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Mind the Gales: An Attention-Based View of Startup Investment Arms

JOSHUA ECKBLAD

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An Attention-Based View of Startup Investment Arms

JOSHUA G. ECKBLAD

**Mind the Gales:
An Attention-Based View of Startup Investment Arms**

Proefschrift ter verkrijging van de graad van doctor aan Tilburg University

op gezag van de rector magnificus, prof. dr. W.B.H.J. van de Donk, in het

openbaar te verdedigen ten overstaan van een door het college voor

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*In loving memory of my mother,
Martine Yolande Profizi Eckblad, and my father-in-law, Xie Ruquan 谢儒全,
who departed far too early.*

*To my father,
for teaching me the value of aesthetics and novel experiences,
and that the quality of your life is a function of how you selectively allocate time and money.*

*For my wife,
our shared love of simplicity, walks in nature and delicious food, which kept me grounded,
especially when the pangs of self-doubt multiplied like a Hydra's head cut repeatedly.*

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My research initiative to better understand attentional influences on CVC investment unit decision making required financial support from multiple sources. Generous donations from Tilburg University Alumni helped to fund corporate firm visits, as part of my data collection effort. The Department of Management provided numerous resources throughout the research process. Support included access to a productive and creative office space, secretarial and travel assistance, funding to attend doctoral paper development workshops and academic conferences, in addition to research assistants who transcribed thousands of pages of interviews. Thanks to the research assistance of Quirein, Beren, Sofia, Boris, Romek, Aleksandra, Lukas and Marouane for their commitment and attention to detail. The Vice-Dean of Research funded a subscription to PitchBook data services, which we used in conjunction with Crunchbase datasets to independently evaluate the data quality of our main investment data sources. Finally, the Center Graduate School, TiSEM's academic research arm, funded the PhD position for three years. In addition to financial resources, I received unbelievable amounts of time and effort from so many people inside and outside the organization. Whether it was senior colleagues who regularly checked in and met with me instead of working to further their own research agendas, the doctoral committee

¹ Our report is available for download: <https://www.corporateventuringresearch.org/#report>

members who used their personal time to review my manuscript, the department heads who made every considered effort to find individually-tailored solutions, or the dozens of outside scholars who attended presentations and/or provided critical feedback — it adds up to an unimaginable collective investment of time and effort, for which I am appreciative and grateful. Acknowledgement goes to Gary Dushnitsky, Daniel Kahneman, James March, William Ocasio and Herbert Simon, in addition to so many other scholars whom I never had the chance to meet in person, for providing the intellectual foundations on which my dissertation humbly rests.

The backing and encouragement of so many colleagues at the Tilburg School of Economics and Management (TiSEM) has been remarkable, which helped to soften my complicated transition from entrepreneurship to academia. I recognize parallels between individual academics and entrepreneurs. Similar to entrepreneurs, academics are independent knowledge workers who work on a series of self-selected “*problems*” with passion and persistence. Similar to entrepreneurs, each young academic uses her or his own unique view of the world to develop a portfolio of research work that competes for resources, attention, and professional growth. A relatively small number of academics successfully manage to alter others’ perceptions in relation to a particular field. Similar to entrepreneurs, most young academics do not make it, despite their intelligence, creativity and hard work. For many scholars, research universities are like professional service organizations such as management consultancies, in which roles are often temporary and short-lived. I have had the privilege of being at TiSEM long enough to witness the considerable flow of exceptionally-talented and committed academic professionals. There are so many people I would like to thank for sharing their views of the world, and for sharing their precious time with me. Among those, I will mention just a few by name. The list is *not* exhaustive by any means.

Tal Simons kindly invited me to join TiSEM’s research master program and welcomed me into Tilburg University. Tal approached me to co-create a new course on creative entrepreneurship, and we set out to design and organize an ambitious, innovative course and team hackathon for our students each year that earned us TiSEM’s teaching innovation award. Tal was an ardent champion and instrumental in supporting my entry into the PhD research program.

Elena Golovko encouraged me to write and thoughtfully facilitated our first online journal article together. Elena was incredibly supportive, with disarming calmness, intelligence and kindness. Shivaram Devarakonda, who left for Hong Kong and fortunately returned, has been a committed academic mentor/coach who generously introduced me to the ropes of academic life and research work. I am privileged to have learned by observing Shivaram's exquisite craftsmanship up close. Shivaram's genuine curiosity, intellect, willingness to wander outside of his "wheelhouse" and to take the time to jointly explore nascent ideas when things were still in an early, fuzzy state, was valuable throughout the six-year dissertation process. Shivaram has the extraordinary ability to distill boundless divergence with keen precision and clarity. One of the biggest challenges for me was to function inside a monumental bureaucracy, which I had somehow eluded during the past 15 years of professional work experience. Geert Duysters helped me to navigate procedures unfamiliar to me, and provided amazing opportunities to leverage my entrepreneurial spirit towards institution-building. Geert is the genuine article, because he is enthusiastic about people and the future, while also being a highly-accomplished researcher, teacher and institutional leader. Thanks to Geert's tireless intrapreneurial drive as the intrepid Dean of TiSEM, I had a unique opportunity to establish a lab that incubated extracurricular entrepreneurship activities in research and education. The lab leadership role is coming to the end of its term after three years, and I am deeply appreciative of the chance to express that part of myself in higher education that feels the joy of creation and the need "to build." I equate institution-building challenges in higher education to CVC investment work, to the extent that both involve sourcing external opportunities, integrating these in conjunction with renewal projects in various parts of the organization, and communicating with multiple stakeholder groups that often express conflicting institutional logics. Many thanks to TiSEM's Management Team, past and present, for their willingness to fund an unusual lab, and with the support of the Department of Management Chairs, Aswin van Oijen and Carol Ou, to kindly offer me a permanent part-time tenured position in strategy and entrepreneurship.

Lastly, but certainly not least, I am forever grateful to my fellow PhD colleagues. We share a passion for higher education and the pursuit of developing societal knowledge and individual human capital (ours and others), by performing meaningful research and teaching in whatever forms that may take. There are simply too many PhDs in the past and current cohorts, to list everyone here — One of the beneficial effects of taking six years to complete a PhD program is that I have had the privilege to meet so many colleagues that inspired me. It is a genuine opportunity to become a member of a community of diverse and unique individuals, driven by a mindset for excellence. I am thrilled to have spent my time here challenging myself and learning from gifted social scientists, and learning from the next generation of business leaders enrolled in my creativity, strategy and entrepreneurship courses. Thank you for allowing me to commit my time, energy and financial resources in such a manner.

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All mistakes, errors, and omissions are mine.

GENERAL INTRODUCTION



According to a recent survey, senior executives expect to produce half of their firms' future revenues from new products, services, or businesses within the next five years (McKinsey & Company, 2021). The introduction of new products or services depends on the refreshment of an incumbent firm's resources, which typically involves firm-wide strategic renewal in order to obtain the "*refreshment or replacement of attributes... that have the potential to substantially affect its long-term prospects*" (Agarwal & Helfat, 2009: 282). One significant source of organizational renewal originates from external knowledge sourced by an incumbent firm's corporate venture capital (CVC) investment mode (Dushnitsky & Lenox, 2005; Eckblad & Golovko, 2016).¹ The CVC investment mode represents one exploration mode that incumbent firms have been using increasingly to acquire knowledge from external startups about the future direction of markets and technologies (Eckblad et al., 2019).² A recent study also found that 44 percent of incumbent firms undergoing digital transformation expect to source innovations related to digital technologies from external startups in the next five years, compared to one percent five years ago (Thompson et al., 2020).

¹ We refer to "*startup investment arms*" as CVC investment units in the remainder of the dissertation, which corresponds to the terminology found in the scholarly literature on corporate venture capital (CVC). Moreover, CVC investment units in our first two empirical studies possess strong strategic intentions to be aligned with their parent firms' renewal goals, and to make evaluation decisions that result in the allocation of financial capital that takes minority equity positions in external startups that are aligned with organizational renewal goals. After an investment is made in an external startup, CVC investment units are conceptualized in our third study to facilitate timely, outside-in transfers of relevant knowledge from portfolio companies to incumbent firms that contribute to achieving innovation. Every care has been taken to remove CVC investment units from our empirical samples that do not possess the strategic intent to generate innovation outcomes for the parent incumbent firm.

² CVC investments can be traced back to 1914 with DuPont's investment in a six-year old external startup named General Motors (CB Insights, 2017). In its modern form, the CVC investment mode started sometime in the mid-1990s when the number of deals and the amount of financial capital invested increased significantly between 1995 and 2000. The intensity of CVC investment activities plunged significantly after the tech bubble burst from 2000 until 2005, and then took off again a few years after the subprime mortgage crisis in 2007. CVC investment activity has grown significantly year-on-year ever since, in terms of the number of deals made, the level of financial capital invested, and the formation of new CVC investment units. Our supplementary historical industry-level analyses of corporate venture capital (CVC) investments are available for download: <https://www.corporateventuringresearch.org/>

Notwithstanding the exploding interest, deriving the expected benefits by exploiting CVC opportunities is not straightforward.³ CVC units must configure the organizational actions that underlie the evaluation, investment selection, and knowledge integration of external opportunities -- tasks that pose considerable coordination and communication challenges to CVC investment units. One principal source of these integrative challenges is the structural distribution of specialized players that must unify numerous actions that depend on each other (see Figure 1).

CVC units play a critical role in managing these interdependencies. Occupying an intermediate position between internal and external networks of players, they bridge external startups, internal business units, independent venture capitalists, and organizational decision-makers staffing investment committees. Further, CVC units perform this function in a context characterized by mixed-motive games, in which the goals of the players are partially coincident and partially in conflict (Gallo & McClintock, 1965). For example, incumbent firms compete and cooperate with early-stage external startups that embody novel technologies and products/services (Covin & Miles, 1999).⁴ Consequently, deciding and acting on any given investment depends on the cooperation of multiple players with the CVC unit. Two questions become focal in this regard: first, what factors shape the behavior of the CVC units? Second,

³ Opportunities throughout the dissertation refer to external startups and are initially considered to be “*discovered*” from a CVC investment unit’s perspective (Shane & Venkataraman, 2000), because external startups pre-exist as independent entities in the environment that are potentially discoverable by any third-party actor. In the CVC investment context, the “*new venture ideas*” embodied in any given external opportunity reflects some degree of novelty to a focal incumbent firm and some degree of favorability assigned by a focal incumbent firm at the earliest stages of search (Davidsson, 2015). We hold the view that during the pre-investment evaluation stage, at least one member of a focal CVC investment unit must consider a focal external startup and its new venture ideas to be a potential opportunity for eventual investment selection, based on his/her understanding of the incumbent firm’s renewal goals, for even the early stages of evaluation processes to occur. Since the early stages of evaluation is our starting point for the dissertation, CVC investment units engage with opportunities. However, this reasoning does not mean to imply that “*creation*” processes do not also occur in relation to opportunities in our studies (Alvarez & Barney, 2007). As an opportunity undergoes evaluation by a CVC investment unit, the original discovered opportunity may give way to a derivative form, as a result of coming into contact with the incumbent firm and engaging in collective co-creation work. This possibility is consistent with Bhidé (2000) and Klepper and Sleeper (2005), who found that many external startups had only a fuzzy concept about their new venture ideas in the early stages of development. Opportunities across our three dissertation studies meet the description of a sequential, hybrid conceptualization of opportunity, from a focal CVC investment unit point of view, that comes into existence when “*discovered*” and that evolves over time through social, collective “*creation*” processes.

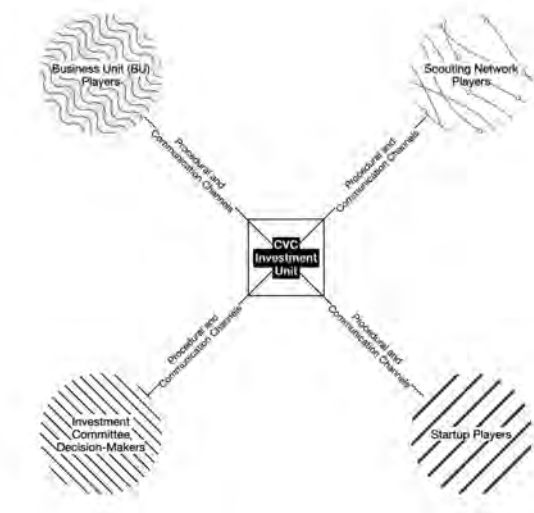
⁴ From an ecological perspective in organizational strategy, incumbent firms face tremendous competitive pressures from new entrants in the marketplace. New market entrants consist of incumbents from other industries, such as established tech firms Facebook, Amazon, Microsoft, Google and Apple (FAMGA) that recently accelerated digital disruptions in the financial, healthcare, and pharmaceutical industries, among others (CB Insights, 2021), and by young early-stage startups offering customers attractive services and/or products that disintermediate, decouple or otherwise reconfigure particular segments of an industry’s dominant value chain. Competition emerges as a result of shifts in consumer demands shaped by new incumbents that start life on the periphery of existing markets.

how do they contribute to the challenge of organizational renewal? In an effort to answer these questions, this dissertation aims to delve into the factors that shape the organizational processes and outcomes at the center of the CVC investment mode.

From the vantage point of CVC investment units, the three studies in this dissertation take a behavioral perspective to examine several critical processes and outcomes. Specifically, it unpacks learning about the parent incumbent firms' renewal goals; obtaining buy-in from internal business units and investment committees; evaluating external opportunities considering the firm's renewal goals; establishing ties with co-investment syndicates; investing in external startups; and integrating external knowledge from portfolio companies to achieve incumbent firms' renewal goals.

Figure 1

Network of Attentional Processing: CVC Investment Unit and Cooperating Players



Note: This figure depicts the network of attentional processing that the CVC investment unit uses to perform various organizational moves in relation to the CVC investment mode. Our first study examines selective attentional effects of the CVC investment unit as a function of interactions with each of the four types of players during the evaluation situation. Our second study examines a CVC investment unit's investment rate outcomes as a function of interactions with scouting network players and business unit players. Our third study examines the treatment effects of the

CVC investment mode on incumbent firms as a function of interactions with portfolio companies and business unit players, in addition to the CVC investment unit's structural position in relation to the parent incumbent firm.

This dissertation takes the perspective of the corporate incumbent. It uses the attention-based view (ABV) to understand better how attention characteristics that underlie these strategic actions can influence decision-making in CVC investment units.⁵ Per ABV, *attention* is the noticing, encoding, interpreting, and focusing on time and effort on the repertoire of issues and action alternatives facing the organization (Ocasio, 1997). When faced with complex environments, decision-makers may restrict their attention to a limited set of stimuli while ignoring others (Ocasio, 1997: 200). Such selective allocation of attention becomes an acute concern in turbulent economic environments in which CVC investment units often operate (Cohen & March, 1974).

The theoretical framework of this dissertation draws on the following notions of the ABV. The ABV theorizes that decision-making and organizational adaptations are determined mainly by structural patterns of selective organizational attention (Ocasio, 1997; Ocasio & Joseph, 2005; Ocasio et al., 2018). Patterns of selective attention stem from the structurally distributed position of players, who possess idiosyncratic valuations and legitimization of issues and answers. Players refer to individuals, groups of individuals, or organizations that “*attend to the environment of action, the inputs of decision-making, and through their attentional processing selectively construct the mental models that result in organizational moves*” (Ocasio, 1997: 200). The resulting pattern or selective focus of attention on particular repertoires of issues and action alternatives is presumed to impact strategic behaviors and outcomes directly. Factors shaping the selective focus of attention are one of the focal concerns in this dissertation.

In this regard, an important mechanism proposed by the ABV is that players interact in procedural and communication channels in which varying perceptions are confronted and resolved through collective social processes (Ocasio, 1997; Ocasio et al., 2018). The resulting

⁵ See Ocasio (1995; 1997), who developed the attention-based view (ABV) as an extension of the behavioral theory of the firm and the Carnegie School perspective (March & Simon, 1958; Simon, 1947). The Carnegie School developed the concept of “*bounded rationality*” and “*satisficing behaviors*” to explain rational behaviors in responses to limits in optimal decision making. The ABV builds on these concepts and puts forth the idea that managerial and organizational attention are limited resources that result in (controlled or automatic) selective focusing that restricts what is attended to, and that in turn affect organizational outcomes. Attention in the ABV is defined as the noticing, encoding, interpreting, and focusing on time and effort on the repertoire of issues and action alternatives facing the organization (Ocasio, 1997).

joint resolution manifests as an organizational move or action, which refers to the output of decision making. In the CVC investment mode, we conceptualize the CVC investment unit as the central player that drives these ABV processes.

While we explain the effectuation of the attention processes in the chapters that follow, we offer a preview here. The impetus for the CVC investment mode in the first place lies in the raw environmental stimuli that “*impinge, directly or indirectly, upon any particular situation*” (Ocasio, 1997: 193). CVC units sequentially discover and evaluate external opportunities based on salient issues deriving from external enablers in the environment that have some perceived importance to their parent incumbent firms (Davidsson, 2015). Working backward from the choices of the investment committee to the evaluation by the CVC investment unit, the ABV framework works as follows. External opportunities that an investment committee selectively invests in exemplify organizational moves (i.e., investment sets). The investment committee decides to fund specific opportunities based on the framing of the incumbent firm’s *issues* and the CVC investment unit’s *answers* that are attended to selectively (opportunity sets).⁶ The CVC unit’s selective pattern of attention towards specific opportunities also constitutes a type of organizational move, regardless of whether they are deliberate. The CVC unit’s selective pattern of attention, in turn, is shaped by how it socializes with multiple players through procedural and communication channels.⁷ Players’ selective focus of attention (i.e., attending to a limited set of issues and answers) occurs through the CVC investment unit’s attention structures that channel and distribute issues and answers through procedural and communication channels. Each channel is singular in how it filters a limited set of issues and answers, and distinct players differ in their valuation of external opportunities.

⁶ We introduce the term and conceptualize an “*opportunity set*” as the collection of external opportunities that a CVC investment unit considers for any given selection event. Since individual opportunities reach the CVC investment unit sequentially, it is useful to visualize groups of opportunities being considered in preparation for the next selection event. We operationalize opportunity sets as quarterly snapshots, which coincide with investment committee meetings, so that we can compare trends between opportunity sets. We also analyze data on the comings and goings of individual opportunities within each opportunity set.

⁷ According to the ABV (Ocasio, 1995; 1997), attention structures regulate the valuation and legitimization of issues and answers. Our studies focus on these attention regulators: rules of the game; players; structural positions. The repertoire of issues refer to cognitive categories of problems, opportunities, and threats that make up the agenda of the incumbent firm. Issues are defined as the available repertoire of categories for making sense of the environment. The repertoire of answers refer to action alternatives that address issues, problems, and opportunities in the incumbent firm (March & Simon, 1958; Ocasio, 1997). Answers are defined by the ABV as the available repertoire of action alternatives: proposals, routines, projects, programs, and procedures.

Two main concerns with prior literature motivate our theoretical and empirical approach. First, incumbents' interest in CVC activity has been cyclical over the previous five decades. To the extent that technologies that threaten incumbents keep on sprouting, rational explanations, while essential, provide a partial explanation. In this respect, behavioral concerns, mainly managerial attention concerns, remain underexplored. Undertaking such an exploration requires opening the CVC *BlackBox*.⁸ Prior work on CVC has abstracted away from the CVC investment unit that performs the evaluation, selection, and integration.⁹ By detaching CVC investments from their organizing roots, organizational design matters that can affect decision-making have been critically understudied. For example, the overwhelming majority of studies that examined strategic outcomes through CVC investments studied the exit performance of portfolio companies instead (e.g., Alvarez-Garrido & Dushnitsky, 2016; Chemmanur et al., 2014; Gompers & Lerner, 2000; Hill et al., 2009; Hochberg et al. (2007); Ivanov & Xie, 2010).¹⁰ Alternatively, empirical studies in the CVC literature have prioritized the financial performance outcomes of portfolio companies.¹¹ This neglect is surprising as the CVC investment mode is widely conceptualized as an incumbent firm response to environmental disruptions caused by external enablers, which Davidsson (2015) describes as changes in external conditions such as technologies, demographics, and regulations. To address these gaps in the CVC literature, we build on previous scholarship and use the ABV to emphasize the antecedents and outcomes of

⁸ See Basu et al. (2016) and Souitaris & Zerbinati (2012; 2014) for notable exceptions.

⁹ Evaluation, selection, and integration are the key CVC investment unit processes that we study empirically in the dissertation. The first study investigates organizational factors that affect the elapsed time that particular opportunities are attended to during evaluation processes; the second study investigates organizational factors that affect the investment rate during selection processes; the third study investigates organizational factors that affect the transfer of outside-in knowledge from portfolio companies during integration processes. However, CVC investment units are also engaged in other activities that are outside the immediate scope of our studies. For example, CVC investment units are often involved in scouting opportunities and providing value-added services to portfolio companies after an investment decision is made.

¹⁰ The exit performance of portfolio companies would be more relevant to independent venture capital (IVC) investors, because exit events such as acquisitions and initial public offerings (IPO) are how IVCs generate a financial return for their limited partners. Even CVC studies that measure the innovation performance of incumbent firms as the dependent variable (firm innovativeness or value), use forward citation-weighted patent counts or Tobin's Q unassociated with the knowledge of portfolio companies (e.g., Belderbos et al., 2018; Dushnitsky & Lenox, 2002; 2005; Keil et al., 2008; Wadhwa et al., 2016; Yang et al., 2014). A notable exception with respect to the latter is Schildt et al. (2005), who do consider the knowledge of portfolio companies when assessing knowledge gains achieved by incumbent firms.

¹¹ There is a long tradition in the CVC literature of considering both the financial and strategic objectives of CVC investment units. We adopt the position that financial objectives help CVC investment units to survive politically, but that the overwhelming primary function of a CVC investment unit is to provide its parent firm with the means to achieve organizational renewal goals (i.e., strategic objectives). Every effort has been made to exclude CVC investment units that pursue financial objectives as their primary strategy from our empirical samples.

decisions and organizational moves made by CVC investment units. Each of our three empirical studies proposes a unique theoretical framework, which draws on key concepts and mechanisms found in the ABV literature.¹²

Study 1

In the first empirical study of the dissertation, we relied on a single-case study of a CVC investment unit at a major European bank, undergoing firm-wide digital technology renewal. We constructed a composite dataset of 1,047 external startups that were evaluated by the bank's CVC investment unit over a six-year period between 2014 and 2020. Prior literature implies that the CVC investment mode requires the evaluation of external opportunities in order to make investment selection decisions. However, the literature has never investigated empirically the composition of opportunity sets from which subsequent investment selection decisions are drawn. This is the first study, as far as we know, to empirically evaluate every opportunity a CVC investment unit has ever considered since its inception. We propose a theoretical framework in which a CVC investment unit's sustained attentional processing during its evaluation of opportunities is a function of interactions with certain players within key procedural and communication channels.¹³

To investigate these relationships, we consider the CVC investment unit's selective and sustained attentional processing, mainly how the CVC investment unit allocated more time to certain opportunities associated with particular players. We use Cox proportional hazard models using the elapsed time that the CVC investment unit is exposed to certain players. These patterns of attention marked preferences about what issues and answers are worth attending to. To execute this approach, we focus on the dyad of the external opportunity and player type as the unit of analysis. Our dependent variable measures the number of days the CVC investment unit

¹² Drawing on Ocasio (1997), the key principles in the dissertation are: focus of attention, situated attention, and the structural distribution of attention. The key ABV concepts in the dissertation are (related mechanisms in parentheses): environment of decision (environmental stimuli; cultural and institutional tool kits; environmental embeddedness), decision makers, issues and answers (embodiment of issues and answers), attention structures (rules of the game; players; structural positions; resources), procedural and communication channels (availability of issues and answers; salience of issues and answers), and organizational moves.

¹³ The evaluation of opportunities refers to processes that a focal CVC investment unit uses to determine whether a discovered opportunity is aligned with an incumbent firm's renewal goals. We take the view that opportunities, from the CVC investment unit perspective, are discovered and have some initial level of perceived favorability as a result of scanning and scouting the external environment, before more stringent evaluation processes occur. However, the level of perceived favorability can subsequently increase or decrease over time as a focal CVC investment unit commits time and effort in evaluating each opportunity for possible selection.

keeps opportunities in its opportunity sets before removing opportunities from an opportunity set. Our main relationship of interest (H1) examines the investment committee decision situation. The investment committee decision situation refers to whether opportunities proposed by the CVC investment unit for investment are perceived as favorable by the investment committee. Our empirical setting allows us to observe the effects of certain players on the allocation of sustained attention to certain opportunities.

We found that the CVC investment unit tends to reduce the number of opportunities that it attends to after a favorable investment committee decision. We also found that opportunities with prior experiences in salient knowledge areas are more likely to receive sustained attention from the CVC investment unit than opportunities that do not possess these knowledge resources. We also found that the CVC investment unit allocated more attention to internal scouting networks, although it simultaneously used both internal and external scouting networks. We answer the following research questions in the first study. *What are the attentional challenges confronting a CVC investment unit during its evaluation of external opportunities? Faced with ambiguity, how does the CVC investment unit selectively allocate sustained attentional processing to make sense of multiple players' differential and distributed valuations of issues and answers? Why does the CVC investment unit pay attention to particular players?* Our study sheds light on the role of attention during the evaluation of opportunities as particular players enhance a CVC investment unit's selective focus of attention on certain issues and answers.

Study 2

The second study shifts focus from the attentional concerns internal to the CVC unit to the interplay between attentional cues originating in the incumbents' external and internal environment (Levinthal & Rerup, 2006). One principal information channel that situates managerial attention in CVC units is their links with VC firms. Given that syndicate networks are the dominant institutional form through which investments in new ventures occur, they play a critical role in defining the context in which managerial cognition and action take place. Prior research suggests that VC syndicate networks serve as pipes for information on new opportunities. The manner in which managers attend to this information is also shaped by the internal environment, particularly the technological environment that influences the incumbents'

ability to cope with threats arising from new technologies emerging in the external environment. Prior work has not paid adequate attention to this interaction.

We propose a theoretical framework in which a CVC investment unit's investment rate is a function of the interaction between a CVC investment unit's access to external opportunities through relationships with independent venture capital firms (degree of centrality in co-investment syndicate networks) and the incumbent firm's ability to absorb external knowledge through the nature of its R&D activities (number of distinct technological areas). We argue that CVC investment units' selective attentional processing operates differently in technologically-concentrated incumbent firms in comparison to technologically-diversified incumbent firms.

We constructed a longitudinal, composite dataset of 209 CVC investment units operating in high-tech sectors between 1992 and 2011. Our dependent variable measures the number of investments each CVC investment unit made on an annual basis. We operationalize network positions using egocentric Bonacich eigenvector centrality that considers all co-investors and their alters.¹⁴ The *corporate technology focus* variable refers to the number of distinct technology classes that the incumbent firm has invested in. Based on a Herfindahl–Hirschman index measure, we computed the technological concentration of each incumbent firm, for each year it appears in the dataset. This empirical setup allows us to observe the effects of network characteristics of the CVC investment unit on the critical organizational move of investment selections.

We found that CVC investment units tend to invest more in external startups when they hold more prominent positions in co-investor syndicate networks. We also found that CVC investment units operating in more technologically concentrated areas are more likely to invest more in external startups. We also found that CVC investment units that hold stronger central network positions and operate in more technologically concentrated areas are more likely to invest more in external startups than CVC investment units with weaker central positions or more diverse technology areas. Our study sheds light on the role of attention drivers from incumbent firms' internal and external contexts affecting CVC investment unit rates.

¹⁴ In the first single-case study, we were able to obtain the full set of external opportunities ever evaluated by the CVC investment unit since its inception. However, data on opportunity sets is simply not available to conduct large scale empirical studies.

