been gained by waiting.

Table 1. Venture boards vs. public firm boards

	Venture board	Public firm board
Composition	Smaller but expand over funding rounds Investor-directors often represent the largest group	Stable and large A majority of independent directors
Roles & Goal	Monitoring, strategic advisory, and resource provision Rapid growth and profitable exit (often have no revenue)	Monitoring, strategic advisory, and resource provision Good financial performance and run for perpetuity
Involvement	Heavily involved and significantly influence various strategic and operational issues	Less involved and do not significantly influence various strategic and operational issues
Committee structure & Decision-making	Often have no board chairman or committees. The entire board participates in decision-making	Strong formal structure. All boards have committees. Decision-making is distributed across board committees
Ownership	Significant ownership, but shares are different: common vs. preferred	Low ownership and all shares are common shares
Outsiders' background	Well informed about the industry	With very limited industry experience

Note: Adapted from Garg and Furr (2017).

Table 2. Entrepreneur interviewees' backgrounds

	Founder experience of VC backed companies	Status of current venture	Titles in current venture	Serial entrepreneurs	Scientific background	Professional background	Independent board positions in other companies	VC experience	Exit experience ^a
E1	Yes	IPO	Co-founder, CEO	No	Yes	No	No	Yes	Yes (led one IPO)
E2	Yes	Series D	CEO, President	Yes	No	Yes	Yes	Yes	Yes (when served as general partner of a VC firms)
E3	Yes	Series A	Co-founder, CEO	No	Yes	No	No	No	No
E4	Yes	Acquired	Co-founder, CEO, President	No	Yes	No	No	No	Yes (led one founder happy but investor unhappy acquisition)
E5	Yes	Seed round	CEO, President, VC investor	Yes	No	Yes	Yes	Yes	Yes (led negotiations for more than 80 fully-executed deals)
E6	Yes	Angel backed	CEO	No	No	Yes	Yes	No	Yes (led one successful acquisition)
E7	Yes	VC-backed early stage	Co-founder, CEO, President	Yes	No	Yes	Yes	Yes	Yes (led 5 successful exits)

Note: ^aThe nature of the exit is described by interviewees, which is subjective and may not reflect other participants' opinions.

Table 3. Investor interviewees' background

	Individual characteristics				VC firm characteristics (Current Position) ^c							
	Founder experience	Scientific background	Executive experience in life science companies	Investor experience in years	Title	Most recent fund's size (in millions)	# of Funds	Industry focus	# of investment over lifetime	Firm age	# of exits	HQ location
VC1	No	Yes	Yes	20	General Partner	\$150	5	Life science	104	19	35	East
VC2	No	Yes	No	8	Partner	\$102	4	Life science	57	18	16	West
VC3	No	No	No	15	Managing Director	\$200	5	Life science and IT	162	25	80	East
VC4	No	No	No	18	Founder and Managing Partner	\$15	3	Diverse	75	12	13	East
VC5	No	No	No	30	Managing Partner	\$275	7	Life science	225	35	86	East
VC6	No	No	Yes	25	Founder and Managing Partner	\$86	5	Life science	135	25	64	East
VC7 ^a	Yes	No	Yes	15	Managing Director	Unknown	>1	Life science	7	15	4	East
Evergreen	No	No	No	11	Managing Director	NA	NA	Diverse	458	29	90	East
Family office	No	No	No	16	Managing Partner	NA	NA	Diverse	4	3	0	East

Note: ^aVC7 is also E5.

^bLife science contains pharmaceuticals, biotechnology, medical devices, diagnostic, healthcare information technology and medicine sectors.

^c Number of funds were asked in the interviews. Other VC firm characteristics were collected from Pitchbook in April, 2018.

Table 4. Descriptive statistics and correlations

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9		
1 Low-valued exits	0.02	0.14											
2 Time horizon differences	0.81	1.41	0.11										
3 Board size	5.80	1.95	0.02	0.24									
4 % of investors	0.54	0.19	0.08	0.25	0.02								
5 % of ind. directors	0.17	0.17	-0.03	-0.03	0.28	-0.63							
6 Inde. Directors w investing experience	0.14	0.35	0.00	0.06	0.12	-0.20	0.37						
7 # of serial-entrepreneur ind. directors	0.17	0.41	-0.02	0.01	0.23	-0.24	0.33	0.29					
8 # of investor-executives	0.28	0.56	0.04	-0.02	0.03	0.27	-0.11	-0.09	-0.12				
9 Founders on boards	0.74	0.44	-0.04	-0.19	-0.03	-0.16	-0.10	-0.11	-0.01	0.21			
10 # of serial-entrepreneur VCs	0.59	0.73	0.02	0.12	0.15	0.28	-0.15	-0.09	-0.05	0.43	0.10		
11 VC experience: time-urgent	6.90	6.53	0.09	0.57	0.23	0.21	-0.03	0.00	-0.02	0.03	-0.15		
12 VC experience: non-time-urgent	7.17	8.91	0.01	-0.02	0.22	0.18	-0.04	0.01	0.04	0.08	-0.03		
13 Firm age	8.07	4.72	0.10	0.51	0.31	0.06	0.15	0.11	0.05	-0.10	-0.22		
14 Patient investors	0.22	0.41	0.02	0.06	0.31	0.26	-0.11	0.03	0.02	0.06	-0.01		
15 Youngest fund age	5.05	3.07	0.09	0.13	0.07	-0.13	0.19	0.08	0.01	-0.01	-0.13		
16 # of patents	1.44	5.94	-0.03	-0.10	0.01	-0.02	0.00	0.00	-0.03	-0.03	0.02		
17 # of FDA pre-market approvals	0.42	1.08	-0.01	-0.04	0.12	-0.02	0.04	0.02	0.06	-0.09	-0.04		
18 SBIR/STTR funding (in \$1,000,000s)	0.02	0.13	0.01	-0.02	-0.04	-0.04	-0.03	-0.02	-0.02	0.02	0.03		
19 # of IPOs	121	81	0.00	-0.09	-0.11	0.06	-0.04	-0.04	-0.06	0.01	0.06		
20 Region=West	0.45	0.50	0.00	0.04	0.02	0.11	0.01	0.02	0.00	0.24	-0.03		
21 Region=Northeast	0.20	0.40	-0.01	-0.02	-0.02	0.00	-0.07	-0.01	-0.05	-0.07	0.03		
			10	11	12	13	14	15	16	17	18	19	20
11 VC experience: time-urgent	0.05												
12 VC experience: non-time-urgent	0.12	-0.06											
13 Firm age	-0.07	0.41	0.02										
14 Patient investors	-0.01	0.12	-0.01	0.07									
15 Youngest fund age	-0.13	0.28	-0.15	0.42	0.17								
16 # of patents	0.00	-0.07	0.01	-0.12	0.01	-0.07							
17 # of FDA pre-market approvals	-0.03	0.01	-0.01	0.07	0.07	0.03	0.24						
18 SBIR/STTR funding (in \$1,000,000s)	0.04	-0.02	-0.02	-0.05	0.02	-0.04	-0.01	-0.03					
19 # of IPOs	-0.02	-0.09	-0.02	-0.12	-0.05	-0.12	0.08	0.05	0.03				
20 Region=West	0.11	0.11	0.18	-0.05	0.01	-0.05	0.04	-0.09	-0.09	0.06			
21 Region=Northeast	0.04	-0.02	-0.05	0.06	-0.07	0.02	0.01	0.06	0.01	-0.01	-0.45		

N=1,899 board-years

Table 5. Estimated coefficients from competing risk models

Dependent Variable: Low-valued Exits							
Variable	M1 (controls)	M2 (H1)	M3 (H2)	M4 (H3)	M5 (H4)	M6 (H5)	M7 (full)
Time horizon differences		0.37** (0.12)	0.25+ (0.13)	0.51*** (0.14)	0.44*** (0.13)	0.34** (0.13)	0.40** (0.15)
Time horizon differences x # of investor-executives			0.42** (0.16)				0.36* (0.16)
Time horizon differences x VC experience: Highly time-sensitive				-0.05* (0.02)			-0.03+ (0.02)
Time horizon differences x # of serial-entrepreneur ind. directors					-0.87* (0.43)		-0.87+ (0.46)
Time horizon differences x # of patents						0.47*** (0.11)	0.59*** (0.12)
<i>Controls</i>							
# of investor-executives	0.34 (0.27)	0.54+ (0.29)	-0.13 (0.42)	0.48+ (0.29)	0.54+ (0.30)	0.52+ (0.30)	-0.12 (0.41)
VC experience: time-urgent	0.00 (0.01)	-0.00 (0.02)	-0.00 (0.02)	0.06 (0.04)	-0.01 (0.02)	-0.00 (0.02)	0.05 (0.03)
# of serial-entrepreneur ind. directors	-0.32 (0.56)	-0.16 (0.55)	-0.07 (0.55)	-0.27 (0.51)	0.55 (0.60)	-0.16 (0.55)	0.51 (0.63)
# of patents	-0.65* (0.33)	-0.61* (0.29)	-0.65* (0.29)	-0.59* (0.29)	-0.60* (0.29)	-1.80*** (0.42)	-2.22*** (0.41)
VC experience: non-time-urgent	0.01 (0.01)	0.01 (0.01)	0.02 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
# of FDA pre-market approvals	-0.04 (0.12)	0.00 (0.13)	-0.06 (0.14)	-0.02 (0.13)	0.01 (0.13)	0.00 (0.12)	-0.08 (0.15)
SBIR/STTR funding (in \$1,000,000s)	0.98 (0.71)	0.66 (0.68)	0.54 (0.61)	0.59 (0.69)	0.63 (0.68)	0.53 (0.56)	0.28 (0.55)
Ind. Directors w investing experience	0.39 (0.52)	0.24 (0.44)	0.20 (0.42)	0.20 (0.45)	0.16 (0.44)	0.23 (0.45)	0.09 (0.43)
Youngest fund age	0.18** (0.06)	0.23*** (0.06)	0.23*** (0.06)	0.20*** (0.06)	0.23*** (0.06)	0.24*** (0.06)	0.20*** (0.06)
Firm age	0.13*** (0.04)	0.10* (0.04)	0.10* (0.04)	0.10* (0.04)	0.09* (0.04)	0.10* (0.04)	0.09* (0.04)
Patient investors	-0.37 (0.41)	-0.36 (0.38)	-0.34 (0.40)	-0.31 (0.36)	-0.40 (0.37)	-0.42 (0.39)	-0.41 (0.39)