Study 3

While the first and second studies address the selection effects of evaluation (opportunity sets) and investment (investment sets), the third study addresses the treatment effects of investment sets or investment portfolios (external knowledge integration) on incumbent firms. Prior literature implies that the CVC investment mode is strategic in order to assist the incumbent firm in achieving organizational renewal. CVC scholars have pointed out that the overarching goal of CVC investment units is strategic rather than merely financial.¹⁵ However, the literature has rarely investigated empirically the conditions under which strategic gains can be made on behalf of the incumbent firm. We propose a theoretical framework in which the CVC investment unit's transfer of external knowledge from portfolio companies to the incumbent parent depends on the dynamics in the market conditions (times of increased technological ferment), the CVC unit's structural position (structural separation from the parent), and incumbent firms' knowledge positions (knowledge stock).

To investigate these relationships, we consider incumbent biopharmaceutical firms' internal R&D responses to exogenous shocks, mainly how the technological composition of an incumbent firm's investment portfolio affected its innovation response to unplanned shifts in market demand. We constructed a longitudinal, composite dataset of 210 CVC investment units and 882 portfolio companies operating in the biopharmaceutical sector between 2000 and 2018. We use a quasi-experiment that builds on difference-in-differences (DID) approach using the disruptions caused by Influenza A virus subtype H1N1 and Ebola Virus Disease (EVD) pandemics. These outbreaks marked unexpected shifts in the environment and market for technologies. To execute this approach, we focus on the dyad of the firm and technology area as the unit of analysis. Our dependent variable measures the number of times a given incumbent firm cites its portfolio companies in a given technology group in a given year (the data structure tuple is Incumbent Firm — Technology Group — Year). Our main relationship or treatment effect of interest (H1) examines the interaction between the *shock technology group* and *shock*

¹⁵ This claim is based on our reading of the academic literature on the CVC investment mode, and grounded in our extensive set of interviews with 100 CVC investment unit practitioners located in Europe and the US. However, we concede that ambiguity in the terminology exists, and that some purely financial results-driven actors also refer to themselves as CVC investment units. Ambiguity between pure financial and strategic actors was common in the archival data sources that we consulted, because these concepts are amalgamated by data providers. Every effort was made to manually remove pure financial cases from our samples in the three empirical studies presented herein. We aimed to retain and study CVC investment units that use financial instruments as a means to impact innovation outcomes for their parent organizations (technologies, markets, products).

period variables. The *shock technology group* variable refers to a specific cluster of technology groups as classified by the International Patent Classification (IPC) that are associated with the influenza A virus subtype H1N1 (A/H1N1) or Ebola Virus Disease (EVD). Our empirical setting allows us to observe the effects of CVC investment portfolio companies on the knowledge outputs of incumbent firms during times of increased technological ferment and CVC investments, thereby controlling for unobserved confounding factors.

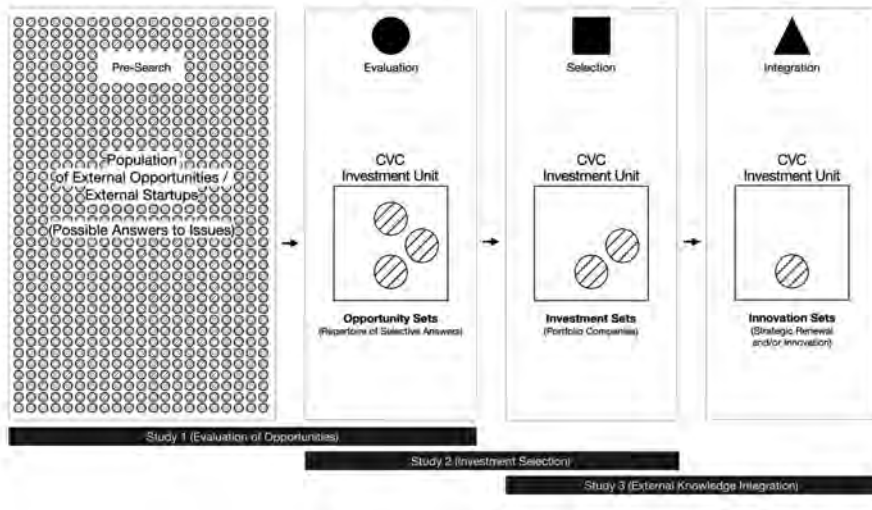
We found that incumbent firms tend to build on knowledge embedded in their investment portfolios to create new knowledge. We also found that CVC investors *structurally separated* from their respective incumbent firms are less likely to enable the outside-in knowledge build-up from their portfolio companies to generate new knowledge. We also found that incumbent firms with prior knowledge in the relevant technological areas (i.e., absorptive capacity) are more likely to use the external knowledge of their portfolio companies to create new knowledge. Our study sheds light on the role of attention in outside-in technology spillovers as relevant portfolio companies enhance an incumbent firm's selective focus of attention on particular technologies and markets as they become highly salient in the environment. We propose a complementary view in which an incumbent firm's ability to extend and delegate portions of absorptive capacity to its investment portfolio enhances an incumbent firm's noticing and reacting to environmental stimuli. This study is one of the few to empirically demonstrate the strategic value of a CVC investment unit's investment portfolio for an incumbent firm.

Implications

The manner in which CVC investment units attend to external opportunities should matter to practitioners and scholars alike. Because attention is a limited managerial resource, what selectively becomes attended to comes at the cost of what is not being attended to (Keil et al., 2004; Ocasio, 1997). Patterns of selective attention shape organizational moves and, subsequently, how the CVC investment mode functions. Such patterns may influence what external opportunities received more sustained attention during evaluation processes, how many investments were made during selection processes, and whether external knowledge from portfolio companies was brought into operation during integration processes.

Figure 2

CVC Investment Unit Search and Integration Activities & Dissertation Studies



Note: This figure depicts a partial view of the sequential chain of critical organizational moves undertaken by CVC investment units. CVC investment units *discover* external opportunities, *evaluate* external opportunities, *invest* in external opportunities, and *facilitate* the outside-in transfer and integration of external knowledge resources that help incumbent firms achieve strategic value from portfolio companies. The sequence also illustrates the path dependencies that accumulate over time or cascading effects of previous decisions, as the choices available in later moves depend on earlier decisions taken.

The set of organizational moves above is linked in a sequential chain of moves because the output of one move becomes an input into the next move and so forth. The ABV provides the lens to study what issues and answers are attended to inside incumbent firms and how the selective focus of attention results in a sequence of decision making that may appear stochastic or unexpected, misaligned with an incumbent firm’s agenda, or otherwise less than perfectly rational (rule-based).¹⁶ Systematic biases or random noise variances can exacerbate coordination challenges (Kahneman et al., 2021). Selective attentional patterns may not always result from

¹⁶ The attention-based view (Ocasio, 1997) is an extension of the Carnegie School perspective (March & Simon, 1958; Simon, 1947), which developed the concept of “*bounded rationality*” and exposed the limits to optimal decision making. The attention-based view builds on the concept of bounded rationality and puts forth the idea that strategic behavior is the result of the (deliberate or non-deliberate) focusing and channeling of attention.

controlled or automatic individual processing. Instead, they may emerge from players' complex social interactions that are often difficult to untangle using tractable analytical models that assume unlimited rationality. From a macro-policy perspective, capital allocation matters greatly because it affects what will be built and, therefore, the characteristics of future markets and, more generally, our futures (Sergeeva et al., 2022). Mallaby (2022), who is a senior fellow for international economics at the Council on Foreign Relations (CFR) in the USA, described venture capital as the “*third great institution of modern capitalism*” since it combines the strength of organizing with the flexibility of markets to provide a forcing function that mitigates complacency, obsolete scripts, or organizational inertia.

The chapters that follow delve into the attentional characteristics of CVC investment units that influence how incumbent firms conduct search for external knowledge and achieve adaptation. The next chapters of the dissertation are organized as follows. After the general introduction (this section), each of our three empirical studies is presented in a sequence that approximates the CVC investment unit's search process itself (see Figure 2): from the evaluation of opportunities (Study 1), and investment selection of opportunities (Study 2), to the integration of external knowledge from portfolio companies (Study 3). Each of our three empirical studies proposes a unique set of hypotheses on CVC investment units, uses the ABV to ground our hypothesis-based predictions, and applies various quantitative methodologies based on longitudinal datasets to statistically evaluate our hypotheses. These studies are not directly affiliated to one another — each study presents an independent, fully-developed empirical study, with detailed explanations of how our research studies were performed and what our findings are. Finally, our three empirical studies are followed by a general conclusion and bibliographic references.

Study One



EVALUATION

The Search for Renewal Fitness:
An Attention-based View

ABSTRACT

We analyzed the real-time construction of opportunity sets, curated by the corporate venture capital (CVC) investment unit of a major European bank over a six-year period, designed to accelerate the bank's digital transformation. An opportunity set is conceptualized as the constellation of external opportunities under evaluation at a given moment in time, where each opportunity within the set embodies a subjective assignment of favorability, until removed altogether by the CVC investment unit. We argue that the perception of favorability for any given opportunity depends on a network of attentional processes that involve distinct, yet, interdependent players. The attentional patterns that emerge from specialized players interacting through distinct procedural and communication channels to make collective sense of ambiguous stimuli, shape the firm's agenda and frame what constitutes an appropriate opportunity. The perceived favorability or renewal fitness of a given opportunity, is therefore contingent on how the CVC investment unit allocates attentional processing to multiple players with conflicting perceptions that need to converge. Drawing from the attention-based view (ABV), the sensemaking perspective and an empirical study of opportunity sets composed of software external startups, we develop and test a theoretical framework that identifies some of the key factors that explain the temporal allocation of attention in opportunity sets under construction. Using Cox proportional hazard models to analyze the CVC investment unit's allocation of sustained attention across opportunity sets, we observed the elapsed time or exposure that certain opportunities disproportionately received as a function of communication channels with certain players. We found CVC investment units allocated their sustained attention to fewer opportunities in subsequent opportunity sets after favorable investment committee decisions. We also found that CVC investment units selectively attended to external startups with the requisite capabilities to engage intrafirm players, and to scouting network players with greater external market saliency. However, we did not find statistical support for our premise that CVC investment units attend to business units associated with greater internal market saliency. These results demonstrate the focal role of CVC investment units to make coordinated efforts that attend to converging differing viewpoints on the valuation and legitimization of underlying opportunities during the evaluation situation. Our results highlight the importance in studying CVC investment units as concrete entities, endowed with distinctive features, that drive emergent social processes in order to achieve critical organizational actions during the evaluation of opportunities. The composition of opportunity sets matters, because these form the basis of future opportunity selection processes, which in turn determine the digital innovation opportunities that an incumbent firm will eventually act on to renew itself. Altogether, we focus on the antecedents of investment selection actions in the CVC investment context, and our results present an attentional view of CVC investment unit-level evaluation processes that the CVC literature lacked in the past.

INTRODUCTION

The diffusion of software technologies and the adoption of online services are disrupting the organization of traditional industries, coercing incumbent firms to undergo digital transformation through a renewal of capabilities. Some scholars have found that incumbent firms can survive if they refresh their attributes and invest in the relevant technologies (Agarwal & Helfat, 2009; Christensen et al., 1998; Kaplan, 2008a; Tripsas, 1997), despite new entrants attempting to displace incumbents. The probing for information on alternative processes and products that replenish the firm plays a significant role in firm evolution and adaptation. The probing involves searching for novel knowledge outside a firm's boundaries (Arrow, 1974; Cohen & Levinthal, 1990; Kortum & Lerner, 2000; Roberts & Berry, 1985; Shane, 2001; Tushman & Anderson, 1986).

Incumbent firms looking for answers to renewal challenges often turn to startups¹. A recent study found that 44 percent of incumbent firms undergoing digital transformation expect to source innovations related to digital technologies from external startups in the next five years, in contrast to one percent five years previously (Thompson et al., 2020). One organizational mode incumbent firms increasingly use to discover external startups that can assist with digital transformations is corporate venture capital (CVC) investments (Chesbrough & Tucci, 2002). The CVC investment mode can help identify strategically relevant early-stage software startups that “*offer a valuable window on technology, as it provides an effective means of scanning the environment for novel technologies that either threaten or complement core businesses*” (Dushnitsky & Lenox, 2006: 754).

The CVC investment mode is often organizationally driven by a CVC investment unit, which serves as a boundary-spanner between external and internal players (Basu et al., 2016; Souitaris, 2012, 2014). In this role, CVC investment units operate at the intersection of multiple information streams (Aguilar, 1967; Burt, 2004; Dollinger, 1984; Tushman & Scanlan, 1981).

¹ Startups refer to external startups, which are considered to be opportunities for a focal CVC investment unit. Opportunities in our study are initially considered to be “*discovered*” from a CVC investment unit's perspective, because external startups pre-exist as objective, independent entities in the environment that are potentially discoverable by any third-party actor. Furthermore, opportunities reflect some degree of favorability assigned by the focal incumbent firm that we studied (Davidsson, 2015). Because we analyze external startups that have made it into the CVC investment unit's shared database, this suggests that at least one member of the CVC investment unit considered a focal external startup to be a potential candidate for subsequent evaluation based on his/her understanding of the bank's renewal goals, and if all went well during more intense evaluation, as a potential candidate for subsequent CVC investment.

They conduct information processing, i.e., inform, update, and exchange knowledge with distinct players that occupy specialized functions — a demanding task owing to its distribution across distinct players (Burt, 2004; Dahlander et al., 2016; Obstfeld, 2005). When faced with ambiguous problems, CVC investment units engage in sustained attentional processing, pooling divergent perspectives and arriving at a more comprehensive picture of the issues and answers (Bower, 1972; Kaplan, 2008a; Knight, 1965; Seidl & Werle, 2018).² The convergence of structurally distributed viewpoints is needed for the CVC investment unit to conduct a renewal fitness evaluation of opportunities in preparation for possible subsequent investment selection.³ Such evaluation is a critical event in the investment process because it represents the decisive governance mechanism regulated by a CVC investment unit that determines what opportunity is permitted to penetrate the incumbent firm’s attentional sphere and for how long.⁴

Nevertheless, the evaluation and portfolio construction process has not received much attention in the CVC literature.⁵ This paucity of studies reflects a strong bias in the CVC literature to examine investment transactions and outcomes at the entire firm level or at the portfolio company level, rather than examining the investment selection and portfolio construction process. Moreover, as a corollary, the CVC investment unit has been relegated to an abstract entity indistinct from the parent incumbent firm, thus ignoring the emergent social processes involved. Notable exceptions are inductive studies by Basu et al. (2016) and Souitaris (2012; 2014), who investigated the role of CVC investment units in regulating internal and external environments through social and institutional processes.

Our goal in this paper is to open the blackbox of the CVC investment process. Our premise is that CVC units are boundedly rational with limited information processing capacity

² This refers to the CVC investment unit’s network of attentional processing of issues and answers, which occurs through distinct procedural and communication channels with distinct, yet, interdependent players.

³ The CVC investment context is characterized by mixed-motive games, in which the goals of the players are partially coincident and partially in conflict (Gallo & McClintock, 1965).

⁴ We refer to the evaluation situation in which opportunity sets are an observable feature of CVC investment behaviors. We conceptualize an opportunity set as the constellation of opportunities under evaluation by the CVC investment unit at a given moment in time (t), where each opportunity within the set embodies a subjective assignment of favorability until removed altogether by the CVC investment unit. This evaluation process operates before an investment decision is rendered for any given opportunity.

⁵ In relation to venture capital, external startups can be invested in by either independent venture capital (IVC) firms or corporate venture capital (CVC) units, or both IVC and CVC. It is an industry practice to refer to an external startup as a “*portfolio company*” once a venture capital investment of either type has been made. However, our study focuses on processes that occur before CVC investments are made, and focuses on external startups that are under evaluation by the CVC investment unit. Although it is the case that some external startups received an investment from an IVC before being evaluated by the focal CVC investment unit, we still refer to all opportunities in the opportunity set as either “*opportunities*” or “*external startups*” from a CVC investment unit’s perspective.

and scarce attentional resources but are confronted by ambiguity in assessing investment opportunities. Accordingly, we focus on the factors that shape the attention of CVC units to investment opportunities. The question we ask is how does a CVC investment unit selectively allocate sustained attentional processing to make sense of multiple players' differential and distributed valuations of issues and answers? Addressing this question requires us to consider the attentional demands when evaluating external opportunities and the implications for behavior.

We developed a theoretical framework based on the attention-based view (ABV) and sensemaking perspectives. We drew on Ocasio's seminal work as well as the following developments (Ocasio, 1997; Ocasio et al., 2018). This view explains the structurally and situationally distributed social attentional processes. Furthermore, we complement this view with sensemaking perspectives that explain the enactment through social cognition. Our theoretical framework centers around the idea that CVC investment units work with particular players through discrete communication channels to make sense of the different valuations and legitimization of external opportunities that are structurally distributed. We suggest that by orchestrating the sensemaking of an ambiguous firm agenda, the CVC investment unit performs its function of aligning multiple players to construct the investment opportunity set for driving organizational renewal.

To conduct an in-depth analysis of the portfolio construction process, we focused on the CVC unit of a single firm.⁶ We examined how a single CVC investment unit at a major European bank, undergoing digital transformation, evaluated opportunities sourced from outside the focal bank's boundaries. When the bank underwent a disruptive digital transformation in response to substantial changes in technology and customer demand, the internal and external players key to the evaluation situation each held idiosyncratic views on the bank's renewal goals. Using the bank's opportunity sets, composed of sequentially discovered opportunities, we analyzed the

⁶ We studied one major European bank, and analyzed multiple opportunity sets over a six-year period. In the context of our study, the CVC investment unit conducts search activities to fulfill the renewal goals of the focal organization. Each financial quarter comprised its own opportunity set of incoming and outgoing external startups, under consideration for CVC investment, which also coincided with scheduled investment committee meetings per quarter. Each opportunity set is conceptualized as a shared team device used to align CVC investment unit team members on day-to-day tasks during the evaluation situation. The opportunity set reflects a subjective assignment of favorability for each external startup it contains, until an external startup is removed by the CVC investment unit. The increased coherence between an external opportunity and internal innovation objectives (external startup-incumbent firm dyad) refers to an opportunity's renewal fitness, which results from a convergence process that is driven by the development of shared meaning across multiple, distributed players. Any external startup in an opportunity set that is perceived to have a level of renewal fitness below a certain threshold, is removed from the CVC investment unit's current opportunity set.

CVC investment unit's allocation of sustained attentional processing to issues and answers concerning renewal goals.

We examined how the CVC unit worked to achieve the convergence of multiple players' perspectives on issues and answers associated with the bank's renewal goals. Each player and corresponding procedural and communication channel operates distinctly to achieve valuation and legitimacy, resulting in particular external startups within the CVC investment unit's opportunity set becoming targets of more sustained evaluation by a CVC investment unit during the evaluation situation. We tracked the length of time a specific investment opportunity is deemed a potential investment before it is abandoned or advanced. We use this duration as a proxy for the attention dedicated to a new opportunity. In our hypotheses, we linked this duration to distinct players that the CVC investment unit needs to interact with to develop an assessment of a potential opportunity.

We found that CVC investment units allocated their sustained attention to fewer opportunities for the next three opportunity sets after favorable investment committee decisions.⁷ We also found that CVC investment units selectively attended to external startups with requisite capabilities to engage intrafirm players. However, we did not find statistical support for our premise that CVC investment units selectively focused on scouting network players with greater external market saliency or attended to business units with greater internal market saliency. These results demonstrate CVC investment units' focal role in making coordinated efforts that attend to differing viewpoints on the valuation and legitimization of underlying opportunities during the evaluation situation. Our results highlight the value of studying CVC investment units as concrete entities endowed with distinctive features that drive emergent social processes to achieve critical organizational actions.

⁷ From the vantage point of the investment committee, which is conceptualized as the decisive decision-maker in our study, we define renewal fitness as an opportunity's degree of alignment with the firm's agenda or renewal objectives. Although different players may each have their own subjective perceptions on the renewal fitness of a given external opportunity, we consider the ultimate evaluation of renewal fitness to be made by the investment committee and communicated to others through its investment decision. In this manner, renewal fitness represents to some degree an objective reality held by the investment committee for which accuracy can be measured. So, a CVC investment unit can be said to have a low rate of accuracy when none of its investment proposals are accepted by the investment committee. However, a rational view of renewal fitness is incomplete, because the investment committee itself may be divided, may hold an idiosyncratic interpretation of the firm's agenda that is not accurate, and because it learns over time and changes its thinking based on inputs from multiple players including the CVC investment unit.

This study aims to reconceptualize strategic fit in the CVC investment context beyond deterministic economic traits and considers the behavioral antecedents. In addition to knowledge itself, the collective beliefs on applying such knowledge inside the incumbent firm appear to be of significant importance in the CVC investment context, where appreciable schisms can separate external and internal environments. We need to consider that players' perception of the incumbent firm's renewal agenda and the renewal fitness of an individual opportunity vary accordingly. Differing viewpoints on renewal fitness are partially resolved through emergent social processes to make sense of ambiguous agendas in a complex network of distributed yet interdependent players.

The chapter is organized as follows. It begins with an explanation of opportunity sets and other key concepts in relation to the attention-based view (ABV) and sensemaking perspectives. Then, we propose four hypotheses to theorize on the key players and communication channels that participate in the CVC investment unit's network of attentional processes. Next, we present a detailed narrative of our setting in the European Banking sector, in which we introduce the key players, the key search processes, and the role of opportunity and investment sets. After that, we explain our Cox proportional hazard model methodology and statistical results for each hypothesis. Finally, we discuss our key findings and contributions, and provide recommendations for future studies that address the limitations of our study.

RESEARCH BACKGROUND

Opportunity Set Construction: The ABV & Sensemaking Perspectives

Although CVC investments have not come under focus using the attention-based view (ABV), ABV scholars argue that attentional concerns are central to understanding strategic change -- the principal goal of CVC investments. We focus our theoretical development on how members of corporate venture capital (CVC) investment units allocate attention to particular players and communication channels, using ABV and sensemaking perspectives.

The ABV contemplates firm strategy as a pattern of organizational attention, the distinct focus of time and effort by the firm on a particular set of issues (problems, opportunities, and threats) and on a particular set of answers or action alternatives (Ocasio, 1997). An incumbent

firm's strategic agenda for change can be viewed as both forward-looking and backward-looking. It emerges from managers' selective patterns of attentional processing of certain issues and answers. At the core of the ABV is the view that managerial attention is limited and, therefore, must necessarily be selectively directed at particular resources (Cassiman & Ueda, 2006; Ocasio & Joseph, 2005; Penrose, 1959).⁸ Accordingly, "*decision-makers selectively restrict their attention to a limited set of stimuli in the complex environment of action, while ignoring others*" (Ocasio, 1997: 200). By limiting communication and information, bounded rationality prevents an evaluation of all available options (Cyert & March, 1963). As a result, decision-makers invariably focus their attention on particular issues and action alternatives. The attention-based theory allows us to understand better how a firm's strategic agenda is a function of selective choices that are either deliberate or unintentional (Ocasio & Joseph, 2008). These selective choices explain a firm's strategic decision-making and adaptation and can facilitate or impede strategic change (Ocasio et al., 2018). Structurally distributed inside and outside incumbent firms, players occupy particular social positions with specialized functions and interact with other players through procedural and communication channels to achieve collective action (Joseph & Gaba, 2020; Joseph & Ocasio, 2012; Shepherd et al., 2017).⁹ However, because the structural distribution of players coincides with the structural distribution of attention, collective action is not a straightforward matter.¹⁰ Players differ in their valuation and legitimization of issues and answers. Depending on the frequency or probability of recurrence, issues shape the dyadic interactions with other players (Ocasio, 1997; Tversky & Kahneman, 1974).

The CVC investment process is a complex organizational activity requiring internal and external players to collaborate with the CVC investment unit in distinct procedural and communication channels. Players confront differing valuations of issues and answers. These discrepancies need resolution for making organizational moves that advance the evaluation situation.¹¹ We refer to an evaluation situation as an assorted sequence of CVC investment unit

⁸ The selective focus of attention thus constitutes a dynamic managerial capability that can occur at an individual or unit level, and is capable of shaping organizational adaptation (Eggers & Kaplan, 2009).

⁹ Each of these players is implicated in CVC investments in some important fashion. This is analogous to the stakeholder concept. A stakeholder is defined as "*any group or individual who can affect or is affected by the achievement of an organization's purpose*" Freeman (1984: 53).

¹⁰ Subunits in the incumbent firm have distinct functions and possess diverse goals, yet they must cooperate in relation to a shared task environment (Cohen, 1984; Greve & Gaba, 2017; Hu & Bettis, 2018; March & Simon, 1958).

¹¹ The concept of organizational moves draws from the attention-based view (ABV), and refers here to critical actions that a CVC investment unit takes in concert with key internal and external players.

tasks enacted after opportunities are first discovered until opportunities are either selected for investment or removed. These tasks are distributed across multiple channels that involve unique combinations of player dyads. The specific collection of tasks is unique to each procedural and communication channel, which is analogous to the concept of situations in the ABV literature. Attention is not only distributed, but channels provide situational contexts in which players interact with the CVC investment unit to perform CVC investments collectively.

Two essential facets of the evaluation situation are that external opportunities remain in flux and that CVC investment unit managers operate their day-to-day activities through a shared organizational repository. The shared organizational repository of information provides a real-time view of the CVC investment unit's opportunity set. We conceptualize an opportunity set as the constellation of opportunities under evaluation by the CVC investment unit at a given moment in time (t_i); each opportunity within the set embodies a subjective assignment of favorability until removed altogether by the CVC investment unit. CVC investment units construct and curate opportunity sets through their organizational moves as a function of attentional patterns that emerge in procedural and communication channels.

While the attention-based view illustrates the potential of selection and distribution of attention to shed light on how opportunity sets are shaped in the CVC investment context, the sensemaking perspective highlights certain social processes that players engage in to achieve shared convergence on certain issues and answers (Weick, 1995; Weick et al., 2005). Players engage in sensemaking and sensegiving activities to converge varying interpretations for collective organizational action.¹² A few scholars have recently advocated linking the ABV and sensemaking perspectives (e.g., Nigam & Ocasio, 2010; Ocasio et al., 2018) because the ABV offers a structural viewpoint and the sensemaking perspective offers a socialized view.

Sensemaking is conceptualized to be triggered by disruptive ambiguity or chaos wherein new meaning is needed to explain unexpected raw stimuli sufficiently for joint action (Maitlis & Christianson, 2014). New meaning is constructed from systemic social processes taking place in procedural and communication channels, in which distributed players communicate to form interpretations that emerge from interdependent interactions. Players repeatedly interact to

¹² We do not imply that full consensus on the perceived favorability of an opportunity needs to be reached by all players, as Eisenhardt (1989) pointed out. Sensemaking and sensegiving are often theorized at the individual level, but the outcomes of these social cognitive processes can be applied to more abstract, aggregate levels of organizational actions.

process information and compete over interpretations in “*arenas for sensemaking*” (Nigam & Ocasio, 2010; Ocasio et al., 2018).