Dependent Variable: Low-valued Exits							
Variable	M1 (controls)	M2 (H1)	M3 (H2)	M4 (H3)	M5 (H4)	M6 (H5)	M7 (full)
# of serial-entrepreneur VCs	0.11 (0.24)	0.06 (0.21)	0.09 (0.21)	0.12 (0.21)	0.08 (0.21)	0.06 (0.22)	0.16 (0.22)
Board size	0.02 (0.11)	-0.00 (0.12)	-0.02 (0.12)	-0.03 (0.11)	0.00 (0.12)	0.01 (0.12)	-0.02 (0.12)
% of investors	3.64** (1.39)	2.63* (1.34)	2.64* (1.34)	2.74* (1.32)	2.45+ (1.32)	2.77* (1.39)	2.67+ (1.37)
% of ind. directors	0.17 (1.57)	-0.48 (1.41)	-0.62 (1.44)	-0.36 (1.39)	-0.64 (1.40)	-0.46 (1.42)	-0.76 (1.52)
Founders on boards	-0.30 (0.35)	-0.33 (0.35)	-0.37 (0.34)	-0.40 (0.36)	-0.29 (0.34)	-0.32 (0.35)	-0.40 (0.34)
# of IPOs /100	0.21 (0.20)	0.26 (0.20)	0.28 (0.20)	0.29 (0.20)	0.25 (0.20)	0.28 (0.20)	0.29 (0.20)
Region=West	-0.22 (0.40)	-0.23 (0.40)	-0.32 (0.42)	-0.17 (0.41)	-0.25 (0.41)	-0.22 (0.39)	-0.32 (0.42)
Region=Northeast	-0.48 (0.48)	-0.26 (0.47)	-0.28 (0.46)	-0.22 (0.48)	-0.22 (0.48)	-0.28 (0.48)	-0.30 (0.49)

Note: Robust standard errors in parentheses;

N=1,899 board-years;

N of startups=220, including 40 failures, 60 competing events, 120 right-censored cases

+ p<0.10 * p<0.05 ** p<0.01 *** p<0.001

Table 6. Estimated coefficients from Heckman selection models

Variable	Dependent Variable: Low-valued Exits							
	First stage	Second stage						
	M8 (selection model)	M9 (controls)	M10 (H1)	M11 (H2)	M12 (H3)	M13 (H4)	M14 (H5)	M15 (full)
Time horizon differences			0.16+	0.11	0.30**	0.20*	0.14	0.25**
			(0.09)	(0.10)	(0.11)	(0.09)	(0.09)	(0.09)
Time horizon differences x # of investor-executives				0.20+				0.16+
				(0.12)				(0.09)
Time horizon differences x VC experience: time-urgent					-0.04*			-0.03*
					(0.02)			(0.01)
Time horizon differences x # of serial-entrepreneur ind. directors						-0.62*		-0.68*
						(0.29)		(0.29)
Time horizon differences x # of patents							0.16**	0.28**
							(0.05)	(0.09)
<i>Controls</i>								
# of investor-executives		0.10	0.15	-0.16	0.12	0.13	0.13	-0.18
		(0.18)	(0.20)	(0.28)	(0.20)	(0.19)	(0.18)	(0.24)
VC experience: time-urgent		0.01	0.00	-0.00	0.06+	-0.00	0.00	0.06*
		(0.01)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)
# of serial-entrepreneur ind. directors		-0.18	-0.13	-0.08	-0.19	0.30	-0.12	0.30
		(0.28)	(0.29)	(0.30)	(0.30)	(0.28)	(0.27)	(0.28)
# of patents	-0.00	-0.41**	-0.42*	-0.44*	-0.44*	-0.42**	-0.84***	-1.19***
	(0.00)	(0.16)	(0.17)	(0.18)	(0.18)	(0.16)	(0.25)	(0.35)
VC experience: non-time-urgent		0.01	0.01	0.01	0.01	0.01	0.01	0.01
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
# of FDA pre-market approvals	0.01	-0.05	-0.04	-0.06	-0.04	-0.04	-0.03	-0.04
	(0.05)	(0.09)	(0.11)	(0.11)	(0.10)	(0.10)	(0.10)	(0.09)
SBIR/STTR funding (in \$1,000,000s)	0.15	0.54+	0.49+	0.45	0.49	0.49+	0.41	0.28
	(0.22)	(0.31)	(0.29)	(0.29)	(0.30)	(0.28)	(0.26)	(0.24)
Ind. Directors w investing experience		0.18	0.15	0.10	0.19	0.15	0.14	0.12
		(0.28)	(0.30)	(0.32)	(0.32)	(0.29)	(0.29)	(0.29)

Variable	Dependent Variable: Low-valued Exits							
	First stage	Second stage						
	M8 (selection model)	M9 (controls)	M10 (H1)	M11 (H2)	M12 (H3)	M13 (H4)	M14 (H5)	M15 (full)
Youngest fund age		0.11*	0.14*	0.15*	0.12+	0.14*	0.13*	0.12*
		(0.05)	(0.06)	(0.07)	(0.06)	(0.06)	(0.05)	(0.05)
Firm age	-0.00	0.05	0.03	0.03	0.03	0.02	0.02	0.02
	(0.01)	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)
Patient investors		-0.23	-0.21	-0.26	-0.29	-0.23	-0.20	-0.31
		(0.25)	(0.27)	(0.31)	(0.28)	(0.27)	(0.25)	(0.25)
# of serial-entrepreneur VCs		0.04	0.00	-0.00	0.02	-0.02	0.00	0.02
		(0.15)	(0.16)	(0.16)	(0.15)	(0.15)	(0.15)	(0.13)
Board size	0.01	0.02	0.00	0.01	-0.00	0.02	0.00	0.01
	(0.02)	(0.06)	(0.07)	(0.07)	(0.07)	(0.06)	(0.06)	(0.06)
% of investors		1.86+	1.61	1.78	1.86	1.60+	1.55+	1.76+
		(1.06)	(1.06)	(1.29)	(1.13)	(0.96)	(0.92)	(0.94)
% of ind. directors		-0.10	-0.29	-0.43	-0.34	-0.37	-0.26	-0.48
		(0.91)	(0.88)	(0.90)	(0.90)	(0.87)	(0.84)	(0.83)
Founders on boards	0.04	-0.12	-0.14	-0.18	-0.18	-0.11	-0.11	-0.16
	(0.07)	(0.21)	(0.24)	(0.25)	(0.24)	(0.23)	(0.23)	(0.21)
# of IPOs /100	0.00	0.12	0.14	0.16	0.16	0.13	0.12	0.13
	(0.03)	(0.14)	(0.17)	(0.18)	(0.17)	(0.15)	(0.15)	(0.14)
Region=West	-0.41**	0.41	0.55	0.39	0.86	0.77	0.56	0.83
	(0.14)	(1.04)	(1.15)	(1.23)	(1.20)	(1.12)	(1.08)	(1.09)
Region=Northeast	-0.38***	0.01	0.14	0.03	0.30	0.31	0.16	0.34
	(0.08)	(0.65)	(0.72)	(0.77)	(0.74)	(0.71)	(0.68)	(0.69)
Inverse Mills ratio		-0.75	-0.91	-0.74	-1.29	-1.16	-0.91	-1.28
		(1.28)	(1.41)	(1.48)	(1.45)	(1.36)	(1.33)	(1.30)
Exclusion restriction (# of VCs in the state)	-0.002***							
	(0.00)							
Constant	-1.88***	-2.88	-2.53	-3.01	-1.89	-1.98	-2.28	-1.42
	(0.11)	(3.06)	(3.40)	(3.80)	(3.46)	(3.24)	(3.20)	(3.14)

Note: Robust standard errors in parentheses;

Stage 1 N=38,759, Stage 2 N=1,899;

Selection model for the match between VC firm and the startup are the same for Model 8-16.