Whereas sensemaking refers to concerted efforts to understand unexpected stimuli, sensegiving refers to “*the process of attempting to influence the sensemaking and meaning construction of others toward a preferred redefinition of organizational reality*” (Gioia & Chittipeddi, 1991: 442). The organization’s top level is where sensegiving often emanates from and where sensemaking often converges (Daft & Weick, 1984; Nadkarni & Barr, 2008).¹³ In the CVC investment setting, the top levels of the incumbent firm are often represented on investment committees or similar governance mechanisms that select investments proposed by the CVC investment unit and possess authority over policies and incentives that effectively control the CVC investment unit.¹⁴ Formal hierarchy plays an important role in aligning renewal goals (Galunic & Eisenhardt, 2001; Joseph & Gaba, 2020). However, what constitutes an opportunity’s renewal fitness is fraught with ambiguities because interpretations of what answers should look like are inconsistent (Kaplan & Tripsas, 2008; Rerup 2009). We thus conceptualize renewal fitness as an opportunity’s degree of alignment with the firm’s agenda or renewal objectives.¹⁵

In what follows, we focus our theoretical development on how members of a focal corporate venture capital (CVC) unit allocate attention to particular players and communication channels during the evaluation situation. The particular set of issues and action alternatives made available to the investment committee are a function of structural and contextual attentional features of the CVC investment unit. We build on prior quantitative work on the ABV such as

¹³ Subunits at lower organizational levels also engage in sensegiving practices such as “*framing contests*,” for example (Kaplan, 2008). However, in the CVC investment context higher levels of the organization effectively regulate the winning frame, because they have the authority to render investment and other key resource allocation decisions.

¹⁴ The CVC investment unit’s search activities culminate in a series of decisions made by the investment committee. The investment committee embodies the organization’s renewal goals, and what it attends to may not be evenly distributed across a complex, multi-divisional organization. We refer to an actual investment committee in our study, but the concept can be extended to any person or groups of persons who meet the following criteria: (a) enjoys proximate access to the wider board of directors and/or CEO, and (b) controls the disbursement of a CVC investment unit’s financial investment capital resources.

¹⁵ Although different players may each have their own subjective perceptions on the renewal fitness of a given external opportunity, we conceptualize the ultimate evaluation of renewal fitness to be made by the investment committee and communicated to others through its investment decision. In this manner, renewal fitness represents to some degree an objective reality held by the investment committee for which accuracy can be measured. So, a CVC investment unit can be said to have a low rate of accuracy when none of its investment proposals are accepted by the investment committee. However, a rational view of renewal fitness is incomplete, because the investment committee itself may be divided, may hold an idiosyncratic interpretation of the firm’s agenda that is not accurate, and because it learns over time and changes its thinking based on inputs from multiple players including the CVC investment unit.

Eklund and Mannor (2021) and inductive work on CVC investments units such as Basu et al. (2016) and Souitaris et al. (2012; 2014). In particular, we build on prior work considering the CVC investment unit (e.g., Basu et al., 2016; Hill et al., 2009; Keil et al., 2008; Tang et al., 2009; Wright & Lockett, 2003). For example, Souitaris and Zerbinati (2014) examined how CVC investment units engage with the incumbent firm by evaluating opportunities for strategic fit apart from financial return and linking opportunities to existing organizational resources and capabilities. In addition, recent studies have examined how CVC investment units look for a strategic fit between external startups and the focal corporate firm (Basu et al., 2016; Dushnitsky & Lenox, 2005; Keil et al., 2008; Wadhwa & Basu, 2013). Building on concepts found in the attention-based view (ABV) and sensemaking perspectives, we propose four hypotheses in the next section about how time and effort is directed at particular external startups in a CVC unit's opportunity sets. We develop a framework about how investment committees (H1), external startups (H2), independent venture capitalists (H3), and business units (H4) drive attentional allocation to specific external startups during opportunity set construction in an incumbent firm.

HYPOTHESES

From the CVC investment unit's perspective, the evaluation situation involves a set of interdependent internal and external players who interact and communicate with the CVC investment unit through dedicated procedural and communication channels. We examine how each type of player interacts with the CVC investment unit in a distinct dyadic procedural and communication channel in which sustained attentional processing is allocated to certain issues and answers. We draw on concepts from the attention-based view (ABV) and sensemaking perspectives to better understand how players' interactions with the CVC investment unit can shape incumbent firms' opportunity sets.¹⁶ We define an opportunity set as the collection of

¹⁶ We analyzed the CVC investment unit's sustained attentional processing on multiple opportunity sets over a six-year period at a single bank. An opportunity set represents a moment in time — each financial quarter comprises its own opportunity set of incoming and outgoing external startups, under evaluation for CVC investment, which also coincided with scheduled investment committee meetings per quarter. An opportunity set is conceptualized as a shared team device used to align CVC investment unit team members. Each opportunity set constitutes the constellation of opportunities under evaluation by the CVC investment unit at a given time(t), where each opportunity within the set embodies a subjective assignment of favorability until removed altogether by the CVC investment unit. As long as an opportunity is either not removed or invested in, it travels from opportunity set to opportunity set.

external opportunities under evaluation by a focal CVC investment unit at a given moment in time.¹⁷

We first examine how a CVC investment unit at a major European bank “*learns*” the organization’s ambiguous agenda by observing investment committee decision feedback and adjusts its allocation of sustained attentional processing accordingly (*H1—investment decision situation*).¹⁸ We then examine how the focal CVC investment unit’s interaction and communication with external startups (*H2—knowledge saliency situation*), scouting networks (*H3—external market saliency situation*), and business units (*H4—internal market saliency situation*) allocate its sustained attentional processing to certain issues and answers.¹⁹ Each of these players occupies a unique structural position, is involved in crucial evaluation tasks in coordination with the CVC investment unit (i.e., situations), and shapes a CVC investment unit’s opportunity sets through distinctive attentional processing of issues and answers. From the CVC investment unit perspective, the evaluation situation has no “*collective mind*”; instead, it has at least four distributed situations that require coordination and communication with multiple decision-makers and players.²⁰ Our theoretical framework helps explain how a CVC investment

¹⁷ Opportunities here are initially considered to be “*discovered*” from a CVC investment unit’s perspective, because external startups pre-exist as independent entities in the environment that are potentially discoverable by any third-party actor. Furthermore, opportunities here reflect some degree of favorability assigned by the focal incumbent firm that we studied (Davidsson, 2015). Because we analyze external startups that have made it into the focal CVC unit’s shared database, this suggests that at least one member of the CVC investment unit considered a focal external startup to be a potential candidate for subsequent evaluation based on his/her understanding of the bank’s agenda or renewal goals. We argue that the longer the evaluation situation lasts for an individual opportunity, the more a discovered opportunity becomes jointly authored through procedural and communication channels, in which players interact and communicate to collectively create new meaning. If all goes well during more intense evaluation, an opportunity may become a potential candidate for subsequent CVC investment selection by the investment committee.

¹⁸ According to the attention-based view (ABV), the issues faced by the incumbent firm constitute the problems that make up the agenda of the firm. Specifically, the agenda here refers to the renewal goals of the bank under digital transformation. The bank is conceptualized to engage in “*agenda-building*”, since organizational renewal goals are continually refreshed (Dutton, 1986; Ocasio, 1997). Ambiguity refers to a lack of clarity that can usually be resolved through action, as conceptualized by Brown et al. (2015). Therefore, a CVC investment unit can retrospectively gain clarity on the incumbent firm’s previous goals through investment committee decisions to reduce ambiguity, but a CVC investment unit’s ability to divine the future goal direction of the firm remains highly uncertain and therefore, the future direction is deemed to be always ambiguous.

¹⁹ Rerup (2009) discussed the role of attentional stability and sustained attention to issues, which improves accuracy in scanning, noticing, encoding and interpreting issues over time.

²⁰ The evaluation situation refers to the CVC investment decision-making context in which opportunities are evaluated, so that selective investment decisions can be made subsequently. The concept of situation is based on the attention-based view (ABV) in which organizational actors find themselves situated in particular decision-making contexts and attention structures that exhibit certain rules, players, positions and resources (Ocasio, 1997: 188; 195-198). During the evaluation situation, the CVC investment unit’s key tasks are to: discover opportunities (external startups) that align with the firm’s agenda, establish co-investor relationships with independent venture capitalists (IVC), match external opportunities to internal business units, and propose selective investment

unit adapts its evaluation behavior as a function of complex social interactions affecting the attentional processing of issues and answers. This approach contrasts with those focusing only on the underlying characteristics of an opportunity or its strategic fit to an incumbent firm.²¹

Investment Decision Situation

We first focus on the effects of the incumbent firm's investment committee actions in shaping the attentional processing of the CVC unit when evaluating new opportunities.²² In the evaluation situation, both the CVC investment unit and the investment committee possess the decision-making power to make certain organizational moves. The CVC investment unit has the autonomy to scan the environment for discoverable opportunities, introduce opportunities to business units, evaluate opportunities, and either remove opportunities from further consideration or selectively propose certain opportunities to the investment committee. The latter represents an extraordinary decision-making power because the investment committee only learns about certain opportunities that the CVC investment unit makes known through selective investment proposals. Each of these organizational moves occurs independently of the investment committee, but the investment committee's organizational moves highly circumscribe a CVC investment unit's degree of autonomy. The investment committee furnishes critical search boundaries that a CVC investment unit has to make sense of on an ongoing basis.

The investment committee engages in at least three sensegiving practices for the CVC investment unit during the evaluation situation:²³

opportunities to the investment committee in alignment with the incumbent firm's agenda or renewal goals. The evaluation situation is time-consuming and time is a limited resource, so CVC investment units must selectively direct their attention to certain issues and answers, at the expense of other issues and answers that are ignored.

²¹ We adopt the attention-based view (ABV), where individual and organizational attention are less a function of individual traits than a function of how attention is distributed across many players, who occupy unique social positions, and situated across varied social contexts. We apply this to the CVC investment context to demonstrate how a CVC investment's unit evaluation of an opportunity, is as much a result of complex, subjective social interactions as it is a result of an opportunity's objective underlying traits or seemingly rational strategic fit with an incumbent fit.

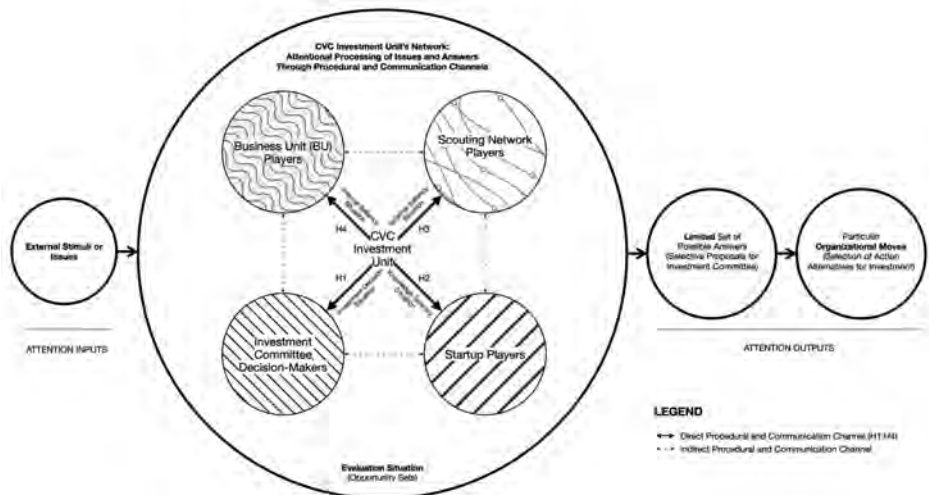
²² We refer to an actual investment committee in our study, but the concept can be extended to any person or groups of persons who meet the following criteria: (a) enjoys proximate access to the wider board of directors and/or CEO, and (b) controls the disbursement of a CVC investment unit's financial investment capital resources.

²³ We refer to Gioia and Chittipeddi's (1991) conceptualization of sensegiving, as a sensemaking variant undertaken to create meaning for a target audience. Sensegiving is defined as "*the process of attempting to influence the sensemaking and meaning construction of others toward a preferred redefinition of organizational reality*" (Gioia & Chittipeddi, 1991, p. 442). See Weick et al. (2005) for a detailed explanation.

1. Communicate the incumbent firm’s agenda to the CVC investment unit before the search begins.
2. Evaluate the renewal fitness of opportunities selectively drawn from a CVC investment unit’s opportunity set at a particular time.
3. Decide whether or not to make the ultimate organizational move in the evaluation situation by taking investment action on any proposed action alternatives.

Figure 1

CVC Investment Unit’s Network of Attentional Processing



Note: This figure depicts how a CVC investment unit regulates the attentional processing of specific issues and answers through interdependent procedural and communication channels, in which a player interacts and communicates with the focal CVC investment unit. The immediate outcome of a CVC investment unit’s attentional processing during the evaluation situation, is a limited set of possible answers that are communicated to the investment committee in the form of selective investment proposals. The investment committee subsequently makes an organizational move and takes action by either selecting an opportunity to invest in, or by refusing any or all of the investment proposals. The scope of our study refers to the large circle, in which the CVC investment unit interacts and communicates with a set of key players in the CVC investment context, through dedicated channels, that shape opportunity sets. An

opportunity set represents a moment in time, and constitutes the constellation of opportunities under evaluation by the CVC investment unit.

Although these are distinct practices, we combine the last two sensegiving practices because the investment committee's investment decision correlates with evaluating an opportunity's renewal fitness. From the vantage point of the investment committee, we conceive of renewal fitness as an opportunity's degree of alignment with the firm's agenda or renewal objectives.²⁴ The CVC investment unit tries to make sense of the investment committee through a dedicated procedural and communication channel, in which the CVC investment unit (1) first receives information concerning the content of an incumbent firm's agenda used to scan the environment; (2) then obtains informational feedback through investment committee decisions on the renewal fitness of opportunities that it proposes to the investment committee. In this dedicated channel, the investment committee is the primary decision-maker influencing the CVC investment unit and its attentional processing. Every opportunity the CVC investment unit "*discovers*" embodies a minimum level of favorability about the incumbent firm's agenda, subjectively determined. The CVC investment unit perceives the alignment between each opportunity and the firm's agenda. Nevertheless, there are subjective differences in perception between players/decision-makers, and the firm's agenda is often ambiguous. Differences in perception can partly arise from the varied structural positions that decision-makers and players occupy. The investment committee, whose members occupy senior executive positions, is in close contact with the highest levels of strategy making and has a broad overview of the incumbent firm's issues and answers.

The CVC investment unit occupies a structural position in the incumbent firm that is further removed from the board of directors and therefore is likely to hold a different valuation and legitimization of issues and answers than the investment committee.²⁵ Different parts of the

²⁴ Although different players may each have their own subjective perceptions on the renewal fitness of a given external opportunity, we conceptualize the ultimate evaluation of renewal fitness to be made by the investment committee and communicated to others through its investment decision. In this manner, renewal fitness represents to some degree an objective reality held by the investment committee for which accuracy can be measured. So, a CVC investment unit can be said to have a low rate of accuracy when none of its investment proposals are accepted by the investment committee. However, a rational view of renewal fitness is incomplete, because the investment committee itself may be divided, may hold an idiosyncratic interpretation of the firm's agenda that is not accurate, and because it learns over time and changes its thinking based on inputs from multiple players including the CVC investment unit.

²⁵ The specialized function and social position of each decision-maker and player, according to the attention-based view (ABV), drive the structural distribution of attention and variation in the valuation of issues and answers.

organization attend to different issues and answers, perceiving the same information about renewal goals differently (Crilly & Sloan, 2014; Joseph & Wilson, 2018). Senior executives anticipate these perceptual differences and engage in multiple sensegiving activities to guide thinking and communicate search boundaries to the CVC investment unit. Sensegiving materializes as a series of in-person meetings, email discussions, and often the written codification of what constitutes “*appropriate*” issues and answers.²⁶

The provision of frames regarding the organization’s renewal goals are formulated by senior executives (Jacobides, 2007; Joseph & Wilson, 2018) and codified into a firm’s agenda. The firm’s agenda is designed to align multiple and diverse organizational subunits. This is analogous to the attention-based view’s concept of agenda, expressed as a “*repertoire of issues*” confronting the incumbent firm that decision-makers respond to with codified search rules. Although issues can serve as a script for search action to discover appropriate opportunities as answers, the agenda is often ambiguous and requires subjective interpretation. In order to evaluate opportunities on their appropriateness relative to the firm’s agenda, a CVC investment unit must first make sense of the organization’s renewal goals. The absence of clarity in the formal agenda results in the need for the CVC investment unit to engage in sensemaking to selectively interpret the intentions of the investment committee and conduct certain evaluation actions that correspond with its interpretation. The license for each subunit to frame organizational issues and answers in a distinctive and highly interpretive manner is somewhat at odds with the primary organizing function of the firm’s agenda and associated search rules.

One of the key sensemaking mechanisms for the CVC investment unit in this procedural and communication channel is the investment decision situation, which repeats in either scheduled or spontaneous intervals.²⁷ After the CVC investment unit discovers an opportunity

²⁶ See March (1970; 1983) and Zucker (1983) on “*appropriate rules*” in incumbent firm decision making. We obtained the codified search rules used by the focal bank in our study, which is described in the background context section in detail before the methods section. The CVC literature has not previously studied the sociomateriality of CVC investment unit documents, as far as we know.

²⁷ The focal decision situation is the investment committee decision of whether or not, at a specific point in time, to invest in an external startup proposed by the CVC investment unit. The decision making that characterizes regular quarterly investment committee meetings, communicates the investment committee’s renewal fitness perceptions at a given point in time. The investment committee decision, therefore, represents valuable feedback to the CVC investment unit regarding its alignment on renewal fitness. We concede that an investment committee may not have an accurate reading of the incumbent firm’s actual renewal goals. So, its investment decisions may be a poor measure of actual renewal fitness. However, it is positive reinforcement from the investment committee that offers the CVC investment unit confirmatory evidence that it possesses a sufficiently clear and updated representation of the organization’s latest renewal goals. It is the positive reinforcement, not the actual accuracy that matters in the end. The CVC investment unit will look primarily to the investment committee to make sense of the firm’s agenda,

that it believes to be favorably aligned with the firm's agenda, it continually reassesses the opportunity's degree of renewal fitness through various procedural and communication channels. If the CVC investment unit eventually deems an opportunity to exhibit low renewal fitness, then it will likely remove the opportunity from the opportunity set. However, if the CVC investment unit eventually deems an opportunity to exhibit high renewal fitness, then it will likely offer it as an investment proposal to the investment committee.²⁸ From the CVC investment unit's perspective, the investment proposal constitutes an important organizational move and represents a dual form of sensegiving and sensemaking. The CVC investment unit makes an effort to influence the investment committee by establishing the strongest case possible for investing in the proposed opportunity (sensegiving). Yet, the CVC investment unit is likely to propose an opportunity that it considers to have the highest renewal fitness with the incumbent firm's agenda (sensemaking). The investment committee responds to the CVC investment unit's organizational move by making its own organizational move in turn. The investment committee has the decision-making authority to choose whether or not to invest in a particular opportunity that the CVC investment unit has proposed.

The investment decision situation plays out during a formal investment committee meeting. It constitutes a "*sensegiving arena*" where the investment committee enforces the search rules associated with the incumbent firm's agenda. Moreover, a favorable decision to invest from the investment committee signals to the CVC investment unit that its proposal is congruent with the firm's agenda. An unfavorable decision to invest from the investment committee signals to the CVC investment unit that its proposal is incongruent with the firm's agenda. Therefore, the investment committee decision situation offers the CVC investment unit some indication of the perceptual gap between the two players about the saliency of certain issues and answers and offers some clarity on the search rules associated with the firm's agenda.²⁹ These signals decay over time because the investment decision situation repeats itself.

because the investment committee is typically the most proximate access that the CVC investment unit has to the wider board of directors and/or CEO, and because the investment committee controls the disbursement of a CVC investment unit's financial investment capital resources.

²⁸ Based on our interviews with the bank, we learned that approximately 10 percent of startups in the opportunity set received the highest level of evaluation. This level of selectivity confirms that intensive evaluation is a rare resource that must be thoughtfully directed at a particular subset of startups in an opportunity set. The CVC investment unit's awareness of such constraints motivates it to become proficient in learning the investment committee's own subjective perception of the firm's agenda, and by extension, that of an individual opportunity's renewal fitness.

²⁹ We use salience/saliency and relevance/relevancy interchangeably in the dissertation, although there has been considerable debate in the marketing and psychology literatures on whether and how these concepts may differ. We

The investment committee search rules can unexpectedly change over time, between periods when it interacts with the CVC investment unit. The investment decision situation recurs through regularly scheduled or spontaneous investment committee meetings. The investment committee often updates the incumbent firm's agenda and associated search rules based on new inputs from multiple players through indirect procedural and communication channels.³⁰ However, based on the occasional communication between the CVC investment unit and the investment committee, the CVC investment unit rarely has access to these emergent and dynamic cognitive updates until the next investment decision.³¹

The periodic “*surprise*” that accompanies an unfavorable investment decision situation triggers even more allocation of time and effort to attend to sensemaking by the CVC investment unit. We expect the CVC investment unit to engage in more sustained attentional processing of issues and answers during the following sequential opportunity sets, as the CVC investment unit makes sense of the investment committee's previous unexpected organizational move. The unfavorable investment decision situation produces “*disruptive ambiguity*” that breaches the expectation of continuity and instigates sensemaking (Weick et al., 2005).³² Because there is a need for sustained interaction between the CVC investment unit and the investment committee, both players attempt to “*interlock their behaviors over time*” (Sandberg & Tsoukas, 2015). A

subscribe to the following statement on salience/saliency: “*Saliency refers to the fact that not all of a man's beliefs stand out with equal prominence in his cognitive field. He may be more acutely aware of certain of his beliefs than others, they may enter his thoughts more readily, they may be more frequently verbalized—they are, in a word, salient*” (Krech & Crutchfield, 1948: 163). Our conceptualization is consistent with Tversky and Kahneman (1974), who referred to salience in relation to the availability or retrievability of an instance based on its frequency or probability. Ocasio (1997: 195) cites Tversky and Kahneman (1974) in relation to availability and saliency, in his description of procedural and communication channels in the attention-based view (ABV).

³⁰ We apply the labels “*direct*” and “*indirect*” to the concept of procedural and communication channels. Both types are illustrated in Figure 1. For example, even though the direct pairing between the CVC investment unit and the investment committee refers to the most important player dyad in the investment decision situation, the investment committee may consult indirectly with other players such as business units and/or external startups before rendering a final investment decision. These indirect social interactions may not affect the immediate outcome of the investment decision situation, but may influence the investment committee's perception of the search rules associated with the firm's agenda, in the future.

³¹ See Dutton's (1986) view of agenda-building, as a dynamic and emergent process. The investment committee acts as the ultimate arbiter of renewal fitness, and its (un)favorable decisions serve as a mechanism for updating what constitutes an appropriate answer.

³² According to Weick et al. (2005), “*...equivocality gives primacy to the search for meaning as a way to deal with uncertainty (e.g., Mills 2003, p. 44). Thus, we expect to find explicit efforts at sensemaking whenever the current state of the world is perceived to be different from the expected state of the world. This means that sensemaking is activated by the question, “same or different?” When the situation feels “different,” this circumstance is experienced as a situation of discrepancy (Orlikowski and Gash 1994), breakdown (Patriotta 2003), surprise (Louis 1980), disconfirmation (Weick and Sutcliffe 2001), opportunity (Dutton 1993), or interruption (Mandler 1984, pp. 180–189).*”

senior CVC investment manager at the bank described the CVC investment unit's retrospective analysis and prospective expectations concerning its interlocked relationship with the investment committee.

“When is the next investment committee meeting? Do we have something to present? How went [sic] the last meeting? And so on and so forth. There are influences and variables in our behavior... One objective is that we want to have at least three positive approvals in the investment committees and at least two investments per year.”

Since the investment committee has authoritative power over the investment decision situation, the burden is primarily on the CVC investment unit to engage in extensive cognizing to resolve the residual equivocality produced by the investment committee's unfavorable investment decision situation.³³ In response, the CVC investment unit shifts its attention to a less restrictive perception of issues and answers, by evaluating a more dispersed set of opportunities. The CVC investment unit casts a wider focus of attention to “*learn*” the investment committee's latest perception of the incumbent firm's agenda. As a corollary, under a favorable investment decision situation, the CVC investment unit's current search rules become wedded to the environment of decisions that inform its subsequent moves. When scripts for search action are deemed to align with the incumbent firm's agenda, the CVC investment unit engages in more preparatory attention because it has learned the saliency of issues and answers from the investment committee's vantage point.³⁴ Preparatory attention speeds up the CVC investment unit's perception of the saliency of certain issues and answers, which in turn speeds up the CVC investment unit's action of removing certain opportunities from subsequent

³³ The CVC investment unit faces considerable ambiguity and attempts to lessen it by gaining clarity. However, the CVC investment unit often cannot gain much clarity about the firm's agenda, and instead resorts to reducing equivocality through evaluation actions that direct the CVC investment unit's attention to certain issues and answers. This trial-and-error behavior is captured by the conceptualization that sensemaking is both discovery and invention (Brown et al. 2015; Weick, 1995).

³⁴ The concept of “*preparatory attention*” facilitates the speed and accuracy of perception and action, and is driven in part by the saliency/relevancy of issues and answers (Ocasio, 1997: 201).

opportunity sets. Minimizing sustained exposure to opportunities incongruent with the firm's agenda frees the CVC investment unit to selectively focus its time and effort on those opportunities that possess high levels of renewal fitness. After a favorable investment decision situation, we expect the CVC investment unit to selectively allocate its sustained attentional processing to fewer opportunities over several sequential opportunity sets.

Hypothesis 1: When an investment decision situation is favorable in a previous period, the CVC investment unit is more likely to selectively allocate sustained attentional processing to fewer opportunities during subsequent evaluation periods, *ceteris paribus*.

Knowledge Saliency Situation

The second hypothesis (H2) focuses on the procedural and communication channel by which the investment committee and the CVC unit coordinate and communicate. It constitutes a critical direct link between an external opportunity, embodying a valuable source of external knowledge, and the incumbent firm seeking renewal of its capabilities through access to certain external knowledge.³⁵

An external startup constitutes a possible candidate in the CVC investment unit's repertoire of answers regarding the firm's agenda. During the evaluation situation, both the external startup player and the CVC investment unit player possess the decision-making power to make certain organizational moves. The external startup player can decide whether to share certain information and partner with the incumbent firm. The CVC investment unit player can decide: (a) whether to remove an external startup from the opportunity set; (b) whether to introduce the external startup to a business unit within the incumbent firm for possible matching; (c) whether to propose the external startup to the investment committee. We describe below why we consider (a) to be a function of (b) and (c) in the knowledge saliency situation that arises in

³⁵ Opportunities can be sourced from any number of external scouting networks used by the focal CVC investment unit, such as opportunities sourced from independent venture capitalists (IVCs) discussed in our third hypothesis. Here, we focus on the direct relationship between a CVC investment unit and a "discovered" opportunity, no matter how it came to be discovered by the CVC investment unit. We refer only to the CVC investment context, which is one of several organizational modes available to an incumbent firm to source external knowledge. In addition, our study takes the CVC investment unit's perspective.

this particular channel. All external startups in our study possess valuable knowledge and are willing to share information with the incumbent firm and establish a partnership tie with the incumbent firm.³⁶ The narrowing of opportunity sets, based on attentional processing, may depend on the knowledge saliency situation wherein the CVC investment unit matches opportunities to business units and proposes opportunities to the investment committee.³⁷

A key mechanism underlying the knowledge saliency situation is the sensegiving capability of an external startup. We build on Gioia and Chittipeddi's (1991) notion of sensegiving as a variant of sensemaking undertaken to create meaning for a target audience. Sensegiving is defined as "*the process of attempting to influence the sensemaking and meaning construction of others toward a preferred redefinition of organizational reality*" (Gioia & Chittipeddi, 1991: 442). Every external startup contained in the CVC investment unit's opportunity set possesses an idiosyncratic assembly of cognitive categories of issues and answers, of which some are more salient than others.³⁸ During the evaluation situation, a startup makes a concerted effort to influence the CVC investment unit's perception through rhetorical or discursive influence (Ocasio et al., 2018). From an external startup's perspective, the objective of rhetoric or discourse is to reorder the CVC investment unit's perception of relevance to certain issues and answers. A CVC investment unit implicitly assigns a ranking to issues and answers based on its current knowledge about technological possibilities and its understanding of the firm's agenda. The CVC investment unit receiving sensegiving has its interpretations and can resist efforts from external startups to influence strategic change (Maitlis & Christianson, 2014; Sonenshein, 2010). However, the saliency assigned to issues and answers involves active social

³⁶Considerable literature exists on social defense mechanisms that external startups use to defend themselves against unintended knowledge appropriation or spillovers in relation to incumbent firms. See Colombo et al. (2016), Dushnitsky and Shaver (2009), or Katila et al. (2008) for examples. Our study presumes a strong willingness on the part of an external startup to share some of its knowledge with the incumbent firm, and despite an external startup having bargaining power and capital fundraising alternatives, a strong motivation on the part of an external startup to establish an investment tie with the focal incumbent firm. In addition, the favorability of opportunities in our opportunity sets, as previously explained, ensures that opportunities possess at least some relevant and valuable knowledge to share with the incumbent firm.