+ p<0.10 * p<0.05 ** p<0.01 *** p<0.001

Figure 1. Firm stages of VC-backed companies

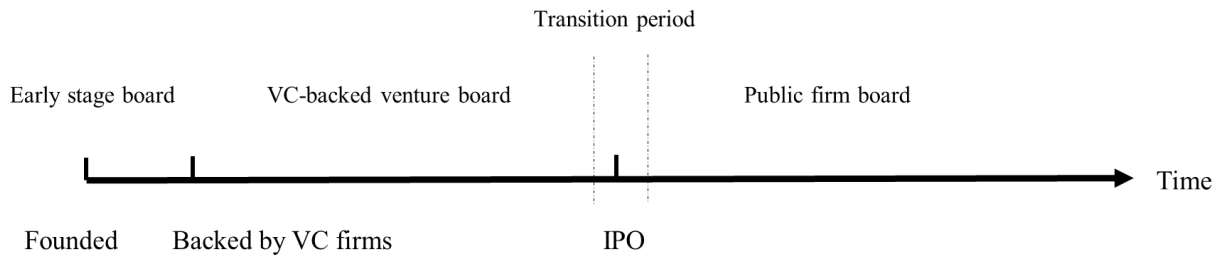


Figure 2. VC business model

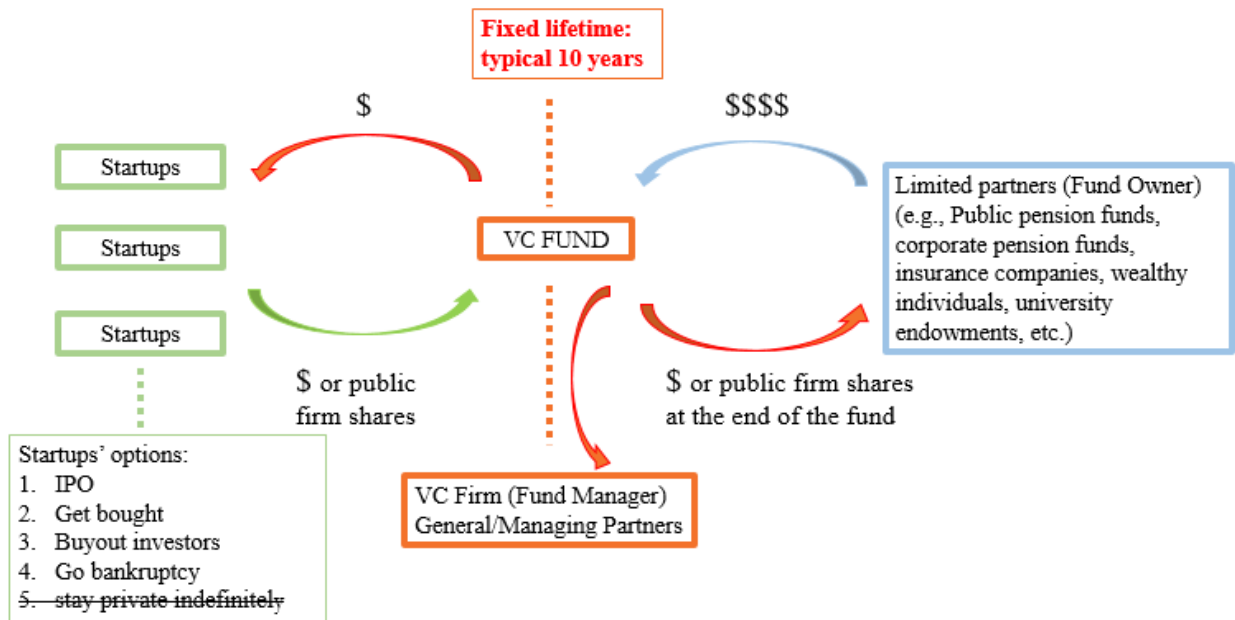


Figure 3. Distribution of time horizon differences

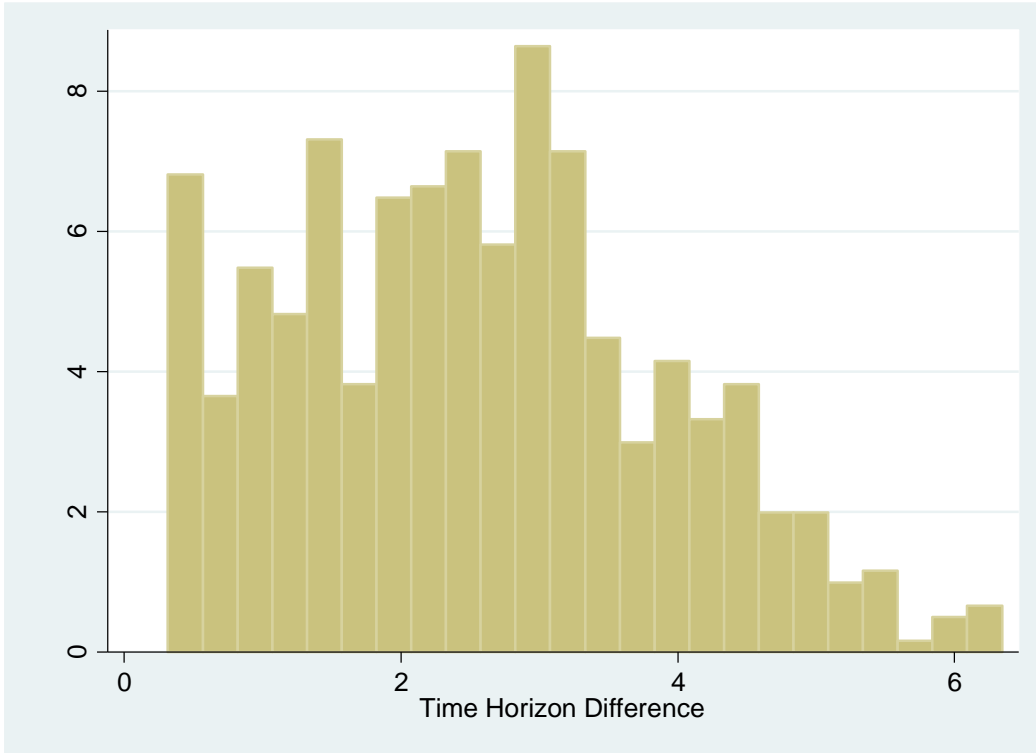


Figure 4. Scatter plot between time horizon differences and firm age

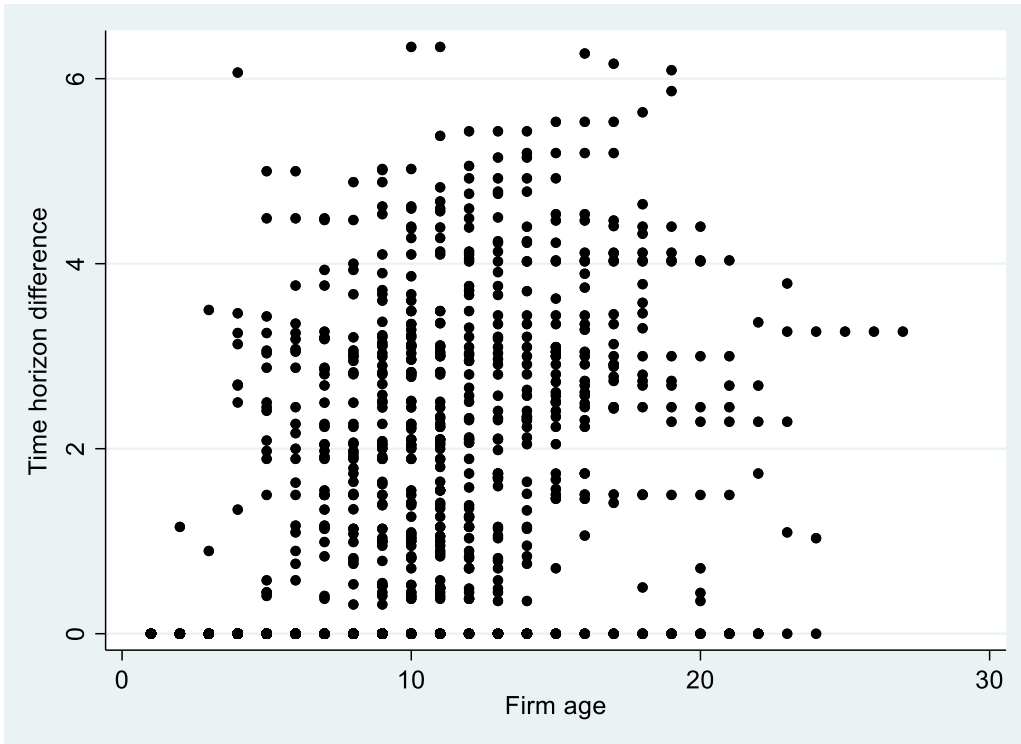


Figure 5. Impact of time horizon differences on low-valued exits across firm age

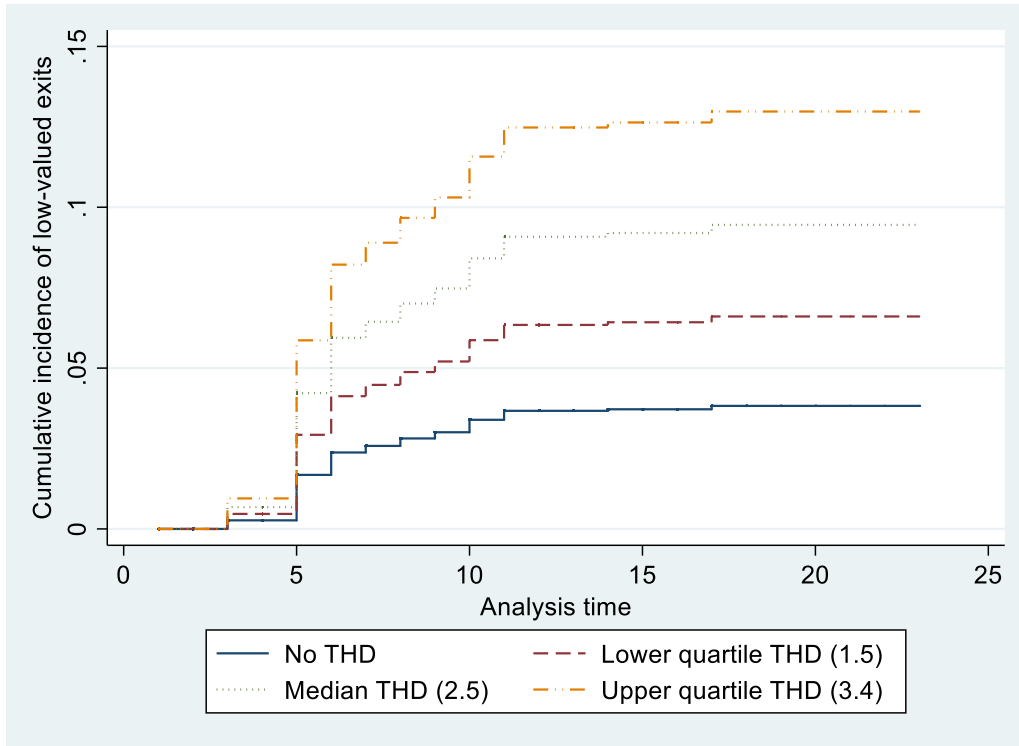


Figure 6. Impact of time horizon differences on low-valued exits at median firm age