³⁷ The reader will note that we have introduced other players to our story for explaining this procedural and communication channel. We center our discussion on the CVC investment unit tasks that involve external startups during the evaluation situation. These critical tasks involve the participation of other players, but the decision-making authority to make organizational moves such as introducing or proposing an external startup still lies entirely with the CVC investment unit. We theorize on the antecedents to these organizational moves, based on the knowledge saliency situation that emerges between an external startup and the CVC investment unit.

³⁸ The attention-based view and sensemaking perspectives are highly applicable to incumbent firms, but these lenses can also be used to help us understand early-stage startups as they adapt dynamically by pivoting through multiple product and/or service designs in a relatively short period of time.

processes and, therefore, is subject to outside influence from other players. Sociomaterial sensegiving practices enacted by external startups to persuade players include elevator pitches, pitch decks, product demos, discussions, and the CVC investment unit's data room. The players interact both synchronously and asynchronously, as well as both in-person and virtually, frequently, although often separated by geographical distance.

The CVC investment unit engages in varying intensities of sensemaking, depending on the critical novelty and incongruity of the knowledge presented by an external startup (Hoffman & Ocasio, 2001; Maitlis & Christianson, 2014). Sensemaking is triggered when individuals confront issues that are “*surprising*” and that require explanation (Maitlis, 2005: 21). The CVC investment unit reduces its need for controlled processing — highly demanding of attentional capacity — when knowledge is less novel and more congruent (Ocasio, 1997). In this situation, individuals can use automatic processing because it is highly routinized, habitual, and unsurprising. Alternatively, the CVC investment unit increases its need for controlled processing when knowledge is more novel, less congruent, and surprising (Ocasio, 1997).

The CVC investment unit is more likely to notice and act on external startups that disrupt their current understanding of appropriate answers to meet the incumbent firm's agenda (March, 1970, 1983; Zucker, 1983). Based on cues that violate an incumbent firm's expectations, the CVC investment unit's sensemaking intensity results in controlled processing by members of the CVC investment unit, directing attention to a restricted set of external startups. A discrepancy between expectations and reality, in the context of technological renewal, often refers to the expert use of enabling technologies on specific and salient business tasks.³⁹ External startups that

³⁹ External startups with technical (co)-founders embody computer science competencies in software technologies that can be applied to either core, adjacent or entirely new areas of banking. The bank searched for the latest technical know-how to perform advanced functions in areas that change rapidly, such as big data, security and cryptocurrencies. These functional areas rely on quickly evolving enabling technologies such as machine learning, biometrics, blockchain and cloud infrastructures. Technology has indeed played a critical role in the banking sector since the 1920s, when accounting machines were first installed (BNP Paribas, 2021). However, banking practices have changed dramatically in the last decade due in part to the substantial rise in FinTech startups that are reinventing segments of the banking value chain, as well as the increasing sophistication of enabling technologies being deployed such as artificial intelligence and machine learning. There are a few outlier banks that did manage to explore the technology frontiers of AI and machine learning, notably Bank of America with a patent portfolio size of 4,943 (Bank of America, 2021). 444 US patents were granted to Bank of America in 2020 alone, with AI and machine learning accounting for approximately 25 percent of these. Putting aside such outliers, banks have traditionally hired programmers and IT personnel to write financial algorithms (quants) and to keep servers up and running (maintaining the infrastructure). These technical skill sets are more bounded than those typically found in external startups, in which new software tools are developed entirely from scratch using advanced technologies. While founders with technical expertise represent the bank's future, founders with previous work experience in the finance sector are presumed to possess a current understanding of the complexity of bank organizations, regulations, and the competitive forces that are transforming value chains. Since all CVC investments are directed at software

possess extensive technological knowledge in conjunction with knowledge of the incumbent firm's domain are more likely to violate expectations than external startups that have no specific domain knowledge.

Prior knowledge of the incumbent firm's domain implies that the individuals, who created a certain external startup, are more likely to have developed a product and/or service that is relevant and unexpected to the industry.⁴⁰ These external startups are also more likely to communicate with members inside the incumbent firm because of their familiarity with the issues confronting that industry and actively communicate their subjective viewpoints on the relative merits of possible answers that persuade various players.⁴¹ The player that an external startup comes into contact with inside an incumbent firm in the first instance is often the CVC investment unit with little technological expertise.⁴² An external startup first needs to convince the CVC investment unit of the value of these changes and explain how they can be accomplished (Maitlis & Christianson, 2014). A senior CVC investment unit manager commented: *“So, if you are convinced maybe there are some blind spots in the product, in the funnel or whatever...what can also foster our decision is if the founder makes the right impression.”*

As a result, the CVC investment unit's heightened sensemaking intensity towards these external startups is associated with certain organizational moves. The CVC investment unit introduces these external startups to business units within the incumbent firm and possibly proposes these external startups to the investment committee for possible investment selection. Business units prize and legitimize an external startup's expertise, opening the way for social

startups in our study, and that the digital transformation of the bank is one of the most salient aspects of the firm's agenda, the joint effect of technological and financial services proficiency is a particularly forceful beacon that various intrafirm players notice.

⁴⁰ The bank we studied, as well as many other industries where CVC investments are used, already had extensive technological capabilities before introducing the CVC investment mode. However, some external startups discovered through the CVC investment mode offered the bank additional capabilities that went beyond the bank's current understanding of a technology itself or understanding of a particular method used to apply a technology to a specific and salient business task.

⁴¹ (Co)-founders with prior professional experiences in finance are more likely to have formulated their product and/or service ideas in a previous financial institution. The rationale is that their ideas embodied nascent technology areas that could not be implemented at the previous employer due to an absence of complementary resources. Therefore, these ideas were initially rejected, which was the catalyst for the formation of a new independent venture. This implies that the founding team will have gained a better subsequent understanding of product-market fit and its enterprise commercialization strategy, based on a previous failure to implement the idea elsewhere. These external startups will more likely target firms with complementary resources in customer base, geographical markets, and application areas (Cassiman & Ueda, 2006).

⁴² Previous scholarship has addressed the delicate interdependencies between previous and future knowledge acquisition (Cattani, 2005; Cohen & Levinthal, 1990; Helfat, 1997).

interaction and mutual knowledge exchange. Suppose an external startup is not eventually matched with a business unit during the evaluation situation. In that case, it is unlikely that the CVC investment unit will propose that external startup to the investment committee for possible investment selection. Removal of the external startup from an opportunity set is likely to occur under this situation. An external startup's sensegiving capability, based on its extensive knowledge of relevant enabling technologies and the domain, increases the likelihood that interactions with players inside the incumbent firm will endure longer durations in the opportunity set. More sustained processing decreases the likelihood of removing an external startup from an opportunity set because ongoing momentum reflects accumulated valuation and legitimization by intrafirm players.⁴³

Accordingly, a CVC investment unit may allocate more sustained attentional processing of the issues and answers embodied by these external startups that meet the resource demands of the knowledge saliency situation (high knowledge saliency), than external startups that do not correspond with the resource demands of the knowledge saliency situation (low knowledge saliency). In addition, we expect that more time will be allocated to these external startups in the opportunity set because they are more likely to use salient technological and domain knowledge to engage intrafirm players and decision-makers than external startups that do not possess the requisite technological and domain knowledge.⁴⁴

Hypothesis 2: A CVC investment unit is more likely to selectively allocate sustained attentional processing to opportunities associated with high knowledge saliency, ceteris paribus.

⁴³ External startups are selected into ever increasing intensities of evaluation by the CVC investment unit, which must choose how to allocate its precious evaluation time and effort. This implies that the CVC investment unit holds a strong conviction about the favorability of an external startup that it introduces to a business unit(s). However, this does not imply that an external startup will not eventually be removed from the opportunity set when other players are not equally persuaded of its valuation and legitimization.

⁴⁴ The importance of an external startup's prior experience in technological and finance domains lies in the external startup's ability to explain its novelty to other players, not simply the novelty itself. Novelty is a necessary, but insufficient condition. We do not expect the effect to be a durable advantage for an external startup, because after a short while the novel knowledge will become diffused in the marketplace for technologies. This effect works in our setting where opportunities are in their very early stages of development, and therefore the beneficial knowledge advantage has not yet decayed.

External Market Saliency Situation

In the third hypothesis (H3), we explain the effects of the scouting network in shaping the CVC investment unit's attentional processing. The scouting network calls the incumbent firm's attention to a certain repertoire of answers to its renewal goals. An incumbent firm can choose from multiple organizational modes to obtain access to external knowledge, including the CVC investment mode. The CVC investment mode has multiple scouting network modes to source external opportunities for subsequent evaluation. These modes can be either internal or external players.⁴⁵

Internal scouting players, especially business units, are associated with more proximate cognitive schemas of issues and answers. Internal players act more habitually because they make sense of previous actions and develop corresponding "*cause maps*" that explain the consequences of previous organizational moves (Sandberg & Tsoukas, 2015). The valuation of ideas and answers often differs between business units inside an incumbent firm. However, their cognitive schemas of issues and answers share "*cause maps*" that are more likely to be similar to an external player -- a similarity arising from convergence in the mutual organization (Weick, 1979).⁴⁶

While internal scouting players act with continuity and are more likely to "*discover*" opportunities that constitute familiar answers, external scouting players make more unfamiliar cognitive schemas available that broaden the CVC investment unit's repertoire of issues and answers. In addition, external scouting players bring up-to-the-minute knowledge about the marketplace for technologies, providing valuable knowledge of early-stage opportunities that have saliency in the wider environment. In particular, independent venture capitalists (IVC) are seen as legitimate external scouting players by intrafirm players. IVCs can offer the CVC investment unit valuable resources in the procedural and communication channel: (a) a supply of early-stage opportunities that have saliency in the environment; (b) an independent third-party

⁴⁵ Souitaris and Zerbinati (2014) found that CVC investment units obtain referrals, among others, from trusted business associates, entrepreneurs, venture capitalists and contacts within the focal incumbent firm's business units. Examples of internal players that perform a scouting function include business units, corporate accelerators, corporate M&A or strategy departments, and the CVC investment unit. Examples of external players that the CVC investment unit can collaborate with to source external startups include commercial datasets, private accelerators and incubators, universities, and independent venture capitalists (IVCs).

⁴⁶ Business units inside an incumbent firm compete for resources and attention, but also cooperate extensively to collectively coordinate the complex activities of the firm. Weick (1979) discussed how *cause maps* converge when groups of individuals become organized.

evaluation based on private information and financial logics; and (c) a willing and capable co-investment partner.⁴⁷

An independent venture capitalist (IVC) engages in sensegiving to persuade the CVC investment unit about its idiosyncratic issues and answers. Although “(a)” creates a point of confusion for the CVC investment unit since it implies an inconsistent view of what solutions should look like, the IVC can use “(b)” and “(c)” as additional sensegiving mechanisms to guide thinking and increase convergence with the CVC investment unit in this procedural and communication channel. We briefly discuss “(b)” and “(c)” below to account for the CVC investment unit’s attentional processing of certain issues and answers as a function of the external market saliency situation. The CVC investment unit uses private information obtained from the IVC scouting network and the plausibility of co-investing with an IVC as mechanisms to increase the valuation and legitimization of certain issues and answers by intrafirm players.⁴⁸ IVCs often communicate strong, unexpected convictions about certain segments of the market for technologies. In the absence of private information and plausible co-investment, the incumbent firm would be more likely to resist efforts from IVCs to influence strategic change within the incumbent firm.

The CVC investment unit’s evaluation situation requires a considerable attentional capacity to obtain private information on early-stage opportunities, which is not readily available.⁴⁹ One particular time-intensive task involves collecting far-reaching information about an external opportunity’s product and/or services, technologies, markets, business models, financial statements, ownership structure, and team members.⁵⁰ The CVC investment unit

⁴⁷ While many external scouting players offer (a), independent venture capitalists (IVC) can offer all three. Syndicated co-investment deals with independent venture capitalists (IVC) are known to be highly competitive and difficult for many investors to obtain. All investments made by the CVC investment unit in our study were conducted using syndicated co-investment deals with IVC. This is beyond the scope of our study since we examine the evaluation situation, which precedes any investments. However, the plausibility of a co-investment partner is attractive during the evaluation situation.

⁴⁸ The CVC investment unit in our study uses all scouting network modes, in varying proportions.

⁴⁹ We found that the due diligence process takes considerable amounts of time and relies on comprehensive information about the underlying opportunity. Based on our survey of senior CVC investment unit managers (39 percent response rate), we learned that it can take between 2 weeks and 6 months to complete the due diligence process in the financials sector, and that it typically takes between 1 and 4 weeks for the due diligence process to begin after first learning about a prospective startup. We found that those CVC investment units with the highest scouting intensities, typically take less than 4 weeks to complete due diligence. CVC investment units that have fixed investment committee meeting timetables every quarter, are thus constrained by time and under pressure to complete most of the due diligence before the next scheduled investment committee meeting. See Eckblad et al. (2021).

⁵⁰ The evaluation situation refers to all the tasks, situations, channels, players, resources, and rules involved in the CVC investment unit’s effort between discovery and selection.

constructs this information resource from multiple sources, including the focal external startup, the external startup's (potential) customers, and the external startup's previous and prospective investors.⁵¹ An external startup uploads information directly to the CVC investment unit's data room.⁵² The CVC investment unit also contacts an external startup's existing customers and those potential customers that were not convinced, to better understand how the focal opportunity stacks up in the marketplace for technologies, and to gain insights into the external startup team's effectiveness. Although some private information may be gained directly from an external startup or its customers, independent venture capitalists (IVC) can supply the most comprehensive private information on an external opportunity.⁵³

IVCs possess considerable private information about the opportunity itself and similar startup players operating in the technological marketplace. IVCs obtain private information directly through discussions with a focal external startup and indirectly through discussions with other investors and/or startups that interacted with the external startup. A CVC investment unit's access to private information supplements the information it receives directly from an external startup. At the very least, it helps to triangulate the validity of overlapping information. The more

⁵¹ Several commercial services sell limited information on external startups (e.g., CBInsights, Crunchbase, PitchBook). It is our experience that data often differs across these services, although the metadata is virtually identical. For example, all services display a list of previous investors, but the actual names of investors could differ. Data discrepancies often result from data that has been scraped from unstructured and/or unverified online sources. We consider that these services constitute public information, since they rely on publicly-available documents filed with the Securities and Exchange Commission (SEC) or unstructured/unverified data available online, and it simply takes a paid subscription to access any of these services.

⁵² The data room is a secure online platform for storing various documents collected from the external startup during the evaluation situation. The CVC investment unit's data room is one of the initial sources of information uncertainty. The data room stores sensitive documents furnished by external startups, including the startup's articles of incorporation, records of previous capital raises, the board of directors' previous actions, business plans, and company financials. The CVC investment unit collects and consults these documents to introduce matches to business units, to build its investment case, and to prepare an investment proposal that refers certain opportunities to the investment committee.

⁵³ Our argument is not that prior evaluations conducted by independent venture capitalists (IVC) save the CVC investment unit time and effort during the evaluation situation, but rather that the CVC investment unit's access to more and higher quality information on an external startup and on salient aspects of the external market help to positively influence intrafirm players, who will in turn selectively spend more time interacting with these external startups given the zero-sum game of attention capacity. Not every type of scouting network player carries the same level of information to the CVC investment unit. Each type of scouting network player carries varying classes of information on underlying opportunities. For example, interest from entrepreneurs that arrive into the focal CVC investment unit spontaneously via unsolicited inbound email or web scouting channels, are more likely to carry minimal amounts of information concerning the quality of the startup team, the market and/or technological product, or to provide a clear picture of its relevance to a particular business unit inside the focal firm. CVC investment units typically have websites that describe their activities and solicit applications, but submissions are neither informationally complete nor vetted by qualified third-parties. In contrast, the scouting network player is more likely to communicate detailed information on the startup because external investors have already performed at least a nominal amount of due diligence.

comprehensive information set makes it more likely that the CVC investment unit will introduce these opportunities to business units. Higher information quality helps sustain interactions between an opportunity and intrafirm players. Obtaining private information earlier in the CVC investment unit's evaluation situation engenders more informed discussions between the focal CVC investment unit and business units inside the incumbent firm. The quality of communication among distributed players is improved as decision-makers across the firm gain a more uniform understanding of the technical specifications and market scope that these opportunities can offer the firm. Consequently, a clearer shared picture of the possibilities emerges when there is less information uncertainty. A senior CVC investment unit manager stated how access to more comprehensive information from IVCs facilitated interactions with intrafirm players.

“If you can get a warm introduction from, for example, a co-investor who you know and can be sure that these guys don't forward shitty teams then it is a kind of first quality step where you say ‘ok’, we can skip some points of the process and go faster in the direction of an investment committee decision.”

Intrafirm players often view IVCs as legitimate external players because of their sustained interactions through capital outlays and financial profit motive and their expertise and knowledge of nascent markets for technology. IVCs' unexpected voices legitimize what is worthy of exploitation in the environment, which influences intrafirm players' valuation of opportunities discovered through the IVC scouting network procedural and communication channel. As a plausible co-investor with expertise in the wider market and financial “*skin in the game*” that sustains interactions and reduces ambiguity, IVCs can sway the focal investment committee because of their relational, informational, and financial resources. Such influence can overcome the resistance of the investment committee when there is considerable ambiguity surrounding the financial aspects of any potential investment.

A senior CVC investment unit manager commented on the ambiguity surrounding valuation and terms: “*But actually it is a huge part of negotiation and has to be solved before we step into the IC [investment committee].*” Opportunities referred from IVCs reduce the need for sustained negotiation because many of the potential issues will have been previously clarified and/or resolved by the IVC beforehand. Sensegiving measures described above help an IVC create influence with the investment committee. In addition, those sensegiving measures indirectly help the CVC investment unit engage in sensegiving that is somewhat akin to political ‘lobbying’ (Kaplan, 2008b). The CVC investment unit makes a concerted effort to influence business units and investment committee members before the next scheduled meeting. The effectiveness of the framing practice depends on the completeness of information and the reduction of ambiguities at the time the process begins.⁵⁴ One senior CVC investment unit manager described the various communication-driven practices that comprised the political lobbying effort.

“A kind of political preparation work... before the actual meeting is taking place we send around our investment proposal... we do a kind of short briefing with the more or less most powerful investment committee members... in which a business unit the potential target fits in. Then, we do a longer session with them and explain why it is so important to invest in this company and how they can help to transform processes and businesses internally in the bank.”

The availability of high-quality private information to the CVC investment enables the unit to resolve some of the financial transaction's ambiguities. Consequently, it can communicate with internal business units about opportunities that embody unexpected environmental signals

⁵⁴ Gleaned from what we learned in our interviews with senior CVC investment unit managers, the lobbying process typically takes between 1 and 4 weeks to complete. See Eckblad et al. (2021) for more CVC investment unit process durations.

and conduct political preparation work in time for the next investment committee meeting. Therefore, we expect that a CVC investment unit is more likely to allocate attentional processing to opportunities that correspond to the *External Market Saliency Situation*, in which an IVC scouting network player provides privileged access (a) to external opportunities that embody external market saliency, privileged access (b) to private information resources that facilitate sustained interaction, and privileged access (c) to financial capital resources as a form of ambiguity mitigation.

Hypothesis 3: A CVC investment unit is more likely to selectively allocate sustained attentional processing to opportunities associated with external market saliency, *ceteris paribus*.

Internal Market Saliency Situation

In the fourth hypothesis, we turn to the impact of business unit players in shaping the attention processing of CVC units.⁵⁵ An internal business unit constitutes the locus in which a CVC investment unit can connect its repertoire of answers, sourced from multiple scouting networks, to the incumbent firm. During the evaluation situation, both the internal business unit player and the CVC investment unit player possess the decision-making power to make certain organizational moves. An internal business unit player can decide whether to associate with an external opportunity that is introduced by the CVC investment unit.⁵⁶ The CVC investment unit

⁵⁵ In our study at a major European bank, the retail banking, corporate banking and investment banking business units constitute the largest share of economic activities.

⁵⁶ Matching processes are multilateral, in which multiple parties participate in the decision to establish a joint partnership. However, an external startup in the opportunity set does not need to fully acquiesce to a dyadic relationship with a particular business unit arranged by the CVC investment unit, during the initial stages of the matching process. The CVC investment unit “sells” existing opportunities to business units. Selling opportunities to internal business units requires considerable effort in terms of gathering information about the opportunity on the one hand, and understanding a particular business unit’s needs and willingness to partner, on the other hand. A socio-technical process of “sensemaking” occurs, as the CVC investment unit exerts time and effort to learn how to match the appropriate opportunity with the appropriate business unit (March, 1970, 1983; Zucker, 1983). Matching can combine issues (business units) and answers (opportunities) in unexpected ways, or can involve co-creation or reflective reframing (Hargadon & Bechky, 2006) that generates an alteration in the discovered form of the opportunity. This joint process can occur even without perfect acquiescence between players. The mutual acquiescence of players becomes particularly relevant when a CVC investment unit proposes an opportunity to the investment committee.

player can decide whether to introduce an external opportunity to a business unit, and if so, which business unit(s) to make the introduction.

The valuation and legitimization of certain issues and answers will differ between business units within the same firm, based on differentiated “*cause maps*” (Weick, 1979). One factor that drives these differences is ongoing political conflicts among organizational subunits, when business units compete for limited resources (Cyert & March, 1963; Nelson & Winter, 1982; Weick, 1995). Particularly under strategic organizational renewal, subunits likely compete more intensely for attentional, financial, technological, and human capital resources. Business units use their dynamic capability to “*build, integrate, and reconfigure organizational resources and competences*”, in part, to establish distinctive competencies that can promote survival within the firm (Adner & Helfat, 2003: 1012). However, individual business units rarely have the necessary autonomy to operate outside the incumbent firm’s strategic agenda.

Business units possess the requisite agency to configure resources according to the firm’s renewal goals. Unresolved conflict between business units interferes with sustained communication and coordination, consequently harming collective sensemaking, hindering the convergence of cause maps between intrafirm players, and resulting in more divergent frames.⁵⁷ The absence of sensemaking convergence and divergent frames make organizing in the incumbent firm more difficult, leading to gaps between a business unit’s objectives and the firm’s renewal goals. Thus, despite the senior hierarchy’s concerted sensegiving efforts to communicate its strategic renewal frames, business units will likely differ in their cognitive distance from the firm’s renewal agenda.⁵⁸

Each business unit possesses distinctive demands regarding various technologies and markets. Such demands may depend on the saliency of issues being attended to. Business units engage in “*framing contests*” to persuade intrafirm players to adopt their perspective, including the CVC investment unit (Kaplan, 2008). Consequently, the incumbent firm’s agenda is likely to select certain business unit players that most appropriately enact the firm’s renewal goals, in

⁵⁷ In this situation, collective sensemaking and action refers to organizational alignment on the firm’s renewal goals.

⁵⁸ Based on the structural distribution of attention espoused in the attention-based view, we expect there to be conflicting interpretations between hierarchical levels of the organization due to the specialized functions of players that each operate under different attention structures (rules, social positions, resources). We draw from the Behavioral Theory of the Firm (Cyert & March, 1963) to argue that conflicts among business units at the same level will also produce conflicting interpretations of the firm’s agenda. Brown et al. (2008) refer to conflicting interpretations as “*discrepant sensemaking*”, which need to be converged for collective action to emerge. In this situation, collective action refers to organizational alignment on the firm’s renewal goals.

which there are “*winner and losers*.”⁵⁹ The CVC investment unit operates with the firm’s renewal goals in mind. It is more likely to selectively allocate sustained attentional processing to certain business unit players whose issues are perceived to overlap with the issues exhibiting the greatest saliency in the firm’s agenda.⁶⁰

Hypothesis 4: A CVC investment unit is more likely to selectively allocate sustained attentional processing to opportunities associated with internal market saliency, *ceteris paribus*.

CONTEXTUAL BACKGROUND

The key parties in our setting

The European banking sector was hit hard by the 2007-2009 global financial crisis and subsequent European sovereign debt crisis. Three factors have heightened the competitive pressures on traditional banks during the past decade. They are

1. the extensive financial capital losses,
2. increased regulatory measures that imposed new capital liquidity requirements (e.g., Basel 3), and
3. the rush of FinTech startups into profitable segments of traditional banking.

Competing for the same customer base has visibly reduced the financial performance of many banks between 2006 and 2013 (Ayadi & De Groen, 2014). More recently, banks were affected by the COVID-19 shock. With setbacks across European economies, banks posted their lowest returns in years. The excess capacity in the European financial sector resulted in persistently low

⁵⁹ For all intents and purposes, the most senior levels of the organization determine the dominant viewpoint or frame on which policies and incentives will be based. See March (1970; 1983) regarding “*appropriate rules*.”

⁶⁰ Based on the considerable digital transformation effort at the focal bank in our study, changes in retail banking are particularly crucial to the incumbent firm’s survival. The retail banking division is of critical importance to the organization’s strategy to shut down “*bricks and mortar*” branches and to introduce digital technologies as a comparatively low-cost and flexible alternative. The digital transformation of this business unit has the potential to positively affect the long term prospects of the bank. We expect the CVC investment unit to make opportunities fit for consumption by spending more time on matching opportunities in the opportunity set to the retail banking business unit in comparison to other business units.

profits and returns that were below the cost of equity, rendering many European banks incapable of investing in strategic renewal. As a result, the profitability of European banks fell from approximately 6 percent at the end of 2018 to approximately 1.5 percent at the end of 2020 (Fernandes-Bollo et al., 2021).

Our study examined a major European bank that underwent significant technological and market changes between 2014 and 2020. The digital transformation renewal project at the bank was deemed an urgent matter, given the high capital expenditures of brick and mortar associated with traditional retail banking. The focal bank's renewal efforts were driven by the need to reduce heavy cost structures and marked by extensive retail branch closures (40 percent reduction) and appreciable headcount losses (one in three jobs downsized) between 2014 and 2020. The focal bank can be categorized as a diversified retail bank based on the classification of European banks developed by Ayadi and De Groen (2014). The bank operates retail banking, corporate banking, small-medium enterprise banking, and investment banking business units.

The focal bank used the external corporate venturing mode to accompany its restructuring efforts of various business units. Our focal CVC investment unit was founded in 2013, at which time it was allocated a capital fund of 5M Euros for investing in external software startups. The capital fund was subsequently incremented to 15M Euros in 2016, 30M Euros in 2018, and 55M Euros in 2020. The focal CVC investment unit had invested 26M Euros into 20 portfolio companies by the end of our study. In addition to receiving capital funds and a codified investment thesis, largely determined by senior executives at the focal bank, the focal CVC investment unit was likewise endowed with a special team committed to scouting, matching, rejecting, and investing in startups.

Research shows that managerial demographic characteristics are essential to orchestrating large-scale technical change (Kaplan, 2008a; Lant et al., 1992; Tushman & Rosenkopf, 1996). For example, decision-makers with technical backgrounds may be more likely to understand the value of novel technical fields (Barker & Mueller, 2002; Kaplan, 2008a). In our case, although CVC investment unit members at the focal bank do not have previous technical experience, they did possess investment and finance industry experience. This experience made them aware of the disruptive challenges facing incumbents because new entrants were observed (FinTech startups), and extant customers expressed interest in using new products or services such as mobile and digital banking.

The CVC investment unit employed three members when the unit was first founded, and by 2020 the unit had grown to seven members. There was a peak of 10 members employed in the unit between 2016 and 2017. In our survey of senior corporate venturing managers in the financial sector, we found that the median team size of CVC investment units was five (the mean is equal to 6.15, with a range of between 2 and 24 employees in a unit).

Despite diverse job titles in the unit, most members are involved in sourcing new investment opportunities and conducting due diligence, including matching external startups with internal business units. Job titles consist of ‘*CEO*’, ‘*Senior Investment Manager and Authorized Officer*’, ‘*Investment Manager*’, ‘*Analyst/Later Investment Manager*’, ‘*Project Manager*’, and ‘*Intern*’. All unit members attended business school and earned masters’ degrees. One member previously worked at a rival CVC investment unit (7.7 percent), three members previously worked at an independent venture capitalist firm (23 percent), and four members previously worked at a consulting firm (30.8 percent). Out of all 13 members who worked at the focal CVC investment unit, seven had previously worked at the focal bank’s headquarters (53.8 percent). In addition, six out of seven of these members had worked at Bank headquarters for more than ten years (85.7 percent). No members had previous entrepreneurship experience. Our survey of senior corporate venturing managers in the financial sector found that approximately 45 percent of CVC investment units had members with previous experiences in entrepreneurship. Therefore, more than half of all CVC investment units have no unit team members with entrepreneurial backgrounds, which is similar to our focal CVC investment unit. In addition, our survey found that 70 percent of CVC investment units had members with previous experiences in the venture capital industry, in the parent’s industry, and had previously worked at the parent firm itself. Our focal CVC investment unit possesses similar team characteristics. The CVC investment unit employs several communication practices to coordinate activities among team members, including emails, shared data and files on Google Apps, and a weekly meeting. The CVC investment unit meets in person every Monday morning, except during the COVID-19 pandemic, when all meetings were conducted virtually.

Besides the business units and the focal CVC investment unit, the investment committee completes our set of key players. We view the investment committee as a mechanism that integrates distributed attention structures. It provides a relational, information, and communication link between senior executives and lower-level business units, in which the

existence of multiple viewpoints is unveiled and reconciled. Many scholars have pointed out that middle managers' perceptions and understandings often differ from top managers' perceptions and understandings (Balogun & Johnson, 2004; Cyert & March, 1963; Huy et al., 2016; Ocasio, 1997; Vuori & Huy, 2016). The investment committee members met every financial quarter to decide on the investment proposals brought forward by the focal CVC investment unit. The committee mainly considered direct information inputs from the focal CVC investment unit, business units, and startup founding teams. The investment committee was composed of executive board members and board members of the focal bank. Through interviews at the focal CVC investment unit, we learned that the CVC investment unit proposed two to three startups to the investment committee every financial quarter between August 2014 and April 2020.

The key search processes: scouting and decision making

The key search processes in our setting are categorized as follows: sourcing opportunities, matching these opportunities to business units, and deciding whether to invest in particular proposals. The final two stages rely heavily on due diligence, which refers to collecting information to evaluate startups for their fit with internal business units and the alignment with the bank's renewal fitness goals. The focal CVC investment unit received seed capital and instructions from the senior management of the focal bank that guided a particular view of what constituted renewal fitness. A formal investment thesis effectively determined the initial search agenda and provided a shared map to help define renewal fitness (Nickerson et al., 2012).

The CVC investment unit's investment thesis prescribed multiple search provisions, including strategy, objectives, criteria, parameters, and an investment process. The investment strategy in the written document referred to the focal CVC investment unit as an '*R&D Unit*' responsible for assisting the bank in "*becoming a digital technology company*." The investment objectives were to invest in startups that provide technological and/or market knowledge to the bank, that allow the bank to expand its portfolio of products/services and/or that replace existing products/services and/or that increase operational efficiencies, and that contribute to a financial return of at least a 1.5x multiple in terms of the overall portfolio. The investment criteria specified that the unit's investment focus should be on early-stage software startups with

customer traction, headquartered in Europe, and proven technologies looking for funding between the seed and Series A stages. In addition, it specified that the target startup sectors should be in financial services, data security, analytics, enterprise applications, platform economy, or have environmental, social, and governance (ESG) impact.

The investment criteria section of the document also mentioned that conventional ‘*venture capital*’ criteria should also apply. These normative criteria included startup teams with proven entrepreneurial and technical capabilities, startups active in large markets, and startups with ‘*clean*’ capitalization tables (i.e., founding team members are majority shareholders, all shareholders are reputable, and the firm has no conflict of interest with any of the shareholders). In addition, the investment parameter section of the archival document stipulated that initial investment amounts should be between 250k and 1M Euros in exchange for a minimum 5 percent equity stake and that 2M Euros is the total amount that can be invested in any single startup inclusive of follow-on investments. These descriptive features are consistent with the median deal size of 2M Euros (the range in the survey was between 250k and 10M Euros) in the financial services sector.

The investment process section of the investment thesis document laid out six steps to the investment process: opportunity sourcing, initial in-depth analysis, sounding board with business units, due diligence, investment committee, and post-investment. In our discussions with senior members in the CVC investment unit, we learned that the initial in-depth analysis, sounding board, and due diligence stages are often folded under ‘*due diligence*’ and should be considered more as degrees of due diligence than entirely separate stages. Based on our interviews with the focal CVC investment unit, we learned that approximately 10 percent of startups in the opportunity set received the highest level of due diligence based on the unit’s evaluation of renewal fitness. The evaluation reflects an interpretation based on the current state of the investment hypothesis. Therefore, we consolidated the six search stages into four stages at the focal unit for our purposes.

Our study examined the first three search stages of the CVC investment unit since the fourth stage relates to activities after an investment is made in a particular external startup. Each stage of search involves a particular relational, information, and communication channel. In these channels, there are social interactions with a particular set of relevant stakeholder groups determining the search process. Freeman (1984, 53) defines a stakeholder as “*any group or*

individual who can affect or is affected by the achievement of an organization's purpose." Channels are characterized as structural features that enable interaction between groups to occur, such as between top and middle managers in an organization (Joseph & Ocasio, 2012; Vuori & Huy, 2016).

The first search stage in the CVC investment unit concerns opportunity generation. The scouting information and communication channel is used to access different types of networks that source opportunities from outside the firm's boundaries. The scouting channel types used to source outside opportunities at the bank are '*investor networks*', '*unsolicited applications*,' '*internal business units*', '*public demo events*,' and '*intentional search*.' In our financial sector survey, we found that these were also the most prevalent information and communication channels used by CVC investment units.

The investor networks scouting channel type refers to opportunities communicated to the CVC investment unit by outside investors. Outside investors consist mostly of independent venture capitalists (IVC) but could also include private accelerators and/or incubators with prior knowledge of promising target startups. The investor network scouting channel requires deliberate and sustained effort to form and maintain relationships over time.

In contrast to investor networks that facilitate the initial communication between external startups and our focal CVC investment unit, unsolicited applications typically offer no third-party introductions. Unsolicited applications refer to incoming flows of information and communication initiated by the focal external startups, which typically arrive in the CVC investment unit by email and/or by an online form. The unsolicited or inbound applications scouting channel is not entirely passive, from the CVC investment unit's perspective, as the quantity and quality of incoming applications vary according to efforts made to promote online through various social media channels, as well as efforts to cross-promote with select ecosystem partners.

The internal business units scouting channel type sourced the vast majority of internal sourcing from four business units in the bank (80 percent), and the remaining is sourced from another CVC investment unit inside the same bank. These internal units have previously met the target startups and developed a relationship based on an initial vetting of the startups and possible renewal fitness. Then these units communicate qualified opportunities to the focal CVC investment unit. Like the investor networks scouting channel, the internal business units scouting

channel requires deliberate and sustained effort to form and maintain relationships with decision-makers over time. Like the unsolicited applications scouting channel, the public demo events scouting channel is not entirely passive.

The CVC investment unit members attend public demo events, often meeting the founding teams at these events, and following up with those startups when there is potential renewal fitness. Unlike any previous scouting channels discussed, intentional search refers to a deliberate search undertaken by the CVC investment unit. Intentional search first identifies a potential startup target through meticulous desk research that consists of search engines and dedicated data services such as PitchBook, CB Insights, and Crunchbase. This scouting channel type represents the most effort-intensive and weakest tie to a prospective startup in the environment because the CVC investment unit reaches out first to a startup without the use of familiar introductions by third parties. A senior corporate venturing manager explained: “*We don’t have a proactive deal flow approach starting with our own hypothesis. That is an exercise we are currently doing also with a little bit more resources on our team.*” As corporate venturing teams gain members, they may be able to increase their engagement in this scouting channel type.

After sourcing an opportunity, the second stage of search in the focal bank concerned evaluating the quality of a focal startup and its renewal fitness from the perspective of business units inside the focal firm. The CVC investment unit uses the business unit information and communication channel to access multiple networks inside the bank. Each type of business unit channel refers to a distinct organizational division that serves different customers and offers differentiated financial products and services. The business unit channel types are ‘*retail banking*’, ‘*commercial banking*’, ‘*investment banking*’, and ‘*small and medium-sized enterprises banking*’. The retail clients business unit provides the public with lines of credit, investment management and advisory services, and insurance. The retail clients business unit was subject to the most significant organizational restructuring effort as part of the bank’s move towards low-cost digital solutions for private customers. During the approximately six-year period under study, the focal bank permanently closed approximately 50 percent of its retail branches. After retail banking, commercial banking was the second most impacted business unit channel by the focal bank’s restructuring and digital transformation. Greater efficiency and focus on services in high demand were the primary objectives of the bank’s strategic transformation of commercial

banking. Whereas retail banking serves individuals, the corporate banking business unit serves larger firms with more complex advisory needs. The investment banking business unit specializes in capital raisings, such as underwriting debt and equity issuances and launching an initial public offering (IPO), among other services. The small and medium-sized enterprises business unit channel was used to match 6.4 percent of the external startups in the opportunity set. The medium-sized enterprises business unit serves smaller firms. Matching opportunities to business units demands considerable effort from the focal CVC investment unit. Those startups that cannot be matched to a business unit are often ejected from the opportunity set, which implies that these startups were no longer considered viable prospects.

After sourcing external startups and then matching these opportunities to business units within the focal bank that we studied, the third search stage was to involve the investment committee. The investment committee information and communication channel provide a formal coordination mechanism for members of the CVC investment unit to interact with senior executives at the focal bank. An investment committee meeting is scheduled every financial quarter to determine whether to invest in the opportunities that the CVC investment unit proposed. Since our focal CVC investment unit's first startup in the opportunity set occurred in January 2014 and the final investment was made in April 2020, there were 25 investment committee meetings in that intervening period. One week before each scheduled investment committee meeting, the CVC investment unit communicated various documentation containing the investment proposal, the pitch deck, and anything necessary for investment committee members to consider. During the scheduled meeting, the investment committee discussed each proposal and spoke with the founders of each prospective startup as part of the committee's decision-making process. Another short discussion followed the formal investment committee meeting that was composed of the investment committee members, senior corporate venturing managers, and three advisors that were external to the firm. The advisors did not obtain voting power, but they advised the voting members of the investment committee. One advisor was an expert in software design. The second was the CEO of a publicly-listed technology firm in Europe. The third was a senior McKinsey & Co consultant with experience in the financial sector.

Opportunity and Investment Sets

Our study of the focal CVC investment unit at a major European bank examined its relationship to external startups by considering two types of sets in the search process: the opportunity set and the investment set. The incoming opportunities that our focal CVC investment unit supplied, through regulating multiple network types within the scouting channel, constituted the opportunity set in our study. Over approximately six years, 1,047 unique external startups were identified by the focal unit we studied. This represented nearly 175 startups, on average, enrolled in the focal CVC investment unit's opportunity set each year. Throughout the six-year period at our focal bank, startups entered and exited the opportunity set based on the CVC investment unit's scouting, matching, rejecting, and investing activities. After entering into the opportunity set, the CVC investment unit applied its due diligence process to determine whether to remove a given startup from the opportunity set, whether to retain a given startup in the opportunity set as an ongoing option, or whether to propose to the investment committee that an investment be made. Once the focal CVC investment unit made an investment in a particular startup, based on a positive response from the investment committee, that startup then joined the focal unit's investment set or portfolio. Our focal CVC investment unit made 20 investments over roughly six years, which averages to three invested startups per year (rounded to the nearest whole number). The mean time was approximately 357 days between the moment a startup first entered our focal CVC investment unit's opportunity set and when it joined the investment set, based on a positive response from the investment committee at our focal bank. Our senior corporate venturing managers survey shows that our focal unit's selection rate is similar to the median average of three invested startups per year found in our sample of CVC investment units. The survey also found that the mean portfolio size was 17 (rounded to the nearest whole number) and that the median age of participating CVC investment units was five years old. Our focal CVC investment unit was less than seven years old by the end of our study. Based on interviews with our focal CVC investment unit, we learned that there was no specified portfolio size target. A senior investment manager commented: *"It is not a mandatory target, where we say that is our target volume or the size of the portfolio at the end of our activities."* Based on our survey, we found that nearly all CVC investment units in our sample founded between 2013 and 2016 did not have *ex ante* portfolio size strategies. Out of 20 portfolio companies managed by our focal

CVC investment unit (less than two percent of the opportunity set), seven provided efficiencies to the focal bank, seven expanded the focal bank's product offerings, six provided efficiencies and expanded the focal bank's product offerings, and two expanded the focal bank's product offerings and cannibalized existing services. In addition, all of the startup sectors specified in the investment thesis were invested in except for ESG. The ranking of startup sectors in which investments were made is as follows: financial services, enterprise applications, data analytics, data security, and platform economy.

METHODS

We tested our hypotheses based on a proprietary dataset that we obtained from a CVC investment unit at a major European bank. The dataset recorded the inflows and outflows of the focal CVC investment unit's opportunity set between January 2014 and April 2020. There were 1,047 startups in the opportunity set, 20 of which were invested by the focal CVC investment unit. The primary dataset we received contained basic information on startups: company name; headquarter city; headquarter country; startup description; startup product category; startup technology; employee count range; funding round; fundraising amounts. Additionally, the primary dataset contained information on the unit's relationship to each startup in the opportunity set: date that the CVC investment unit first encountered a startup; scouting channel type used to discover the startup; the lead unit team member; date that the unit removed the startup from the opportunity set; rationale for why the startup was removed from the opportunity set; business unit type when the CVC investment unit successfully established a match with a startup; a binary indication as to whether the startup was ultimately invested in by the focal unit; date when a startup was invested in by the focal unit.

Data collection: Interviews, Surveys, Archival Data, and Databases

In addition to the opportunity set that we obtained, we conducted interviews with the focal CVC investment unit at a major European bank from 2019 to 2021. These senior '*key informants*' were highly knowledgeable about the history and workings of the focal CVC investment unit (Basu et al., 2016, Kumar et al., 1993). Senior corporate venturing managers at

the focal CVC investment unit were interviewed multiple times, using semi-structured interview protocols based on learning more about the unit's search process and activities. To evaluate the generalizability of these perspectives, we interviewed senior corporate venturing managers at more than fifty other firms across various sectors. We also used a semi-structured interview approach in order to learn more about their respective units' search processes and activities. In addition to these sets of interviews, in order to place the focal CVC investment unit in context among its peers, we surveyed 39 percent of the population of CVC investment units in the insurance sector that made more than one investment within the past five years. Three sub-sectors make up the financials sector: insurance, banks and diversified financials. There exists considerable overlap between these sub-sectors of the financials sector, because banks and insurance firms are both financial institutions and banks regularly provide insurance products as financial services. Our survey data was collected between July 15 and August 6, 2021 from senior members of CVC investment units, in partnership with an industry association headquartered in New York City, USA. In partnership with the industry association, we first created a list of the entire global population of insurance firms that had made at least two investments in external startups in the past five years. We consulted Crunchbase bulk data to generate the list, and then manually vetted and contacted each of the 72 insurance CVC investment units in the sample either by email and/or telephone in the weeks preceding our data collection dates. In addition to interviews and surveys, we obtained various documents from the focal CVC investment unit that included the formal investment thesis, the unit's team composition and previous experiences, and examples of investment proposals prepared by the focal CVC investment unit and subsequently communicated to the investment committee for review. Lastly, we enriched the opportunity set that we received from the focal CVC investment unit. The dataset we received contained very little information on startup characteristics, so we manually collected data on website URLs, industry NAICS, founding dates, survival, exits, funding rounds, investors, revenue, employee count, and founding team work and education backgrounds. Some of this data helped to triangulate the information that we had received from the focal CVC investment unit, but most of the data provided us with information about the startups that we had not received. We consulted the Crunchbase bulk data on startup fundraising rounds and investors, LinkedIn web data on startup founding teams and their previous work and education experiences, Orbis database on startup financials and employee counts, startups'

websites, and other country-specific private and public database sources on startups' financials. Next, we created a composite dataset of 148 variables, and developed code to merge all the various pieces of information to recreate a composite dataset for our main variables of interest. In building our composite dataset, we gave priority to information in the following order (from high to low priority): information that we received directly from the focal CVC investment unit; official startup website; Crunchbase; LinkedIn and other social media sites; Orbis; various other databases based on a national corporate registry. We should note that the independent collection of data on startups is highly challenging and time consuming, because startups are commonly private, very small and largely unseen, and subject to minimal or near-absent financial reporting requirements. Therefore, our ordering of data prioritization was emergent, and based on meticulous manual examination of the data over a period of 18 months. We arrived at the most appropriate sources, by means of the research experience itself.

Variables and Measures

Dependent Variable

Our dependent variable is a time variable, in which we compute the number of days elapsed between the moment the startup first enters the opportunity set until the startup is removed from the opportunity set. If an investment is made in a particular startup, then it is removed from the sample. We target those startups that were considered in the opportunity set, but that did not ultimately make it into the focal CVC investment unit's investment set.

Independent Variables

The main independent variable in our first hypothesis is the *investment committee approvals rolling mean*, which is a continuous variable based on a moving average of the committee approvals during the previous three scouting windows. Our composite dataset has 25 scouting windows, 17 of which resulted in at least one favorable decision (68 percent). The focal CVC investment unit makes three proposals available towards the end of each scouting window, and the investment committee makes between 0 and 2 investments per scouting window. Our second hypothesis is based on the *founder tech & finance related experience* variable, which is a dichotomous variable coded as either '0' or '1'. The variable is equal to '0' when a startup in the

opportunity set has no founding team members with previous technical and financial work experiences. Likewise, the variable is equal to '1' when a startup has at least one founding team member with previous technical and financial work experiences. Our third hypothesis is based on the *scouting channel investors* variable. The *scouting channel investors* variable is a dichotomous variable coded as either '0' or '1'. It is '0' when a startup was not sourced into the opportunity set using external investor networks, and '1' when a startup was sourced using external investor networks such as independent venture capitalists (IVCs). Our fourth hypothesis is based on the dichotomous *matching channel retail banking* variable, which is coded as '0' when a focal startup in the opportunity set was not matched to the retail banking business unit, and '1' when the startup was matched to the retail banking business unit.

Control Variables

In addition to our independent variables, we include the following control variables: *unit attentional load*, *unit cumulative investments made*, *startup age*, *startup age missing*, *startup core banking product*, *startup prior VC funds received*, and *founders with business education*. The variable *unit attentional load* measures the number of startups that enter the opportunity set and that have not been rejected. In order to compute this variable, we first collected data on when each startup first encountered the focal CVC investment unit. Then, we assigned each startup to a particular entry window number and exit window number, based on the startup's entry date into the opportunity set and the date that a startup was either cleared from the opportunity set or invested in. Window numbers were computed based on financial quarters each year from Q1 2014 to Q1 2020, which equaled 25 scouting windows. As a robustness check, we measured *unit attentional load* using an identical approach as described, but divided the value for each window by the number of CVC investment unit members that were collected on a yearly basis. The variable *unit cumulative investments made* indicates the cumulative number of startups that were invested. Based on the fact that our data covers the inception of the focal CVC investment unit, this measure happens to be identical to the historical investment portfolio size for the focal unit. The variable *startup age* measures the age of a startup in days, between its founding date and the date it first entered into the opportunity set. The variable *startup age missing* imputes means, based on the previous *startup age* variable, for any given startup for which we were unable to obtain a reliable founding date during our data enrichment process. The variable *startup core*

banking product is a dichotomous variable, coded as 0 or 1, that indicates whether a startup's product represents a core financial product '1' or non-core financial product '0'. A core financial product is defined as a startup that has any of the following product categories: *banking, factoring, financial, insurance, payments, personal finance management, or trading*. In contrast, a non-core financial product is defined as a startup that has any of the following product categories: *non-financial, big data, security, or cryptocurrency*. Although cryptocurrencies will likely be highly relevant to finance in the future, this product category is not yet part of a traditional bank's existing core services. Therefore, we classified the cryptocurrency category as a non-core financial product. All 1,047 startups in the sample were coded as one of any of the eleven possible product categories. *Startup prior VC funds received* is a dichotomous variable, where '0' indicates that the startup had not received venture capital (VC) funding before entering the focal CVC investment unit's opportunity set. The value '1' indicates that the focal startup had received VC funding before entering the opportunity set. Lastly, *founders with business education* is a continuous variable that indicates the number of founding team members with previous business education.

Estimation Models

To address our four research questions, we used Cox Proportional Hazard models. Hazards (survival) analysis allows us to examine the temporal aspects of the dependent and independent variables, in order to analyze factors associated with the occurrence and timing of the removal of startups from the focal CVC investment unit's opportunity set. We performed an additional analysis using a cohort fixed effects model in order to consider variation over 25 scouting windows (see model (6) in the results section). Each of the twenty-five scouting windows culminates in an investment committee decision that is either favorable or unfavorable with respect to the proposed startups offered by the focal CVC investment unit. The subsequent time period that follows an investment committee decision is considered to be a distinct scouting window.

RESULTS

Table 1 reports descriptive statistics. Table 2 presents a correlation matrix. Table 3 contains the results from the Cox Proportional Hazards models.

The baseline model (1) in Table 3 includes only the control variables. Model 1 shows that there is a very strong effect of the *unit cumulative investments made* on the rate of being removed from the opportunity set. The positive coefficient implies that as the cumulative number of a unit's investments increases, the CVC investment unit is more likely to remove startups from the opportunity set in a fewer number of days. Similarly, model (1) shows that there is a very strong effect of the *founders with business education* on the rate of being removed from the opportunity set. However, the negative coefficient implies that a CVC investment unit is more likely to continue to consider a startup whose founding team has former business education for a greater number of days. In addition, model (1) shows a significantly positive, but weaker effect of *unit attentional load* on the rate of clearing startups from the opportunity set. The greater the unit attentional load on the CVC investment unit, the fewer days startups will remain in the opportunity set. Model (1) shows a significantly negative effect of *startup prior VC funds received* on the likelihood of a startup being removed from the opportunity set. The negative coefficient implies that startups with VC funding prior to meeting the CVC investment unit are more likely to remain in the opportunity set for a great number of days. The remaining control variables *startup age* and *startup core banking product* are not significant, but have positive signs. This implies that the older a startup is when it meets the CVC investment unit for the first time, the fewer number of days it takes for the CVC investment unit to remove it from the opportunity set. Similarly, startups offering a core banking product also spend a fewer number of days in the focal CVC investment unit's opportunity set.

Model 2 adds *investment committee approval rolling mean* (hypothesis 1). Model 2 shows that there is a very strong effect of the investment committee approval on the rate of being removed from the opportunity set. The positive coefficient indicates that as the number of positive approvals accumulate from the investment committee (moving average of the last three decision making periods), the CVC investment unit is more likely to remove startups from the opportunity in a fewer number of days. Therefore, we found support for hypothesis 1. Exactly as in the previous model (1), the *unit cumulative investments made* and *founders with business*

education control variables have very strong effects. *Unit cumulative investments made* also has a positive sign as in the previous model, and *founders with business education* also has a negative sign as in the previous model. Whereas *unit attentional load* in the previous model had a significant p-value of .02 at the $p < .05$ level, *unit attentional load* in model (2) is similarly positive and not significant. However, *startup prior VC funds* received in model (2) is more significant than in model (1), and similarly negative. The remaining control variables *startup age* and *startup core banking product* are not significant, and have positive signs just as in model (1). In the case of our focal bank, 68 percent of the quarters had favorable decisions by the investment committee (seventeen out of twenty-five quarters). Thirty-three percent of scouting windows received no investment, in which the investment committee communicated a negative decision on the CVC investment unit's proposal. Forty-one percent of startups were sourced after a negative decision was made.

Table 1

Descriptive Statistics

Variable	Mean	S.D.	Min.	Max.
Investment committee approvals rolling mean	.7275	.4277	0	1.6667
Founder tech & finance related experience	.2894	.453	0	1
Scouting channel investors	.3343	.472	0	1
Matching channel retail banking	.2932	.455	0	1
Unit attentional load	77.57	25.082	0	131
Unit cumulative investments made	8.044	6.058	0	17
Startup age •	1135	2421.4	1	71707
Startup age missing ••	.2808	.45	0	1
Startup core banking product	.49	.5	0	1
Startup prior VC funds received	.07736	.267	0	1
Founders with business education	.2751	.604	0	3

• Measured in days.

•• Measured using the mean age.

Model 3 keeps *investment committee approval rolling mean* and adds *founder tech and finance related experience* (hypothesis 2). Model 3 shows that there is a strong negative effect of the *founder tech and finance related experience* on the rate of being removed from the opportunity set. That is, the CVC investment unit is likely to consider founding teams with tech and finance experience for a greater number of days in the opportunity set. Therefore, we found support for hypothesis 2. Similar to model (2), *investment committee approval rolling mean* has a very strong positive effect on the rate of being removed from the opportunity set. Just as in the previous two models, *unit cumulative investments made* has a very strong positive effect. In model (3), *startup prior VC funds received* is negative as in the previous models and even more significant than the previous models. *Founders with business education* is also negative, just in the previous two models. However, it is not significant. The remaining control variables in model (3) are not significant and have the same signs as the previous models.