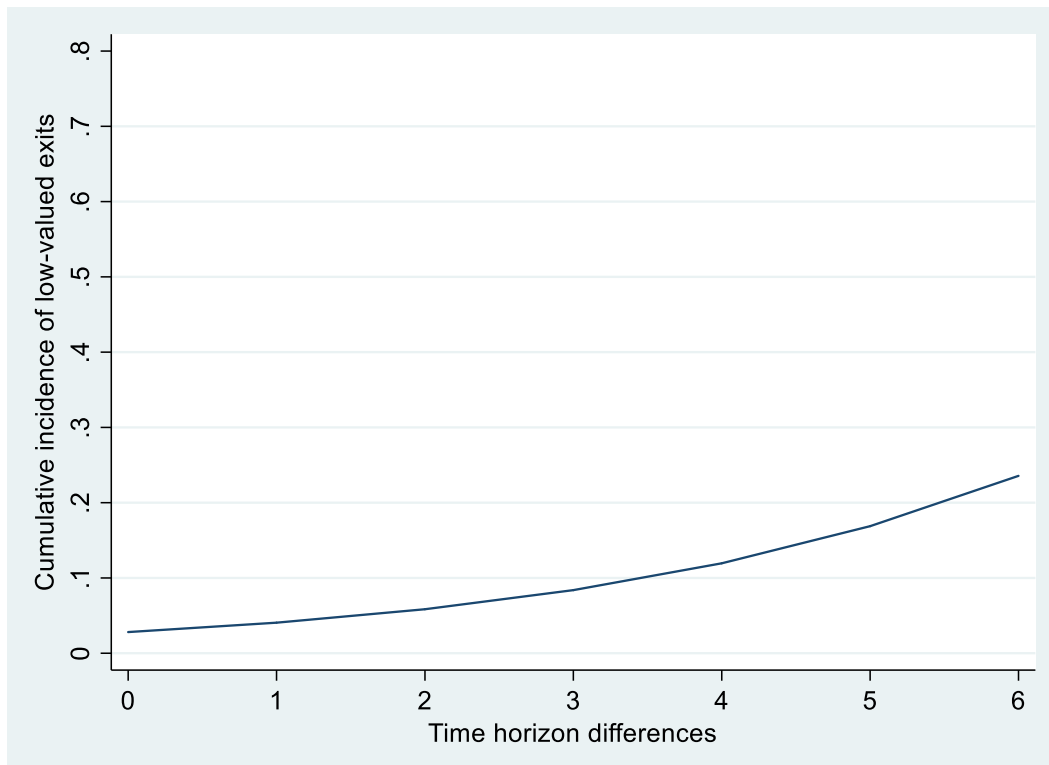


Figure 7. Moderating impact of the number of investor-executives

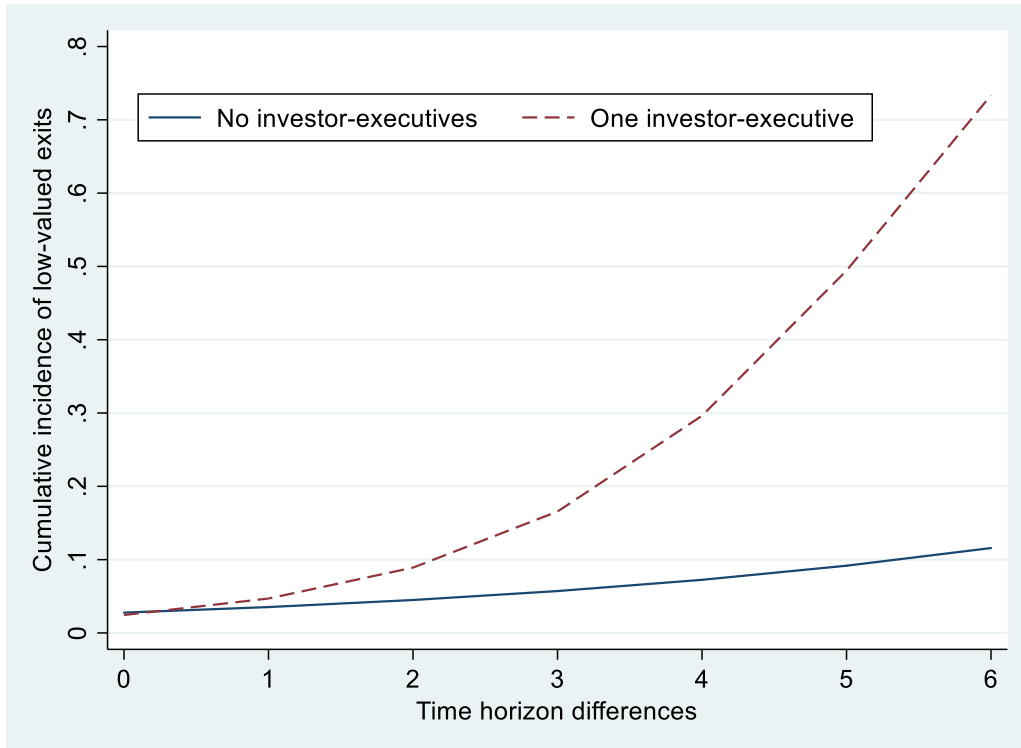


Figure 8. Moderating impact of the experience of time-urgent VCs

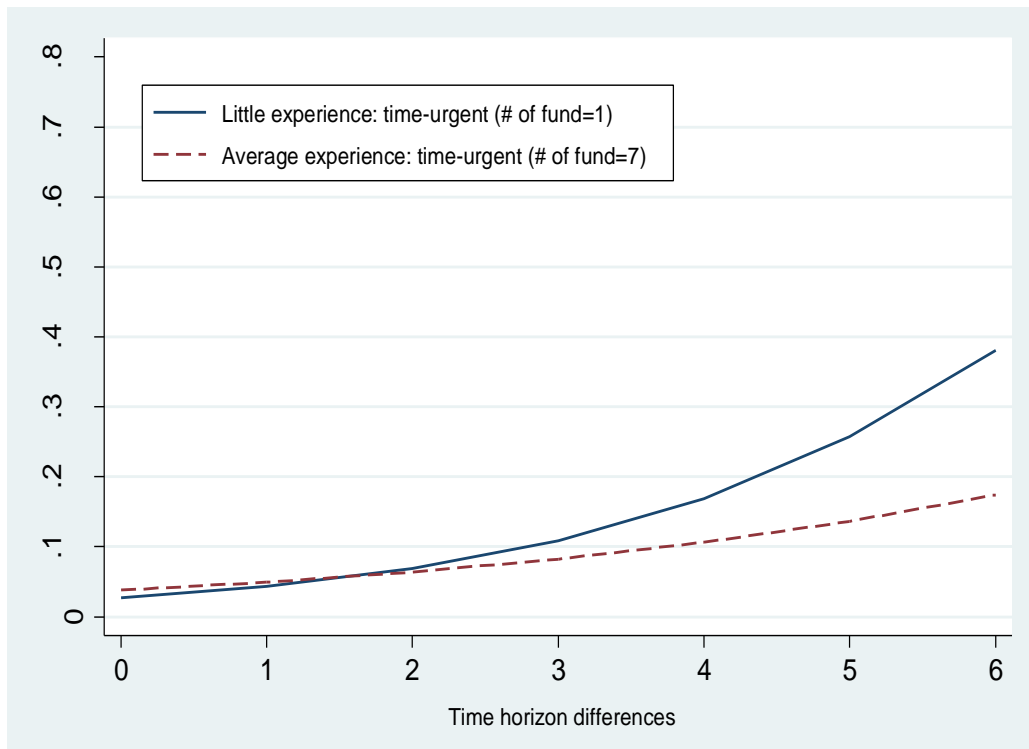


Figure 9. Moderating impact of the number of serial-entrepreneur independent directors