Table 2

Correlation Matrix

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Investment committee approvals rolling mean	—	.01	.11	.00	.36	.17	-.03	-.03	-.03	.13	.00
2. Founder tech & finance related experience	.01	—	.07	-.01	.09	.17	-.03	-.38	-.02	.00	.71
3. Scouting channel investors	.11	.07	—	.00	.12	.04	-.02	-.12	.03	.09	.05
4. Matching channel retail banking	.00	-.01	.00	—	-.09	-.11	-.04	-.01	.20	-.03	.02
5. Unit attentional load	.36	.09	.12	-.09	—	.29	.02	-.03	-.02	.04	.07
6. Unit cumulative investments made	.17	.17	.04	-.11	.29	—	-.05	-.16	-.17	.27	.11
7. Startup age *	-.03	-.03	-.02	-.04	.02	-.05	—	.00	.00	-.02	-.03
8. Startup age missing **	-.03	-.38	-.12	-.01	-.03	-.16	.00	—	.03	-.07	-.27
9. Startup core banking product	-.03	-.02	.03	.20	-.02	-.17	.00	.03	—	-.07	.02
10. Startup prior VC funds received	.13	.00	.09	-.03	.04	.27	-.02	-.07	-.07	—	.00
11. Founders with business education	.00	.71	.05	.02	.07	.11	-.03	-.27	.02	.00	—

Model (4) keeps the same set of variables as the previous models, and considers *scouting channel investors*. It is negative and non-significant. In model (4), all control variables have the same signs and significance levels as model (3). One exception is that the variable *startup prior VC funds received* has a slightly lower degree of significance at the $p < .01$ level, instead of $p < .001$ as found in model (3). Therefore, we found partial support for hypothesis 3. All control

variables have the same signs and levels of significance as model (4). Over a period of approximately six years, 1,047 unique external startups were identified by the focal unit that we studied. This represented nearly 175 startups, on average, enrolled into the focal CVC investment unit's opportunity set each year. The actual level of opportunity inflows fluctuated on an annual basis, with ranges that varied between six percent and fifty-four percent each year. Based on our survey of senior corporate venturing managers, CVC investment units self-reported a median number of 250 startups that entered into their respective opportunity sets in the previous year. At the Bank, the investor networks scouting channel type was used to source 36.5 percent of the external startups in the opportunity set. Based on our survey of corporate venturing senior managers in the financials sector, we learned that sourcing opportunities from IVCs and private accelerators/incubators was the most prevalent scouting channel. We found that 40 percent of median dealflow, in the units we surveyed, originated from outside investor networks. The unsolicited applications scouting channel type sourced 24.5 percent of the external startups in the opportunity set. Based on the same survey of CVC investment units, we found that ten percent of median dealflow originated from unsolicited applications (the range was between zero and 75 percent). In our focal bank setting, the internal business units scouting channel type sourced 15.1 percent of the external startups in the opportunity set. Based on our survey, we found that ten percent of median dealflow originated from internal business units (the range was between zero and 50 percent). The public demo events scouting channel type sourced 9.6 percent of the external startups in the opportunity set. Based on our survey, we found that ten percent of median dealflow originated from public demo events (the range was between zero and 50 percent). The intentional search scouting channel type sourced 9.1 percent of the external startups in the opportunity set. Based on our survey of senior corporate venturing managers, we found that five percent of median dealflow originated from intentional search in our sample of CVC investment units (the range was between zero and 50 percent).

Model (5) adds the *matching channel retail banking* variable (hypothesis 4). The coefficient for the variable is positive and significant. A positive coefficient suggests that the CVC investment unit spends less time considering startups in the opportunity set that have been matched to retail banking, in comparison to other business units. Therefore, hypothesis 4 is not supported. All control variables have the same signs and significance levels as the previous models, except for the *startup core banking product* variable which is negative in model (5). This

suggests that startups offering core banking products will remain in the unit's opportunity set for a greater number of days, than startups offering non-core banking products. At the focal bank we examined, the retail clients business unit channel type was used to match 47.6 percent of the external startups in the opportunity set. The corporate banking business unit channel type was used to match 35.5 percent of the external startups in the opportunity set. The investment banking business unit channel type was used to match 10.5 percent of the external startups in the opportunity set. Our analysis of the unit's rejection codes, in relation to the opportunity set of our focal CVC investment unit, revealed that at least 43 percent of the startups in the opportunity set for which we obtained rejection codes (833 out of 1,047 startups) were never successfully matched with an interested business unit. Of those startups that were unsuccessfully matched by the focal CVC investment unit, 39 percent were in alignment with the stated renewal fitness. The remainder (61 percent), of those startups that could not be successfully matched with an interested business unit, were deemed to be outside the boundaries of renewal fitness.

Table 3

Cox Proportional-Hazards Models						
Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Investment committee approvals rolling mean		.4305 *** (.07744)	.438 *** (.07745)	.4474 *** (.07819)	.4269 *** (.07815)	3.085 * (1.212)
Founder tech & finance related experience		.000000027	.0000000156	.0000000105	.0000000469	0.1092 -2829 *
Scouting channel investors			-.2856 ** (.11)	-.2877 ** (.1099)	-.2697 * (.1129)	-.2829 * (.1219)
Matching channel retail banking			-.008716	.00885 (.06976)	-.0693 (.06987)	.00816 (.07193)
Unit attentional load	.00291 * (.001283)	.0004824 (.00142)	.0006108 (.001422)	.0007364 (.001428)	.001202 (.00143)	.0004494 (.006641)
Unit cumulative investments made	.03496 *** (.005742)	.0341 *** (.005991)	.03553 *** (.006018)	.03534 *** (.006024)	.03624 *** (.006002)	-.0154 (.03304)
Startup age	.0000000114 (.0000113)	.0000000126 (.00001121)	.0000000354 (.00001127)	.0000000446 (.00001127)	.0000000156 (.00001127)	.64114 (.00001181)
Startup age missing	.235 (.07345)	.14182 (.0762)	.163947 (.07803)	.17195 (.07853)	.13228 (.07845)	.03223 (.0808)
Startup core banking product	.3363 (.06488)	.20986 (.06475)	.566314 (.0648)	.6482 (.06482)	.63259 (.06559)	.16991 (.06741)
Startup prior VC funds received	.804 (.1238)	.86427 (.1248)	.93257 (.1248)	.93511 (.1253)	.57194 (.1255)	.34779 (.1305)
Founders with business education	-.3129 * (.115)	-.406 ** (.00114)	-.412 *** (.000967)	-.4007 ** (.00139)	-.4003 ** (.00142)	-.4042 ** (.00195)
Cohort Fixed Effects (25 scouting windows)		-.2644 *** (.06078)	-.2501 *** (.06118)	-.09503 (.0842)	-.09538 (.08405)	-.1028 (.08415)
Score test	.0000136	.0000434	.25907	.25647	.22197	.16517
	68.15	100.5	108.6	109.4	128.4	178.8

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First row of each variable refers to the parameter estimates of the model. Standard errors are in parentheses in the second row of each variable. P-values are indicated in the third row of each variable. p < .05 * p < .01 ** p < .001 ***

Model (6) contains all the variables in our study and adds cohort fixed effects that consider variation over 25 scouting windows. The *scouting channel investors* variable switches to a positive sign, and remains not significant. However, the variable *startup prior VC funds received* has a high degree of significance at the $p < .01$ level and negative coefficient in all models, which provides partial support for hypothesis 3, since the CVC investment unit is selectively allocating attention to opportunities that were previously endorsed by independent venture capital (IVC) firms. However, some of the mechanisms we explained would differ in this case when compared with the third hypothesis. Model (6) is the only model in which *startup age* becomes significant ($p < .05$). All other variables have the same signs and levels of significance as model (5), except for the *unit cumulative investments made* variable that switches signs. This variable goes from being positive and having very strong effects across all models, to becoming negative and non-significant in model (6). A negative coefficient for *unit cumulative investments made* implies a higher likelihood that the unit will consider startups in the opportunity set for longer periods of time as the unit's portfolio size becomes larger. A slight difference between model (5) and model (6) occurred for the *investment committee approval rolling mean* variable, in which the level of significance decreased slightly from $p < .01$ to $p < .05$, but the actual p-value barely missed the more stringent threshold as it is equal to .01092. Lastly, we found cohort effects in model (6), but not in model (5). Cohort effects offer evidence that there are statistically significant variations over time, and that even within the same CVC investment unit, there are variations between its 25 scouting windows or opportunity sets that we examined.

DISCUSSION

The CVC investment mode is characterized by mixed-motive games, in which the goals of the players are partially coincident and partially in conflict (Gallo & McClintock, 1965). The CVC investment mode meets the following conditions: (a) multiple external and internal players must participate, (b) each player holds differing perspectives on the firm's renewal agenda, (c) it is the CVC investment unit's responsibility to converge varying viewpoints during the evaluation situation, and (d) partial-convergence during the evaluation situation facilitates critical organizational actions or moves that lead into the investment situation. The first question might be, "How do CVC investment units allocate their sustained attentional processing to make sense

of multiple players' viewpoints during the evaluation situation?" One way to answer this question is to measure the dispositionally elapsed time or exposure that a CVC investment unit has to any particular set of players. The simple mechanism at play is that the more one pays attention to particular players, the more one is being influenced through social interactions on what issues and answers constitute appropriate organizational responses. The underlying assumption is that the firm's agenda is ambiguous and, by logical deduction, subject to persuasion. The more one pays attention to one set of players over another, is neither necessarily good nor necessarily bad. The selective allocation of attention does, however, have the potential to influence what opportunities get introduced to business units, and what opportunities get proposed to investment committees. This should matter to practitioners, because one could imagine that certain attentional patterns may reinforce inertial path dependencies, or systemic unequal life chances, or any number of other selection biases or noise. For example, only paying attention to internal scouting sources for the discovery of external opportunities, could produce a certain narrowing of opportunity sets that results in highly proximate and familiar opportunities. For some incumbent firms, this outcome may be just fine. However, in a setting characterized by considerable organizational renewal (e.g., digital transformation), overly familiar answers to new problems are unlikely to yield the most beneficial knowledge and market resources that could achieve the incumbent firm's renewal goals. A reasonable follow up question would be: "*Why then does the CVC investment unit pay attention to certain players?"*"

We investigated the antecedents of certain attentional allocation patterns in CVC investment units during the evaluation situation. We empirically tested four hypotheses that address how a CVC investment unit allocates its selective focus of attention to certain players through procedural and communication channels. The theoretical rationale for our hypotheses is explained in the hypotheses section, which sets forth why we expect the allocation of selective and sustained attention. Each of the four hypotheses relates to a distinct player that needs to cooperate with the CVC investment unit for the evaluation situation to generate at least one of three organizational moves. The CVC investment unit will either remove an external opportunity from the opportunity set, or the CVC investment unit will introduce an external opportunity to an internal business unit(s), and/or the CVC investment unit will propose an external opportunity to the firm's investment committee for possible investment selection. Any of the three organizational moves depends on the network of attentional processing that involves the

participation of the investment committee, external startups, scouting networks, and business units. The statistically significant results for our first hypothesis confirm our expectation that CVC investment units are influenced by the incumbent firm's investment committee. CVC investment units will remove opportunities from the opportunity set at a faster rate after a favorable investment committee decision, than after an unfavorable investment committee decision. Given the constrained limits of attentional capacity, by removing opportunities more quickly the CVC investment unit offers itself more sustained attention on fewer opportunities. The effect appears to last three opportunity sets, which equates to three financial quarters in which the investment committee considered proposals for possible investment. This attentional pattern implies that the CVC investment unit interprets the investment committee's favorable decision as positive reinforcement of its particular framing of the firm's agenda. The level of perceived ambiguity diminishes because there is no need to update mental models, which allows the CVC investment unit to operate with greater speed in decisions relating to selective attention. With a clear frame of what should remain in the opportunity set, it becomes easier to remove opportunities from the opportunity set. Our rationale differs from an alternative explanation that draws from the behavioral theory of the firm. Based on the concept of satisficing, we should also expect to see a CVC investment unit employ short-cuts or heuristics wherever possible to mitigate the effects of limited attentional resources. However, the satisficing concept applies more readily to routine or consistent situations, and less to the unexpected and adaptive circumstances of firms under strategic renewal. Although renewal goals are communicated by senior executives, these are often ambiguous at any given time and often ambiguous because renewal goals can evolve over time. The investment committee possesses the final authority to frame the firm's agenda, in relation to the CVC investment unit in our context, but its perception of the firm's agenda and what constitutes appropriate issues and answers also changes over time. These shifts in perception could result from learning based on the retrospective analysis of previous outcomes, but could also result from random noise. For the CVC investment unit to keep up with an unpredictable moving target, it needs to continuously generate variation that departs from its perceived frame. While satisficing behaviors would likely lead to search rigidity due to anchored heuristics that create automatic processing of information, an attention-based view provides a more accurate account of how CVC investment units are simultaneously influenced by investment committee decision-makers, but also by a network of distinct players

that are likely to introduce unexpected variation in viewpoints regarding opportunities in the opportunity set. The presence of variation opens up the CVC investment unit to adaptation processes over time, which allows it to partially mirror investment committee shifts in perception between decision intervals. The results from our final three hypotheses are a mixed bag, but we should interpret these results in light of a single-case study. Our reasons for why we expected the CVC investment unit to allocate selective attention towards particular players are grounded in theory, but we also should expect considerable heterogeneity between CVC investment units in how each allocates selective attention to certain issues and answers. The fact that two of our final three hypotheses were not supported by statistical evidence, could be evidence of some dysfunction in the particular case we analyzed. We found statistical support for the second hypothesis in which we expected the CVC investment unit to dispositionally allocate sustained attention to external startups that are capable of engaging in sustained discussions with intrafirm players. Because introducing external startups to business units and proposing external startups to the investment committee are critical actions for any CVC investment unit, we should not expect a competent CVC investment unit to depart from this attentional processing situation. However, in the case of our third and fourth hypotheses, it would be reasonable to expect to observe heterogeneous behaviors in selective attention that differ among CVC investment units. In our single-case analysis, the bank's CVC investment unit demonstrated certain selective attention behaviors that are inconsistent with our expectations for the third and fourth hypotheses. We happen to observe one strategy instead of another. In the case of our third hypothesis, the absence of significant statistical evidence implies that our focal CVC investment unit did not allocate sustained attention to opportunities sourced from independent venture capitalists (IVC). We expected that a CVC investment unit would attend to salient external market signals, in order to ensure the updating of knowledge on technology and market trends, and that the reputational quality and investor quality of an IVC would create greater interest with intrafirm players such as business units and the investment committee. A post-hoc analysis we conducted revealed that the bank's CVC investment unit allocated sustained attention to internal scouting networks, in addition to external scouting networks. The use of internal scouting networks is consistent with a statement one of the bank's senior CVC investment unit managers made to us, "*what can drive the decision very fast is if there is already contact between the bank or business unit of the bank and the startup.*" The statistical evidence supports the view that both

internal and external scouting networks were used, with a stronger statistical effect for the use of internal scouting networks. This result suggests that our focal CVC investment unit allocated less selective attention to external scouting networks, than to internal scouting networks. Based on the rationale of external market saliency, it could be deduced that the focal CVC investment unit did not update its knowledge on technological trends to the greatest extent possible. There are several possible explanations for why a CVC investment unit might access less recent and less novel information concerning markets for technology. It is possible that there was an operational deficiency in the CVC investment unit, or that the CVC investment unit was able to obtain the latest information from an alternative source, or that we were unable to measure the degree to which a CVC investment unit allocated attention to IVC players. It is unlikely that the CVC investment unit spent considerable time learning from IVCs and that this behavior would not be reflected in our measure of sustained attention. This implies that the CVC investment unit either dealt in older and more proximate technological knowledge, or leveraged alternative procedural and communication channels for obtaining such information. It would be reasonable to infer that CVC investment units might differ in the extent they balance external and internal scouting networks, considering incumbent firms' varying abilities to absorb external knowledge. An incumbent firm that possesses weaker R&D capabilities regarding advanced enabling technologies, such as machine learning and biometrics, may have a diminished ability to learn from the IVC procedural and communication channel. Reduced firm ability would likely lead a CVC investment unit to self-select against allocating sustained attention to the IVC player. An alternative explanation for our results is that the ability to absorb advanced technological knowledge existed in the bank, but the CVC investment unit was unable to sufficiently establish relational ties with IVC firms. Fewer available IVCs to learn from, would also lead to the self-selection effects described above. In the case of our fourth hypothesis, the positive coefficient and significant statistical result imply that our focal CVC investment unit did not allocate sustained attention to external opportunities matched with a salient internal business unit. Instead, it seemingly selectively allocated its focus of attention to other business units, instead of the retail banking business unit that was the focus of the bank's digital transformation. We expected that a CVC investment unit would dispositionally attend to salient internal market signals, because salient business units are expected to reflect a higher degree of alignment with the firm's agenda and its renewal goals. The lack of statistical support could be explained either

by our measurement of the retail banking business unit, or by the deliberate action of the CVC investment unit to systematically contravene the firm's agenda. It is conceivable that the CVC investment unit did allocate considerable attention to the retail banking business unit upfront, so that it was able to more efficiently process opportunities before our measurement period. This would confirm our premise that CVC investment units selectively focus their attention on strategically salient internal markets, but it would also explain the positive and significant coefficient. As to our second alternative explanation, a decision to sustain attention to issues and answers that conflict with the firm's agenda would likely be caused either by strong competing beliefs or by relational strife with certain business units. Episodic gaps between a CVC investment unit's and its parent firm's viewpoints are to be expected, for the reasons described earlier, but sustained conflicting viewpoints are not to be expected since the CVC investment unit would not likely survive for the six-year period that we studied. In speaking to members of the CVC investment unit, we did not observe any motive that suggests a conflict in conviction between the CVC investment unit and the bank. The lack of statistical evidence for sustained attention to the retail banking business unit could instead potentially have been caused by relational frictions between the CVC investment unit and that business unit. It is also plausible that the CVC investment unit either deliberately or unintentionally averted its sustained attention to the retail banking business unit, but simultaneously paid sufficient sustained attention to the retail banking business unit as to not draw negative attention to itself from senior executives. This may pose a risky balance to strike since business units undergoing renewal are the ongoing focal objects of organizational adaptation and prevalent in the minds of senior executives.

In closing, our emphasis on the antecedents of sustained attentional allocation in the CVC investment mode during the evaluation situation, highlights the importance of studying CVC investment units as separate from the parent incumbent firm. By separating the CVC investment unit from the incumbent firm, we can utilize the attention-based view (ABV) and sensemaking perspectives to offer a distinctive view of the CVC investment mode that is structural, social, emergent, and action-oriented. We apply Ocasio et al.'s (2018) insight into the centrality of communication to the CVC investment mode, based on their view that the ABV offers an explanation of structurally and situationally distributed social processes, and sensemaking perspectives offer an explanation of enactment through social cognition. The CVC investment unit is embedded in a complex network of attentional processes, in which distinct players and

their viewpoints are structurally distributed. Not only has the CVC investment unit often been disregarded in the CVC literature, but the evaluation situation has been understudied as well. For CVC investments to be made, multiple players must first engage in mixed motives games where collective sensemaking leads to collective action during the evaluation situation. But sensemaking here is not merely the role of social cognition in revealing the objective truth about the incumbent firm's renewal agenda. Collective sensemaking processes, described in our study, create particular outcomes, unpredictably, because they shape what issues and answers are selectively attended to, at the cost of other issues and answers that are ignored in the process. In the context of the evaluation situation, the network of sustained attentional processing explains how opportunity sets are constructed sequentially and how the evaluation of an opportunity's renewal fitness is socially constructed. The composition of opportunity sets matters, because these form the basis of future opportunity selection processes, which in turn determine the digital innovation opportunities that an incumbent firm will eventually act on to renew itself. This way of thinking differs from the current view of selection processes in the CVC literature, which largely ignore path dependencies established in the evaluation situation and over-emphasize certain rational evaluation criteria in dyads between external startups and incumbent firms such as technology overlaps. Partners' respective technological knowledge overlap may matter, but this dyadic measure has more to do with innovation outcomes that come many years later, if all goes well, than it has to do with how opportunity sets get built, and how investment committees make investment selection decisions. The evaluation situation, as we conceptualize it, is not simply about traits of an external startup or the dyadic strategic fit with an incumbent firm, but about the CVC investment unit's regulation of a network of distributed players with differential and distributed valuations of issues and answers that interact stochastically, as part of a delegated, decentralized attentional processing environment that shapes the subjective evaluation of an opportunity's perceived renewal fitness. We shed light on a "*blackbox*" process that CVC investment units engage in to make sense of an external opportunity, and to form collective action or organizational moves, which are not predictable from startup traits alone. Altogether, we highlight the antecedents of selective attention in the CVC investment mode, and our results present an attentional view of CVC investment unit-level evaluation processes that the CVC literature lacked in the past. We offer a unique measure of attention based on the exposure or elapsed time of sustained attention on certain players and associated external

opportunities. Because of the high degree of ambiguity involved in driving organizational renewal, senior executives routinely formalize features of search activities. Senior executives' subjective representation sets the agenda for action, in the manner that cognition precedes the adoption of particular technologies through investments in external startups (Gavetti & Levinthal, 2000; Gavetti et al., 2005; Kaplan, 2008b). Rather than regard an incumbent firm's strategic agenda as merely the result of a unilateral, top-down process, we argue that a firm's strategic agenda is more often guided by multilateral individual and group cognition through procedural and communication channels. Our study helps to reconceptualize the focal governance role of CVC investment units and the emergent and dynamic nature of the evaluation situation that guides the firm's agenda, as a precursor to the investment selection situation. This offers a distinctive view of how opportunity sets get constructed that serves as a counterweight to the prevailing top-down, *ex ante* rule-based logic of appropriate issues and answers in the CVC literature (March, 1970; 1983).

We acknowledge potential limitations to our study. First, the financial services sector searches answers for a relatively narrow set of issues, which may allow more attentional capacity per individual issue than a more diversified firm that has a broader set of issues to attend to. A CVC investment unit in a diversified incumbent firm will be confronted with much greater levels of ambiguity regarding the firm's (diverse) agenda as a result, and may have to access additional governance mechanisms not available in our setting. Second, the participation of business units was required by the bank in our single-case study, which may not always be necessary in the CVC investment mode. One less player and organizational move during the evaluation situation could alter the dynamics in the network of attentional processing we proposed. However, we recently observed a growing trend in which the organizational move to match an external opportunity to an internal business unit is becoming a prerequisite for subsequent investment selection in many CVC investment units. Third, the bank's CVC investment unit was responsible for regulating the network of distributed players, but this may not always be the case. Some incumbent firms have multiple units of different types working together to regulate distributed players, which introduces more complexity to the model we proposed. Instead of the CVC investment unit being at the center of the network, there may be a need for the CVC investment unit to cooperate with other units that share in this responsibility but that may report to different decision-makers. For example, there may be dedicated players that intervene between a CVC

investment unit and internal business units. This would likely alter the communication patterns between players, and create even more distance between the incumbent firm and external opportunities. This may shape evaluation situation outcomes in particular ways that we have not considered in our study. Fourth, we did not have the data available to analyze consideration sets, which we conceptualize as situated between opportunity and investment sets. A consideration set would include only those external opportunities that were proposed to the investment committee. Consideration sets in conjunction with data on rationalizations why the investment committee rejected certain proposals, could shed more light on opportunity sets in the evaluation situation and the social construction of the perceived renewal fitness of an opportunity. Lastly, we argue that clearing startups from the opportunity set reflects a deliberate act or volition to wrestle back control of the opportunity set in an effort to counteract ‘*garbage can*’ forces (Cohen et al., 1972). Clearance rates draw on a particularly unique aspect of our dataset, which is the indication of incoming and exit dates for all external startups in the opportunity set.

CONCLUSION

Drawing on the ABV and sensemaking perspectives, we applied the principles of structurally distributed players and social processes that affect cognition to reconceptualize the evaluation situation enacted by CVC investment units. We propose that the evaluation of opportunities in the CVC investment mode is as much about this network of attentional processing, than it is about the individual traits of external opportunities. We answered Ocasio et al.’s (2018) call to examine communication in relation to the selective focus of attention, and answered Dushnitsky’s (2012) appeal to examine a wider and more recent set of phenomena in the CVC investment mode. To achieve this, we analyzed the sustained and selective allocation of attention to certain opportunities as a function of distinct players operating in procedural and communication channels jointly with the CVC investment unit. We used time-stamped data to recreate the sequence of external opportunities that entered into the CVC investment unit’s opportunity sets over a six-year period between 2014 and 2020. Our proprietary dataset was composed of all 1,047 external opportunities ever considered by a single-case CVC investment unit at a major European bank, undergoing significant digital transformation, since its inception. We sought to better understand how and why the CVC investment unit engaged in the evaluation

of opportunities by regulating its selective and sustained attention to four types of distinct players through specific procedural and communication channels: investment committee, external startups, external scouting networks, and internal business units. We found that the CVC investment unit sustained attention to fewer opportunities in response to unfavorable investment committee decisions concerning the investment selection of proposed opportunities. Our rationale is that CVC investment units adjust their evaluation behaviors based on the perceived need to update their understanding of the firm's agenda and by extension of what constitutes the renewal fitness of individual opportunities. We also found that the CVC investment unit selectively focused on opportunities with the capabilities to engage intrafirm players. However, we did not find statistical support for our predictions that CVC investment units would selectively attend to external and internal market salience. We reason that these results are likely more an indication of the idiosyncratic orientation of the particular single-case CVC investment unit we studied, than necessarily generalizable. In short, the design of the search process may be an object of rational decision (March & Simon, 1959), but its *actual* practice by CVC investment units is influenced by particular attentional forces. Thus, the idiosyncratic opportunity sets that CVC investment units build, through sourcing and matching, is shaped by a CVC investment unit's selective focus of attention and by the structural distribution of attention in the focal organization. Based on the variance that we observed between opportunity sets in the same CVC investment unit, our study demonstrates the prevalence of *within* CVC investment unit variances in addition to *between* CVC investment unit variances documented in prior literature. Heterogeneity is a fundamental trait of the CVC investment mode, which makes studying CVC investment unit practices valuable and challenging empirically. Yet, the pursuit of renewal goals and organizational adaptation is an ever more formidable challenge. Indisputably, problemistic search is resource-intensive, time-consuming, and uncertainty-laden.

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Study Two



SELECTION

**SEARCHING BEYOND THE HORIZON:
OPPORTUNITY AND MOTIVE IN CVC INVESTMENTS**

ABSTRACT

We examine how corporate firms deal with the competitive effects of technological change by utilizing corporate venture capital (CVC) investment opportunities to source external knowledge. Whereas previous scholarship has largely focused on the composition of CVC investment portfolios to predict performance outcomes, we examine organizational level drivers of CVC investment behavior. We contend that CVC investment behavior is influenced by the interaction between two fundamental considerations: the supply of investment opportunities made available to the corporate firm because of its position in the environment; and the demand for new technological investments deriving from the need to cope with technological change. We argue that the degree to which CVC programs place bets on external startup ventures with uncertain prospects depends not only on their position in investment syndicate networks but also on how organizational attention is systematically guided by the threats posed by technological change. We analyze investments made by CVC programs of 209 publicly traded firms over 20 years, and find that more centrally placed corporate firms in the VC investment syndicate have higher investment rates. We find that greater focus of the corporate firm's technological capabilities induce them to take advantage of the investment opportunities that arise from a central position in syndication networks. Our findings imply that CVCs serve as a "*window on technology*" only to the extent that technological positions of corporate firms direct attention to choices within the opportunity set that is determined by the corporate firm's network of investment relations.

INTRODUCTION

Rapidly changing technological environments challenge corporate firms' ability to remain viable in the face of competitive threat from potential and new entrants (Henderson & Clark, 1990; Schumpeter, 1942; Tushman & Anderson, 1986; Uotila et al., 2009). Corporate firms address this challenge by sourcing external knowledge to enhance knowledge generated through internal R&D activities with that generated by other firms. In order to effectively induce growth many firms depend on cultivating boundary-spanning interorganizational ties that allow critical access to the latest knowledge and offer a window on emerging technologies (Ahuja, 2000; Dushnitsky & Lenox, 2005; Grant & Baden-Fuller, 2004; Schildt et al., 2005). In particular, ties with startup ventures that are likely to unleash "*gales of creative destruction*" can be a source of competitive advantage in the face of technological change (Gans et al., 2000; Schumpeter, 1942).

Corporate venture capital (CVC) investments have become one systematized mode for promoting knowledge exchange between corporate firms and external startup ventures (Dushnitsky & Lenox, 2005; Keil, Maula et al., 2008), in which the former take minority equity positions in the latter after an exacting selection process. First deployed in the 1960s, CVC investors participated in 23 percent of all VC-backed deals and there were 2,740 CVC investments worth \$53B in funding in 2018 (Waite, 2019). There is a growing interest in CVC investments as an effective "*window on technology*" for corporate firms to first detect and then respond to radical changes in the environment, in addition to providing capital and management resources to startup ventures that expedite their growth (Benson & Ziedonis, 2009; Dushnitsky & Lenox, 2005). Previous literature on CVC investments often emphasizes the value of CVC investments to startup ventures in terms of improved growth rates and the value to corporate firms in terms of pecuniary benefits that flow from a subsequent acquisition or initial public offering (IPO) of a given startup venture (Chemmanur et al., 2014; Hellman, 2002). However, the literature has scarcely addressed the antecedents to the rate of CVC investments from a corporate firm's perspective, as well as examined organizational-level characteristics that may subsequently influence the investment rate.

Investment in new ventures entails considerable uncertainty and that remains true even for CVC investments (Gompers & Lerner, 2001; Tong & Li, 2011). To partially address this uncertainty, corporate firms typically approach the investment process by using networks and syndicating with other VCs (e.g., Gompers, 1995; Lerner, 1994; Maula, 2001). In addition to tackling uncertainties in the investment process, syndicate networks also provide information and quality signals on opportunities to make new investments (Ahuja, 2000; Keil et al., 2010).

However, unlike independent VC investors, who are purely driven by financial considerations, CVC investors also have to take the technological concerns of the parent firm when selecting opportunities for investment (Hill et al., 2009). Accordingly, it is conceivable that the investment process of CVCs is guided both by the external knowledge of new ventures appearing on the horizon with technologies of interest and by the internal knowledge of technological challenges confronting the firm on the competitive landscape. This aspect of the CVC investment process has received relatively limited attention in the academic literature compared to other external organization modes despite the growing importance of CVC investments in many technology-intensive sectors. Research into antecedents and contingencies would help to explain the variance in CVC investment rates exhibited by corporate firms, as well as clarify some of the firm-level factors that affect a corporate firm's prospects in utilizing the CVC investment mode to source external knowledge.

This paper explores organizational level mechanisms that help corporate firms to better utilize CVC investments to source external knowledge in the face of uncertainty that stems from technological change. Taking the perspective of the corporate investing firm, we examine the extent to which the centrality of a corporate firm in the VC investment syndicate network positively influences the rate of CVC investments, and in particular whether the technological focus of the corporate firm strengthens this effect. Building on social network theory (SNT), we suggest that a central network position in the VC investment syndicate provides a corporate firm with improved access to deal flow and better quality information that reduces uncertainty about the venture thus inducing the corporate firm to invest (e.g., Hochberg et al., 2007). This is what we refer to as the supply-side of our argument, while the demand-side of our discussion is framed by considering a corporate firm's locus of organizational attention. Drawing on the

attention-based view, we argue that the issues that attract an organization's attention and the answers sought depend on the degree of technological focus and the attendant threat that technological change entails (Maula et al., 2013). We propose that when a privileged network position offering a munificent but uncertain set of investment opportunities interacts with an organizational context that directs attention towards risky ventures, higher rates of CVC investments in risky ventures are obtained.

To explore this theoretical model, we investigate the extent to which the centrality of a focal corporate firm in the VC investment syndicate (supply-side) and organizational attention (demand-side) positively influence the focal corporate firm's subsequent CVC investment rate. Our longitudinal quantitative study analyzes 209 corporate firms publicly-traded on the New York Stock Exchange (NYSE) over 20 years with active CVC investment programs (3,270 firm-years).¹ We find empirical support for the assertion that a higher degree of centrality in the VC investment syndicate enhances a corporate firm's rate of CVC investments, and that greater organizational attention positively moderates the VC investment syndicate centrality—CVC investment rate relationship. That is, *ceteris paribus*, a corporate firm's well-supplied pipeline stimulates a higher rate of CVC investments, and a well-supplied pipeline in conjunction with focused organizational attention stimulates the highest rate of CVC investments. In addition, we evaluate two distinct outcome variables that reflect varying degrees of risk-taking investment behavior. The first outcome variable examines a corporate firm's CVC investment rate in which it invests in a particular external startup venture for the first time (i.e., new to the corporate firm). The second outcome variable examines a corporate firm's investment rate in which it invests in an early round for a given external startup venture (i.e., the startup venture's business model remains speculative to date), which refers to the riskiest of the two types of investment behaviors.

Our study makes at least four contributions to research on external knowledge sourcing and corporate venturing. First, our study reveals corporate firm-level traits that can potentially reduce uncertainty in CVC investment activities, thus stimulating increased strategic investments in external startup ventures. Previous literature has largely focused on the corporate firm's

¹ The total number of firm years is not equal to 209 corporate firms multiplied by 20 years, because not all CVC units operated during the entire sample period.

portfolio of CVC investments as the unit of analysis and on performance outcomes such as the number of exits but pays scant attention to the antecedent conditions that drive CVC investment behavior (e.g., Cox-Pahnke et al., 2015). We extend this literature by examining the organizational conditions that cause firms to make specific investment decisions. Our study also shows how potential investment opportunities that result from a corporate firm's central position in the VC investment syndicate network (i.e., supply-side pipeline) may be utilized in the light of organizational motive brought about by imminent threats from technological change. Lastly, this is one of the first studies to offer a theoretical explanation as to why some corporate firms engage in seemingly riskier CVC investment behaviors than competing corporate firms. These points have important implications for corporate firms in terms of their prospects for sourcing external knowledge and achieving growth through CVC investment activities.

THEORY DEVELOPMENT AND HYPOTHESES

The fundamental goal of corporate activities is to cultivate sustained competitive advantage, which requires a corporate firm to position itself in an uncertain future (Sitkin et al., 2011). This implies that corporate firms must find ways to go beyond the “steady-state” of internal research and development (R&D) activities to achieve competitive advantage, particularly in dynamic environments that encounter regular transformations in markets and technologies. This is consistent with Powell et al.'s (1996) claim that sources of expertise and breakthroughs are widely dispersed in the environment, and thus the locus of innovation will increasingly be developed in “networks of learning” rather than anchored inside any particular firm.

The logic that supports an internally oriented and centralized approach to R&D has become out-of-date. Whereas in the past internal R&D was considered a valuable and strategic firm asset (e.g., a dissuasive barrier to entry), toward the end of the 20th century in the U.S., however, a number of macroeconomic factors combined to erode the foundation of self-sufficient innovation. One factor is the rise in the number and mobility of knowledge workers, making it increasingly difficult for corporate firms to control their proprietary ideas and expertise (Coff,

1997). A second factor is the growing availability of private venture capital, which has helped to finance startup ventures and their efforts to commercialize novel ideas (Gans & Stern, 2003). A third factor is the information revolution (e.g., supported by information technology and the Internet), which fosters more fluid knowledge transfer that results in abundant information. A fourth factor is that the cost of R&D continues to increase, in part due to the reduced productivity of R&D investments and the growing need to replace patent expirations with a concomitant loss of revenue. For example, in the pharmaceutical industry, the number of potential revenue-generating drugs as a percentage of R&D expenditures has fallen sharply (Paul et al., 2010).

One alternative to being dependent on internally oriented R&D is for a corporate firm to utilize corporate venture capital (CVC) investment activities as a counterpart to stimulate external knowledge sourcing. The CVC investment mode is activated when a corporate firm takes a minority equity position in an external startup venture. CVC investments are comparable to private venture capital (VC), except for the central role of strategic motivation that characterizes the knowledge exchange between a corporate investing-firm and an external startup venture (Dushnitsky & Lenox, 2006; Dushnitsky & Shapira, 2008). CVC investments establish boundary-spanning ties with external startup ventures to source novel knowledge for corporate investing-firms (Rosenkopf & Nerkar, 2001) such as new technologies, products, business models, and markets, as well as an entrepreneurial way of thinking (Chesbrough & Rosenbloom, 2002; MacMillan et al., 2008). Despite an exacting CVC investment selection process, external startup ventures nonetheless abound in uncertainties (Zahra & Filatotchev, 2004) because they are more likely to pursue R&D activities that are more novel and risky than that of a corporate firm (Aghion & Tirole, 1994). The novelty and risk associated with external startup ventures make CVC investors particularly attentive to accessing the most promising external startup ventures through scouting and selection activities (Hill et al., 2009). Obtaining this access is not a trivial challenge for corporates because prospective entrepreneurs do not consider corporates as the natural sources of risk capital. Moreover, they may also be concerned by the threat of misappropriation of their nascent ideas by the corporate (Anton & Yao, 1994; Katila et al., 2008).

In addition to the availability of access to valuable CVC investment opportunities, a corporate firm's management response to technological changes is also an important determinant in its CVC investment rate. While many factors influence management's response to environmental shifts in technologies, we consider the role of technological focus. Technology focus is characterized by the number of distinct technological domains in which a corporate firm operates. We focus on how a corporate firm's concentration of technological activities affects what its management pays attention to in order to cope with the challenges posed by technological change. The underlying mechanism is based on highly bounded rational processes that shape management's attentiveness about the nature of technological change taking place outside a focal corporate firm's boundaries. This attentiveness will make a particular set of interests more salient to a corporate firm's decision-makers, thus affecting its motive to respond to competitive threats and propensity to engage in CVC investments.

In what follows, we consider how factors outlined above shape the CVC investment behavior of corporate firms. Specifically, we focus on the information flow in VC syndicate networks and how the CVC's position in these networks facilitates access to information on new investment opportunities. We also take into account how the technological focus of firms directs managerial attention to determine the selection of investment opportunities. Finally, we consider how the corporate's technological focus moderates the effect of a CVC's network position. Taken together, these hypotheses allow us to better understand CVC investment behavior.

Position in the VC syndicate network

CVC investments made in a particular external startup venture typically implicate multilateral dynamics, as investment deals involve co-investment by private independent venture capitalists (VC) as well as competing corporate firms' CVC investment arms. A VC investment syndicate network represents an inter-organizational cooperation between corporate firms, private venture capitalists, as well as other corporate firms co-investing in a given external startup venture. According to Anokhin et al. (2011), over 80 percent of corporate firms syndicate at least some of their investments, in which a VC investment syndicate deal may have between

one and 50 or more co-investors. However, corporate firms and VCs possess distinct institutional logics due to divergent interests and actions. For instance, VCs may prefer a startup venture “exit” by means of an initial public offering (IPO), or to sell the startup venture to a different acquirer, or the corporate investing-firm may face competition from competing corporate investing-firms that want to acquire the given startup venture. In such cases, the corporate investing-firm delaying the acquisition of a target external startup venture creates the risk of preemptive actions by co-investors and the potential loss of investment opportunity in the future. VC investment syndicates require both cooperation and competition.

The ability to effectively manage the tension between cooperative and competitive forces within the VC investment syndicate bestows a competitive advantage upon a corporate firm. According to social network theory (SNT), a network actor gains substantial visibility as well as preferential access to network members when it occupies a central position among rival actors. Knowledge flow that results from a corporate firm’s more central position in the VC investment syndicate provides privileged access to preferential opportunities (Inkpen & Tsang, 2005). A more central position in the VC investment syndicate thus bestows further power and the means for a corporate firm to manipulate the regulation of various types of resources embedded in the network. For the purpose of our paper, a corporate firm leverages its advantaged position to rein in competitive forces with co-investors in order to form a pool of high-quality external startup ventures from which to prospect. A corporate firm can respond appropriately to rivals’ syndication behaviors that attempt to threaten its favorable position inside the VC investment syndicate network (Elg, 2000). It may exert bargaining power, for instance, to negotiate better contractual terms with co-investors or to obstruct certain co-investors from participating in an investment deal. It is precisely the means to square cooperative and competitive forces within the VC investment syndicate that supplies deal flow to constitute a pool of potential startup venture candidates as well as supplies insider knowledge to appraise the quality of these startup ventures.

A corporate firm makes CVC investments in specific external startup ventures after an exacting selection process, in which less than 10 percent of candidate startup ventures receive funding (Casson et al., 2008). A corporate firm’s decision-making process requires constantly drawing from a pool of candidate startup ventures. There are a number of potential fountainheads

for organizing such a supply pipeline, but the most likely sources are other VCs that actively seek out potential startup ventures as well as startup ventures themselves that become aware of a corporate firm's CVC investment activities. For example, Anokhin et al. (2013) found that a corporate firm's prior level of strategic engagement with startup ventures significantly affected its reputation and attractiveness subsequently to other startup ventures seeking funding. In both cases, deal flow arises from a corporate firm's previous CVC co-investment activities and standing in the VC investment syndicate community. The central position of a corporate firm vis-à-vis the entire VC investment syndicate therefore plays an important role in generating a supply of investment opportunities for the corporate investing-firm. Furthermore, the supply pipeline may constitute a competitive advantage for a corporate firm, as it may have access to investment deals that rival corporate investing-firms may not be aware of.

Not only does a more central position in the VC investment syndicate network afford a more steady supply of investment opportunities, but it also offers higher-quality investment leads. A corporate firm becomes aware of a particular external startup venture's existence and receives more tacit knowledge that discloses its confidential workings. This tacit knowledge may include the inner workings and other proprietary circumstances that reveal a more accurate view of a startup venture's prospects (e.g., organizational, technical, or market). Nonaka & Takeuchi (1995) explained, for instance, how engineers worked alongside breadmakers to learn the motions necessary to knead bread dough. This type of knowledge can only be gained by in-depth exposure when a specific VC works closely with a focal startup venture. However, this otherwise difficult-to-acquire knowledge invariably leaks into the VC syndicate network. While a corporate firm may not have experienced a given startup venture firsthand, details gleaned by a specific VC become available to privileged members in the relational network. That is, valuable inside knowledge eventually reaches a more centrally-positioned corporate firm due its relative visibility and political influence. Barney (1986) emphasized that one way for organizations to obtain crucial resources at a price that can create a competitive advantage, is to purchase these resources in imperfect markets with more accurate expectations of their future value (i.e., information is not yet in the public domain). Access to confidential information equips a corporate firm with the preferential means to select investments from a high-quality pool of

external startup venture candidates in comparison to a less centrally-positioned corporate firm. Regular access to a high-quality pool of startup ventures in turn lowers a corporate firm's risk perception, for both first-time (i.e., the external startup venture is novel to the corporate firm) and early-stage investments (e.g., the external startup venture's business model is not yet validated by the market).

To sum up, the more a corporate firm occupies a central position in the VC investment syndicate network relative to potential co-investors, the greater the pipeline of high-quality external startup ventures. This preferential supply pipeline in turn tends to mitigate a corporate firm's perception of investment risk, which leads to a higher CVC investment rate. Based on this rationale, we hypothesize:

Hypothesis 1: The more central position a corporate firm occupies in the VC investment syndicate network, the more it will make CVC investments in external startup ventures.

Technology focus of the corporate firm

Responding to competitive threats is critical for long-term survival, but corporate firms appear to have difficulty searching outside the limits of their current routines and processes (Adler & Obstfeld, 2007; Baumard & Starbuck, 2005). One reason is that returns to investments that exploit existing capabilities are immediate, whereas returns to search are distant and uncertain (March, 1991). Another reason is that inertial forces reinforce existing routines. Corporate firms adopt bureaucratic routines by design, as this helps to overcome the computational limits of individuals and gain efficiency (Weber, 1946). The efficiency of organizations leads to a paradox. Merton (1940) and Selznick (1949) argued that there were some important dysfunctional consequences to bureaucratic organizations, such as the consequences of pattern repetition, extreme reliability, and uncertainty avoidance biases. Inertial forces on structures, processes, and capabilities designed to simplify organizational complexity, inhibit the ability of a corporate firm to realign with its new environment. Therefore, it is certain

that without attention being directed to alternative futures, new pathways are not likely to be considered (D'Aveni & MacMillan, 1990; Starbuck, 1983).

The attention-based view (ABV) helps to explain why some corporate firms undertake the decision to respond to competitive threats and adapt to changing environments, while others do not (Ocasio, 1997). ABV builds on the logic of bounded rationality that recognizes the limits of attention in the face of the sheer complexity of the problems that organizations face (March & Simon, 1958). In this view, the most rational behavior demands simplified models that capture the main features of a problem without capturing all its complexities. Rather than highlight the suppressed aspects of bounded rationality and selective attention, ABV recognizes that *“the focalization and concentration of consciousness associated with selective attention create adaptive properties of critical concern to strategic activity, as they facilitate the accuracy, speed, and sustained processing of information in perceptual judgements and actions.”* (Ocasio, 1997: 203). This implies that a corporate firm with higher levels of technological focus can advantageously allocate its attention to a more restricted problem space with a particular set of issues and answers. This more concentrated focus enables a corporate firm to be more likely to recognize competitive threats as well as to be more likely to gain from efficiencies. According to the principle of focus of attention, a more concentrated organizational focus is likely to activate further response actions as *“the selection of organizational moves depends on the issues and answers that decision-makers attend to.”* (Ocasio, 1997: 201). In addition, firms give preferred treatment to alternatives that represent the preservation of present routines over those that represent substantial change. Thus, the consolidation of effort that selective attention potentially affords, enables a corporate firm with higher levels of technological focus to more effectively leverage existing routines and current activities. In other words, corporate firms with higher levels of technological focus will have more experience operating in a technological domain of expertise that is congruent with the source of the competitive threat and its solution. In the context of our paper, this framework is expected to reduce a corporate firm's perception of uncertainty towards CVC investment opportunities, thus fostering a greater realization of these investments.

While greater technological focus enhances a corporate firm's ability to recognize and respond to competitive threats, technological focus paradoxically elevates its exposure to technological shifts. A corporate firm with high technological focus becomes more likely to endure technological disruptions than high technological dispersion, as a greater share of its existing technologies depend on fewer technological domains. Moreover, technological disruptions render the former more vulnerable as a greater share of its revenues flow from fewer technological domains. A corporate firm characterized by high levels of technological focus thus responds to competitive threats with more suitable urgency when framed as existential threats. Alternatively, corporate firms with high technological dispersion may not perceive the consequences of environmental selection processes. That is because corporate firms with dispersed technological profiles are less susceptible to the erosion of fit between a corporate firm and its environment, in comparison to those corporate firms that have concentrated technological profiles. Moreover, if a technologically-dispersed corporate firm derives only a limited portion of its revenue from a segment affected by technological changes, it is all the more unlikely that a corporate firm will exert the considerable effort required to overcome inertia. That is, a corporate firm must be acutely aware of the threat that changes in the technological environment pose and perceive the existential need, in order to commit the valuable resources of time, people, and energy in the service of such alternative courses of action. These mechanisms collectively explain demand-side motives that compel a corporate firm to respond to competitive threats by utilizing CVC investments.

Altogether, these arguments conceptualize technological concentration as a mechanism that enables intrafirm dynamics that make use of current knowledge in order to link CVC investment units to enabling knowledge areas that are producing change. This mechanism explains how even broad and distant search could result from more homogenous intrafirm knowledge resources, which contravenes prevailing views in the literature on the prerequisite need for diverse knowledge resources in order to pursue unexpected opportunities in the environment. Our reasoning is based on the observation that technological areas are sufficiently wide-encompassing to the point that greater homogeneity in technological knowledge provides a more selective pinhole through which to perceive a wider angle of external opportunities. The

alternative is for CVC investment units to become overwhelmed by overextended attentional processing that struggles to make sense of the infinitely large landscape of opportunities in the environment. This offers a distinct role for concentration that conflicts with predictions in prior literature on CVC investments. Based on this rationale, we hypothesize:

Hypothesis 2: The higher a corporate firm's degree of technology focus, the more it will make CVC investments in external startup ventures.

Interaction between network centrality and the technology concentration of the corporate firm

Lastly, we consider a corporate firm's supply-side opportunities and demand-side motives simultaneously in CVC investments (see Figure 1). Based on our previous discussion, it stands to reason that the effect of a corporate firm's supply-side pipeline on its CVC investment rate would depend on the strength of its demand-side motives. In other words, the extent to which a corporate firm acts on investment opportunities depends also on a CVC investment unit's attentiveness, which itself depends on the homogeneity of intrafirm knowledge resources. Even if CVC investments provide a response to competitive threats, the mere supply of investment opportunities is not entirely deterministic of the investment decision. Our rationale is based on the following. The first hypothesis establishes the positive relationship between a CVC investment unit's network centrality and subsequent investment rate. The second hypothesis establishes the positive relationship between a corporate firm's (associated with a given CVC investment unit) technological concentration and the CVC investment unit's subsequent investment rate. In our third hypothesis, we predict that technological concentration moderates the network centrality-investment rate relationship. In order to theoretically argue the existence of interaction effects, we provide an explanation of the mechanisms that link the main independent variable to the dependent variable, and then explain how the interaction variable modifies these mechanisms. Moreover, to ensure that our arguments are theoretically complete, we rule out the potential reverse interaction effect between the main variable and moderating

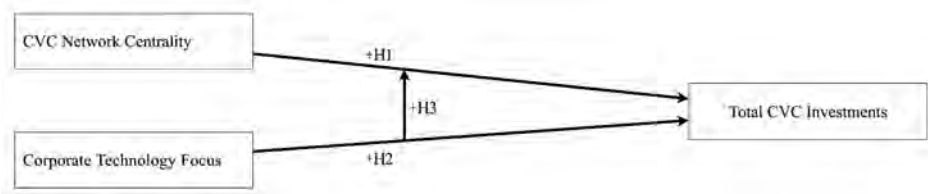
variable. First, we theorize that increased network centrality in co-syndicate investment networks provides a focal CVC investment unit with better access and information about underlying opportunities during the evaluation stage that precedes subsequent investment selection decisions. This happens because higher levels of network centrality imply that co-investors have fewer outside options, and so will be more willing to share such information with a focal CVC investment unit. That information is helpful to the CVC investment unit's intrafirm evaluation processes, and so increases the likelihood of a subsequent investment. Then, we argue that a corporate firm's increased technological concentration enhances the ability of its CVC investment unit to make more effective use of investor-side information in intrafirm evaluation processes, because demand from business units will be more uniform as technological concentration increases. As more information arrives, it can be more effectively channeled for evaluation by a CVC investment unit at a corporate firm that is technologically more concentrated than diversified. The CVC investment unit can more easily filter information that is not relevant for the corporate firm's business units when there are fewer complexities on the demand-side, than when the demand-side includes more complexity through diverse requirements. This is analogous to the mathematical distinction between many-to-one and one-to-many. From the CVC investment unit perspective, focusing on just a few signals coming in from possible co-investors can be applied to many more business units in a more technologically focused corporate firm. Our assumption is that a CVC investment unit of a more technologically focused corporate firm has learned better what signals to pay attention to in the first place. In addition to productivity efficiencies obtained from a one-to-many approach, the CVC investment unit associated with a more technologically concentrated corporate firm obtains further advantages: (a) the CVC investment unit gains more options within the corporate firm to match external opportunities to business units, (b) the CVC investment unit reduces uncertainty and complexity by attending to fewer issues/answers that are more salient, and (c) the CVC investment unit increases the visibility and salience of particular issues/answers, by allocating more time to a reduced number of issues/answers. Under higher levels of technological-concentration, these mechanisms improve the CVC investment unit's response to incoming information from possible co-investors, by improving the CVC investment unit's

intrafirm coordination and communication. This is due to the greater homogeneity of technological capabilities and demands from within the corporate firm. Lastly, as both the network centrality and technological concentration increase in our model, the CVC investment unit will likely be able to better communicate its requirements to attentive investors. This could improve the CVC investment unit's chance of hearing about opportunities that are particularly sought after by the corporate firm. Therefore, as network centrality increases, more technologically concentrated firms are predicted to have higher investment rates. Second, we rule out the potential reverse interaction effect, in which network centrality moderates the relationship between technological concentration and investment rate. This is necessary because we established the positive relationship between technological concentration and investment rate in the second hypothesis of our study. We explain the positive relationship between technological concentration and investment rate through the stronger intrafirm motive, resolve and capability to push through change that exists inside corporate firms with higher levels of technological concentration. These structural traits are unlikely to be influenced by increases in information that co-investors bring to a more centrally positioned focal CVC investment unit. After all, it is a stretch to claim that better information from co-investors improves the resolve of a corporate firm to introduce change. Our premise is that the CVC investment unit does not influence the resolve of a corporate firm and its constituents, but rather that the structural features of an incumbent firm affect the ability of a focal CVC investment unit to conduct its brokerage function to orchestrate external and internal information. Therefore, we rule out the potential of a reverse interaction effect. Based on this rationale, we hypothesize:

Hypothesis 3: A corporate firm's technology focus strengthens the positive relationship between its VC investment syndicate network centrality and its rate of CVC investments in external startup ventures.

Figure 1.

Our Theoretical Model



METHODS

Sample and Data

We constructed a dataset of 209 firms publicly-listed on the New York Stock Exchange (NYSE), which conducted CVC investments between the years 1992 and 2011. Although the firms in our sample all perform CVC investment activities, they exhibit heterogeneity in their CVC investment behavior. Our core data derived from Thomson Reuters' VentureXpert database, which provides firm-level data on corporate firms, transaction-level data on each investment round, as well as firm-level data on external startup ventures. We enriched the corporate firm data with information from three other sources. Using our list of corporate firms, we obtained financial data from Standard & Poor's Compustat database, U.S. patent data from the European Patent Office (EPO) PATSTAT database, as well as alliance and acquisition data on corporate firms' other corporate activities from the SDC Platinum database.

To construct our sample, we first identified the population of corporate firms listed publicly in the U.S. that actively engaged in CVC investments activities between 1980 and 2016. We focused on corporate firms in the high-tech, biotech, and entertainment sectors whose dynamic technological environments compel incumbents to conduct CVC investments. These industries are also well-suited to unearthing contingencies that suppress the utilization of CVC investments as a mechanism to respond to technological change. To this initial list of corporate firms, we applied several screening conditions to arrive at our final sample used for the analysis

in this study (see Table 1 for details of our sample screens). First, from the firms VentureXpert designates as “Corporate PE/Venture,” we retained firms that are neither banks nor other types of financial institutions. Second, we retained corporate firms that made at least three CVC investments since 1984. As the lifespan of CVC investment activities is typically two years on average for a given corporate firm (Dushnitsky, 2012), a three-year threshold allows capturing corporate investors that survived beyond the initial two-year attrition period. Third, we retained corporate firms that invest in high-tech external startup ventures using the NAICS-based (North American Industry Classification Scheme) categorization developed by Hecker (2005). The following NAICS for startup ventures were retained: 3254, 3341, 3342, 3344, 3345, 3364, 5112, 5161, 5179, 5181, 5182, 5413, 5415, 5417. These categories correspond to pharmaceutical and medicine manufacturing, semiconductor manufacturing, aerospace product manufacturing, communications equipment manufacturing, computer equipment manufacturing, software publishers, internet publishing and broadcasting, computer systems design, engineering services, telecommunications, and scientific research and development services. Fourth, we retained corporate firms for which data on financials and other corporate activities were available in Compustat and SDC Platinum.

Table 1

Screening Criteria	Number of CVC Investment Units
1. CVC investment units found in Thomson One	778
2. CVC investment units with investment transaction data	736
3. CVC investment units with an investment after 1984	698
4. CVC investment units confirmed to be corporate actors	552
5. CVC investment units invested in high-tech ventures	492
6. CVC investment units active for at least three years	396
7. CVC investment units listed in the United States	362
8. CVC investment units with information available in COMPUSTAT	222
9. CVC investment units retained after dropping five financial firms	217
10. CVC investment units used in sample after accounting for missing values	209

Measures and Analysis

Dependent variables.