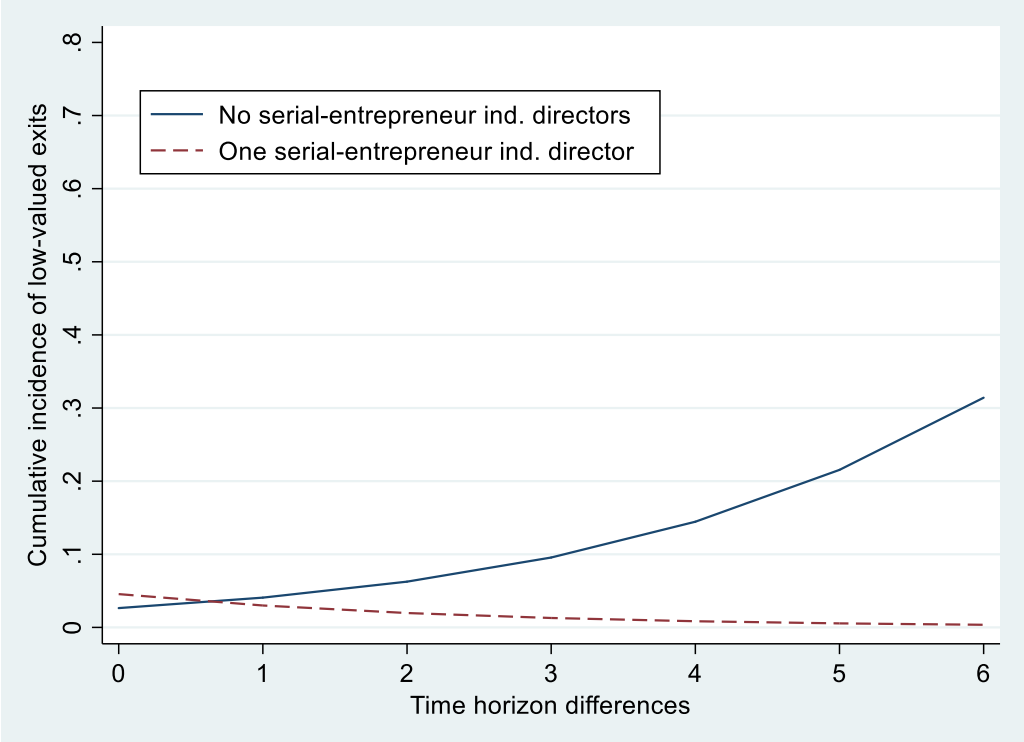
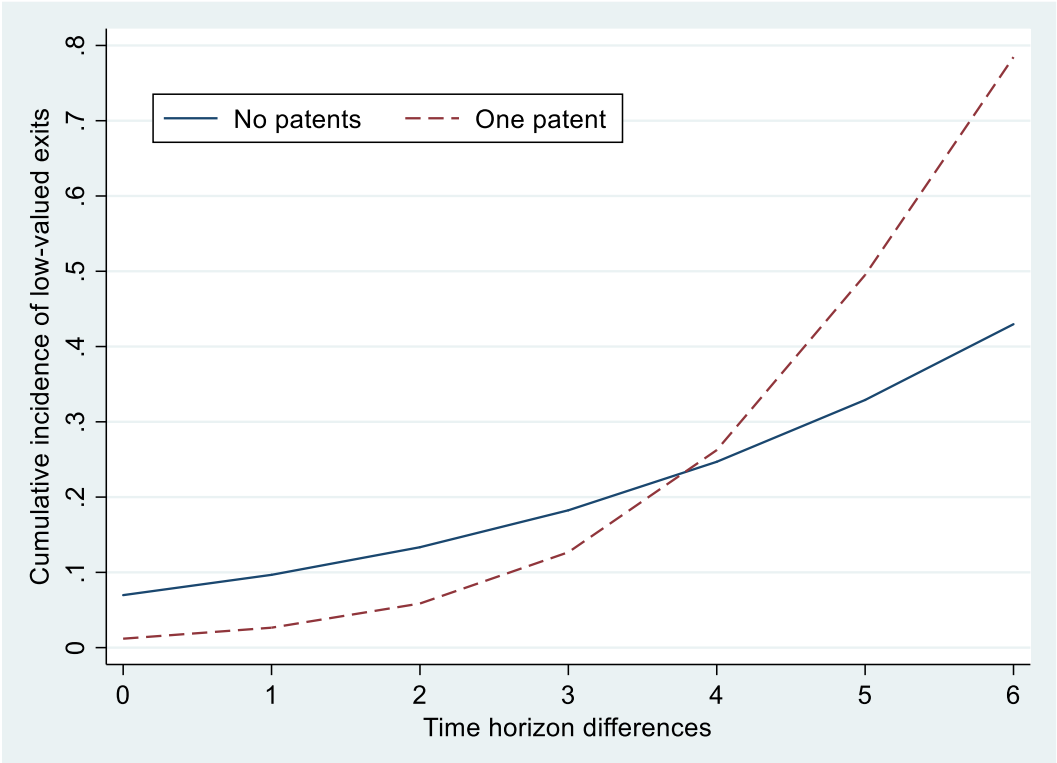


Figure 10. Moderating impact of the number of patents



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