Our focus in this paper is on the venture capital investment behavior of a corporate firm. Our main dependent variable, *total investments*, simply refers to the total number of CVC investments *corporate firm_i* makes in *year_t*. Because this variable counts the number of investments and thus take integer values only, we used a fixed effects poisson regressions in our analysis. These models not only allows to control for unobserved heterogeneity among corporate firms, but also provides estimates robust to over dispersion (Wooldridge, 2002).

Independent variables.

Our first independent variable is *cvc centrality*, which refers to the position that corporate *firm_i* occupies vis-à-vis *alter_j* in *year_t*. This variable is measured by computing eigenvector weights for *corporate firm_i* and all *venture capitalists*, that made investments during the period 1992-2011 under investigation (approximately 350,000 transactions). Specifically, we applied Bonacich's beta-centrality $c(\beta)$ measure (Bonacich, 1987) that considers influence in bargaining networks in which one's own influence is decreased by connection to others with alternative exchange partners (see Equation 1. in matrix notation). This adequately describes the context of the VC investment syndicate, in which corporate firms compete and collaborate with VCs to secure the most favorable sheet terms.

$$C(\alpha, \beta) = \alpha(I - \beta R)^{-1} R \mathbf{1}, \quad (1)$$

Where $\mathbf{1}$ is a column vector of ones and I is an identity matrix. Additionally, α is a scaling vector and β equals zero thus placing a greater value on the local structure. With respect to the dependent variable(s), *cvc centrality* is lagged by one year ($t-1$).

Our second independent variable is *technology focus*, which refers to the extent to which the corporate firm concentrates its technological activities in a given set of domains. We capture the technological domains in which a corporate firm is active by observing its patenting activity

in various patent subclasses defined by the Cooperative Patent Classification Scheme (CPC). We track patent filing activity in the five year window before a given year, and construct patent portfolios of the corporate firm and calculate the distribution of patents under different three-digit patent classes. Using this distribution, we compute *technology focus* using a Herfindahl-Hirschmann type index (HHI), which takes values between zero and one and increasing values from zero to one indicate increasing technological focus (Hu & Jaffe, 2003; Oxley & Wada, 2009).

We include a series of controls for attributes of a corporate firm practicing CVC investments, as well as industry- and year- fixed effects. A firm's R&D expenditures are investments in knowledge creation (Griliches, 1990) and contribute to its ability to absorb external knowledge (Cohen & Levinthal, 1990). The R&D intensity may be related to the search for technological opportunities developing outside the firm as well as its technological diversity. We control for a corporate firm's *R&D intensity*, which is lagged by one year (t-1) with respect to the dependent variable, and compute this ratio in the conventional way by taking the ratio of R&D expenses to the net sales. Also, a firm's patent stock can reflect the scale of its technological resources and absorptive capacity (Silverman, 1999). We control for a corporate firm's *patent count* by computing the logarithm of the average number of patents during the five-year period before a given year. We include controls for a corporate firm's other corporate activities such as acquisitions and alliances that firms use to tackle their innovation challenges (Ahuja & Katila, 2001; Lavie et al., 2011). We measure *acquisition count* as the average number of acquisitions during the 5-year period before a given year for a given firm. Similarly, we measure *alliance count* as the average number of alliances during the five-year period before a given year for a given corporate firm. We control for a corporate firm's level of financial slack using *free cashflow*, which is lagged by one year (t-1) with respect to the dependent variable(s), and compute this variable as the sum of *cash-on-hand*, *net income*, and *depreciation*. This represents the level of financial resources available to a corporate firm for the purpose of pursuing CVC investments and/or other corporate activities. The availability of slack resources can increase exploratory search (Singh, 1986) and lead to greater innovative performance (Nohria & Gulati, 1996). We control for a corporate firm's performance using *return on equity*,

which is lagged by one year (t-1) with respect to the dependent variable(s), and compute this ratio as the net income divided by average stock equity. This allows us, among others, to take into account the level of motivation that a corporate firm may have to pursue CVC investments, arising from the breadth of historical and social performance gaps. Firm size can have both negative and positive effects on firm innovation (Teece, 1992). We control for a corporate firm's size using *total assets*, which is lagged by one year (t-1) with respect to the dependent variable, and compute this variable by dividing *total assets* (billions of US dollars). Lastly, we control for year-level effects for the period between 1992 and 2011.

Table 2. Descriptive Statistics and Correlations

Variables	1	2	3	4	5	6	7	8	9	10	11
1 CVC investments	1.00										
2 CVC centrality	0.83	1.00									
3 Corporate technology focus	-0.04	-0.08	1.00								
4 Net revenues	0.06	0.09	-0.15	1.00							
5 Total assets	0.05	0.07	-0.12	0.77	1.00						
6 R&D intensity	0.00	-0.01	0.05	-0.04	-0.03	1.00					
7 Free cash flow	0.19	0.21	-0.11	0.77	0.74	-0.03	1.00				
8 Return on assets	0.09	0.08	-0.02	-0.01	-0.04	-0.19	0.06	1.00			
9 Patent count	0.18	0.21	-0.19	0.35	0.30	-0.02	0.33	-0.02	1.00		
10 Acquisitions made	0.18	0.24	-0.14	0.39	0.63	-0.03	0.46	0.01	0.38	1.00	
11 Alliances formed	0.17	0.25	-0.14	0.25	0.16	-0.02	0.27	0.05	0.56	0.38	1.00
Mean	1.07	0.00	0.20	18.33	26.77	0.18	4.89	0.09	740.04	11.76	17.27
S.D.	4.37	0.00	0.25	34.53	60.47	1.92	9.98	0.14	2012.47	23.27	38.68

N=3270. Coefficients with absolute values >0.04 are significant at $p<0.05$.

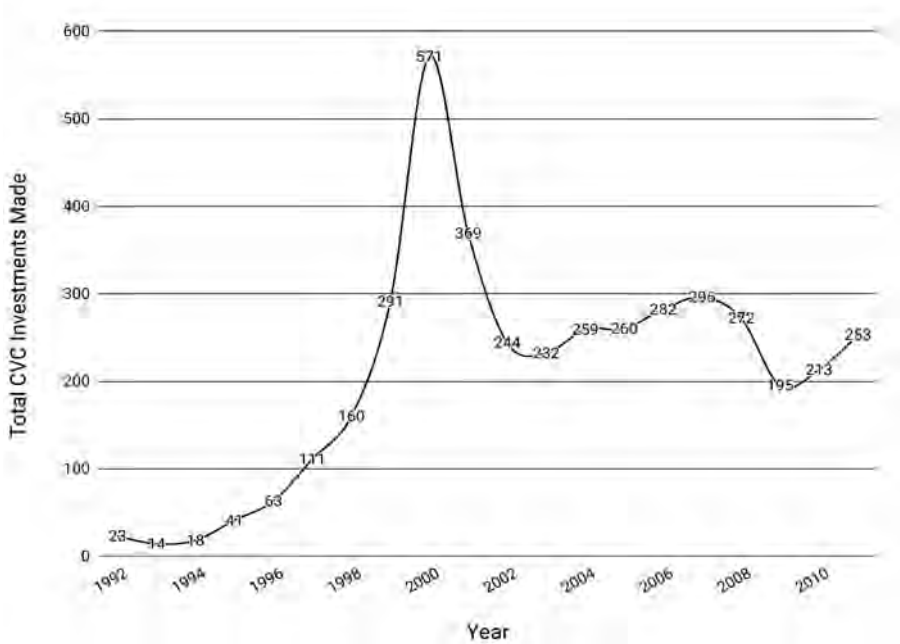
RESULTS

Table 2 presents descriptive statistics and a correlation matrix of pairwise Pearson correlations between the variables used in our study. We note that our sample corporate firms accrued acquisitions and alliances ten to thirteen times more than CVC investments for a given year, on average. This is consistent with our premise that CVC investments are a response to technological change distinct from either acquisitions or alliances. We note that corporate firms made 23 CVC investments in 1992 and 253 CVC investments by the end of our sample period.

CVC investment activity peaked at 571 investments made in 2000 (see Figure 2). We find that more centrally positioned corporate firms (i.e., centrality above the mean) tend to make at least one new CVC investment per year more than less centrally placed corporate firms ($p < 0.001$). The mean variance inflation factor (VIF) is 1.41 and the range for VIF values falls between 1.00 and 2.17. The VIF values for our core explanatory variables lie in the range of 1.10 and 1.54. The VIF values for only two of our control variables i.e., *acquisition count* and *total assets* are greater than two. Because these VIF values lie well below the heuristic of ten proposed by Netter et al. (1989), multicollinearity among the independent variables does not present a problem in our study.

Figure 2

Total Investments by CVC Firms between 1992 and 2011.



We now turn to discussing our main results shown in Table 3. Our first hypothesis argued that a corporate firm will make more CVC investments when it occupies a central position in the VC investment syndicate network. Accordingly, we expect a positive sign for the coefficient of *cvc centrality* in Table 3. We find that the coefficient of *cvc centrality* in Models 2 and 3 of Table 3 is positive and significant ($p < 0.001$). This suggests that the central position of the corporate firm in the VC investment syndicate has a strong positive influence on the corporate firm making first-time investments in a given year and provides strong support for Hypothesis 1. Using coefficient estimates from Model 3 of Table 3, we find that a one standard deviation increase in *cvc centrality* results in a 27 percent increase in first-time CVC investments with all other variables held at their mean values.

Our second hypothesis proposed that a corporate firm will make more first-time CVC investments when it possesses a greater *technology focus*. We found that the coefficient of *technology focus* in Model 3 of Table 3 is positive and significant ($p = 0.046$). Using coefficient estimates from Model 3 of Table 3, we find that a one standard deviation increase in *technology focus* results in a 4 percent increase in first-time CVC investments with all other variables held at their mean values.

Our third hypothesis advanced that a corporate firm's technology focus positively moderates the relationship between *cvc centrality* and *total investments*. The coefficient of our interaction term *cvc centrality* \times *technology focus* in Model 4 of Table 3 is positive and significant ($p = 0.007$), which provides strong support for Hypothesis 3. We graphically display these interactions in Figure 3. We plot standardized values for *cvc centrality* on the X-axis and the expected value for total CVC investments made on the Y-axis (Hoetker, 2007). We plot the expectation function for the year 2000 for a corporate firm possessing characteristics at levels equal to the mean values of the control variables. While the broken line shows the expectation function when *technology focus* is held at its mean, the solid line depicts the expectation function when *technology focus* is held at one standard deviation above the mean. We note that the expectation function slopes more upward when *technology focus* is held at 1 standard deviation above the mean than when held at the mean.

Table 3. Fixed Effects Poisson Estimation For Total CVC Investments

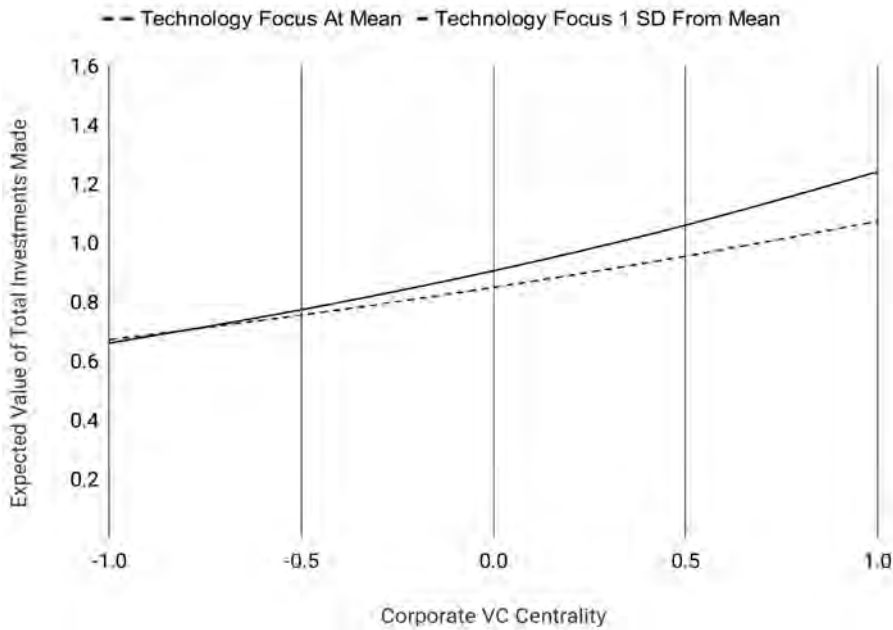
VARIABLES	(1) CVC investments	(2) CVC investments	(3) CVC investments	(4) CVC investments
CVC Centrality		0.212*** (0.050) [0.000]	0.216*** (0.051) [0.000]	0.234*** (0.040) [0.000]
Corporate technology focus			0.126* (0.063) [0.046]	0.064 (0.074) [0.386]
Centrality X Focus				0.081** (0.030) [0.007]
Net revenues	0.316 (0.220) [0.150]	0.221 (0.195) [0.257]	0.249 (0.204) [0.223]	0.262 (0.210) [0.213]
Total assets	0.234 (0.159) [0.142]	0.304* (0.149) [0.041]	0.288+ (0.154) [0.061]	0.259 (0.158) [0.100]
R&D intensity	0.965** (0.350) [0.006]	0.798** (0.271) [0.003]	0.855** (0.276) [0.002]	0.851** (0.284) [0.003]
Free cash flow	0.067 (0.050) [0.178]	0.089* (0.045) [0.048]	0.095* (0.045) [0.034]	0.089* (0.044) [0.046]
Return on assets	0.280 (0.632) [0.658]	0.657 (0.554) [0.236]	0.661 (0.554) [0.233]	0.597 (0.576) [0.300]
Patent stock	0.041 (0.068) [0.550]	0.033 (0.059) [0.575]	0.048 (0.058) [0.408]	0.069 (0.059) [0.237]
Acquisitions made	0.000 (0.002) [0.902]	-0.005* (0.002) [0.034]	-0.005* (0.002) [0.048]	-0.004 (0.002) [0.108]
Alliances formed	-0.003 (0.003) [0.298]	-0.003+ (0.002) [0.094]	-0.003+ (0.002) [0.100]	-0.003+ (0.002) [0.088]
Constant	-8.059*** (1.164) [0.000]	-7.553*** (1.022) [0.000]	-7.762*** (1.044) [0.000]	-7.681*** (1.069) [0.000]
Log likelihood	-2579	-2507	-2501	-2495

N=3270. Clustered robust standard errors in parentheses (209 clusters). P-values in brackets.

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Figure 3

Interaction effect between CVC centrality and corporate technology focus on total investments made by CVC investment units.



Among the control variables, we find that *R&D intensity* has a strong positive effect on CVC investments. This suggests that corporate firms that invest heavily in maintaining their internal technological competencies are also likely to be more actively involved in corporate venturing activities. The availability of free cash flow also positively impacts CVC investments ($p=0.046$). This result is consistent with Dushnitsky and Lenox's (2005) empirical study on corporate ventures, and further challenges the view that the availability of financial slack does not necessarily lead to rent-seeking behaviors, but supports corporate renewal (Agarwal & Helfat, 2009). Finally, other external corporate development modes appear to have a negative relationship with corporate venturing, which can be seen by the negative sign in Model 3 for both *acquisition count* ($p=0.048$) and *alliance count* ($p=0.10$). This result combined with that for

R&D intensity seem to suggest that while corporate venturing complements internal development, it acts as a substitute for other external development activities.

DISCUSSION

To briefly summarize our results, we found compelling statistical evidence to support four of our six hypotheses. Robust statistical support was found for the four hypotheses (1A, 1B, 3A, and 3B), in terms of the direction of the predictions as well as the level of statistical significance $p < 0.001$. Hypotheses 1A and 1B predicted that a corporate firm will make more first-time CVC investments when it occupies a central position in the VC investment syndicate network and that a corporate firm will make more early-stage CVC investments when it occupies a central position in the VC investment syndicate network, respectively. These results were highly statistically significant at $p < .001$. Hypotheses 3A and 3B predicted that a corporate firm's technology focus strengthens the relationship between VC investment syndicate network centrality and first-time investments and a corporate firm's technology focus strengthens the relationship between VC investment syndicate network centrality and early-stage investments, respectively. These results were similarly highly statistically significant at $p = .001$. However, we found mixed results for Hypothesis 2A and no significant results for Hypothesis 2B. Hypotheses 2A and 2B predicted that a corporate firm will make more first-time investments when it possesses a greater degree of technology focus and a corporate firm will make more early-stage investments when it possesses a greater degree of technology focus, respectively.

Our findings suggest that a corporate firm's VC investment syndicate network centrality and its technology focus are alone insufficient to reliably predict its CVC investment rate. When a corporate firm's VC investment syndicate network centrality and technology focus interact, then we find that corporate firms with higher levels of technology focus and a more central position in the VC investment syndicate network exhibit comparatively higher CVC investment rates as well as riskier CVC investments in comparison to those corporate firms that possess more technological diffusion, *ceteris paribus*. That is, technology focus appears to become an organizational advantage once a corporate firm has gained a central position in the VC

investment syndicate network. The rationale is that once a corporate firm's supply pipeline generates a pool of potential high-quality external startup venture candidates, its technological focus enables management to pay more deliberate attention to the investment opportunities on offer, leading to a higher rate of CVC investments. In this manner, the seemingly deterministic and positive performance outcomes of network centrality are found to be shaped by the bounded rationality of organizational attention. Our findings support the premise that corporate firms depend on supply-side opportunities and demand-side motives to thoroughly utilize CVC investments. Corporate firms endowed with these organizational features are expected to be better prepared to respond to competitive threats that arise from technological changes in the environment.

There are some potential issues in the research design of our empirical study. As long as we believe that our independent variables are exogenous, then we can safely assume that the regression procedures that generated our coefficients are unbiased and truly reflect the "true" population value on average (Wooldridge, 2002). However, according to Shaver (1998), firms choose strategies based on their attributes and implications. Therefore firm choices are necessarily endogenous and self-selected. Based on this reasoning, VC investment syndicate network centrality and technology focus may be endogenous independent variables, and possibly correlated with the unobserved error term, thus conceivably producing inconsistent coefficient estimates. In the setting of CVC investments, it is important to note that the corporate firm's decision to pursue corporate venturing activities is motivated as senior decision-makers purposively adopt and retain such practices.

In response to these possible concerns, we suggest that sample-selection and self-selection biases be addressed in future studies. Sample-selection bias can undermine the internal and external validity of results when a sample is unrepresentative of a "true" population (i.e., the use of non-randomly selected samples to estimate a causal relationship). It is important to include other geographic regions as we seek to generalize our findings, based on corporate firms publicly-listed at the NYSE, to the global setting of CVC investment activities. For instance, the share of Asian and European CVC investments as a share of global venture capital spending has notably increased during the past decade in terms of both the volume and financial

value of syndication deals. However, this bias may not be present in our study because the overseas growth has mainly developed after 2011, which is also our sample cut-off point. In the case of self-selection, bias follows from when the investing-firm makes the choice to pursue CVC investments based on unobservable factors that correlate with both outcomes and observable factors. Self-selection based endogeneity clearly represents an internal validity threat to corporate venturing research, as the decisions, processes, investment types, and strategies will be chosen (i.e., selected into) by managers with outcomes in mind (i.e., expected performance implications). That is, senior managers in a corporate firm do not make decisions on a random basis such as the rate of CVC investment undertaken. Instead, the performance implications of these decisions are paramount to the eventual firm decision taken. Therefore, omitted variables are likely to affect both the choice of how to organize CVC investments regarding the pipeline of startup ventures and management attention to technological shifts as well as the rate of CVC investments, thus possibly rendering biased the coefficient estimates. To address both types of endogeneity described above, we suggest the use of instrumental variables employing two-stage least squares (2SLS) and Heckman-type corrections in future studies.

CONCLUSIONS

In analyzing 3,270 firm-years (209 firms in a 20-year sample period), our study examines whether organizational attention affects the extent to which domestic and international corporate firms utilize their CVC investment opportunities. These large, corporate firms are based in dynamic technological environments (i.e., high-tech, biotech, and entertainment industries) that compel them to invest in technological change and novel knowledge. By taking minority equity positions in external startup ventures, CVC investment activities therefore represent one such strategic practice for corporate firms to access crucial and otherwise unavailable technological resources to achieve external knowledge sourcing. Our study seeks to better understand the conditions that influence whether corporate firms respond to changes in their environment or fail to respond adequately to competitive threats.

We find support for our claim that corporate firms depend on supply-side opportunities and demand-side motives to thoroughly utilize CVC investment opportunities. We find that a higher degree of centrality in the VC investment syndicate network enhances a corporate firm's rate of CVC investments, and that greater organizational attention positively moderates the VC investment syndicate centrality—CVC investment rate relationship. That is, *ceteris paribus*, a corporate firm's well-supplied pipeline stimulates a higher rate of CVC investments, and a well-supplied pipeline in conjunction with focused organizational attention stimulates the highest rate of CVC investments. We also find that the positive effect of organizational attention increases as the supply of startup venture investment opportunities increases.

Our study makes at least four contributions to research on external knowledge sourcing and corporate venturing. First, our study reveals corporate firm-level traits that can potentially reduce uncertainty in CVC investment activities, thus stimulating increased strategic investments in external startup ventures. Second, this is one of the first studies that we know of to investigate the performance implications for a corporate firm when it occupies a central position in the VC investment syndicate network. Third, our study shows how potential investment opportunities that result from a corporate firm's central position in the VC investment syndicate network (i.e., supply-side pipeline) may be underutilized because of limitations in organizational motive brought about by diffused organizational attention. Lastly, this is one of the first studies to offer a theoretical explanation as to why some corporate firms engage in seemingly riskier CVC investment behaviors than competing corporate firms (e.g., early-stage investments versus later-stage investments). These implications are highly salient in the phenomenological setting of CVC investments and other external corporate venturing activities, in which corporate firms play a central role in driving long-term economic growth through their formation of strategic ties with external startup ventures.

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Study Three



INTEGRATION

Outside-In Knowledge Integration:
Realizing Timely Strategic Value from CVC Investment Portfolios

ABSTRACT

Incumbent firms often engage in external R&D by investing in external startups, among other innovation modes. These external corporate venturing activities aim to create a window in new technologies and impact innovation outcomes for their parent organizations (technologies, markets, products). The potential strategic value of an investment portfolio may depend on enabling adjustments to dynamics in the market conditions. This essay examines the extent to which CVC portfolios facilitate this adjustment process as well as the extent to which the organizational design of the CVC programs and incumbents' knowledge positions shape the process. To investigate these relationships, we consider incumbent biopharmaceutical firms' internal R&D responses to exogenous shocks, mainly how the technological composition of an incumbent firm's investment portfolio affected its innovation response to unplanned shifts in market demand. We use a quasi-experiment that builds on difference-in-differences (DID) approach using the disruptions caused by Influenza A virus subtype H1N1 and Ebola Virus Disease (EVD) pandemics. These outbreaks marked unexpected shifts in the environment and market for technologies. To execute this approach, we focus on the dyad of the firm and technology area as the unit of analysis. Zooming in at this level, we observe 210 global CVC investors and 882 portfolio companies between 2000 and 2018. We found that incumbent firms tend to build on knowledge embedded in their investment portfolios to create new knowledge. We also found that CVC investment units *structurally separated* from their respective incumbent firms are less likely to enable the outside-in knowledge build-up from their portfolio companies to generate new knowledge. We also found that incumbent firms with prior knowledge in the relevant technological areas (i.e., absorptive capacity) are more likely to use the outside-in knowledge of their portfolio companies to create new knowledge. Our study sheds light on the role of attention in outside-in technology spillovers as relevant portfolio companies enhance an incumbent firm's selective focus of attention on particular technologies and markets as they become highly salient in the environment. We propose a complementary view in which an incumbent firm's ability to extend and delegate portions of absorptive capacity to its investment portfolio enhances an incumbent firm's noticing and reacting to environmental stimuli.

INTRODUCTION

Managerial decisions regarding outside-in knowledge resources in research and development (R&D) activities can shape incumbent firms' innovation outcomes, such as creating new knowledge (knowledge integration). Scholars have found that many incumbent firms in knowledge-intensive industries that traditionally relied more heavily on internal R&D have begun to rely increasingly on external modes of R&D to address structural and technological shifts (e.g., Balakrishnan & Wernerfelt, 1986). For example, the biopharmaceutical industry has been facing increased competition from new innovative entrants despite formidable entry barriers, including heightened knowledge complexity and capital costs, scarce human capital, elevated governmental regulations for approving new drugs, and lowered R&D productivity rates (Dushnitsky, 2012; Economist, 2021; Kessel, 2011; Munos, 2009; Petrova, 2014; Scannell et al., 2012). To address such competitive challenges, incumbent biopharmaceutical firms have turned to external knowledge sourcing, particularly the corporate VC (CVC) investment mode (Alvarez-Garrido & Dushnitsky, 2016; Ceccagnoli et al., 2018).

Extant research examining corporate venture capital investments has examined two focal questions. The first set of questions are tied to the antecedent conditions to CVC investments, including industry technology conditions, appropriability conditions and network positions of incumbents (Basu et al., 2001; Dushnitsky & Lenox, 2005b; Gaba & Bhattacharya, 2012; Katila, Rosenberger & Eisenhardt, 2008; Kim, Steensma & Park, 2019). The second set of questions are related to the performance of portfolio companies and incumbent firms. This second line of work has shown that CVC investments tend to augment the innovation outcomes of external startups that received investments from CVC investors as well as incumbents (e.g., Alvarez-Garrido & Dushnitsky, 2016; Belderbos et al., 2018; Di Lorenzo & van de Vrande, 2019; Wadhwa & Kotha, 2006).¹ Although these papers have advanced our understanding of how the CVC investment mode plays a critical role in incumbents' adaptation to technological change, they do not offer conclusive evidence in support of the assertion that CVC investments serve as a window on new technologies and do not consider the design of CVC programs in facilitating favorable

¹ We refer to CVC investors in this paper, because we distinguish between structurally-separated CVC investors and structurally-integrated CVC investors. The former refers to an indirect investment made by means of an independent CVC investment unit and the latter refers to a minority equity investment made directly by an incumbent firm. The term CVC investors refers to both in this study, and we analyze differential effects of structural position on our dependent variable in models 3 and 4 in the evaluation of our second hypothesis.

technological outcomes (Dushnitsky & Lenox, 2005a). Addressing this gap is the central concern of this paper.

The empirical study described in this chapter adopts the incumbent firm perspective and examines the link between incumbents' technology trajectories and portfolio companies' technologies. We investigate the following question: *To what extent do incumbents leverage their CVC portfolio companies to shape their technology trajectories?* In addition, we also explore the contingent factors that determine this effect. Specifically, we consider the knowledge structure of incumbents and the organizing form incumbents use to implement CVC programs. These conditions elucidate the part incumbents' absorptive capacity as well as the CVC units' structural separation from the incumbents in shaping the trajectories.

We employ a quasi-experimental research design based on the Influenza A virus subtype H1N1 and Ebola Virus Disease (EVD) pandemics as exogenous shocks, allowing us to investigate new knowledge creation using incumbents' investment and patent portfolios. Our approach addresses endogeneity concerns and enables us to evaluate the use of knowledge embedded within portfolio companies by associating specific market conditions with particular technological groups. The biopharmaceuticals sector suits our purpose because incumbent firms and external startups habitually patent their inventions to protect intellectual property in this industry.

We found that incumbent firms draw on the knowledge of their portfolio companies to create new knowledge when particular sets of technologies are in high demand. We also found that CVC investors structurally separated from their parent incumbents are less likely to use the outside-in knowledge of their portfolio companies to create new knowledge. We also reveal that incumbent firms with prior knowledge in specific technological areas are more likely to use the outside-in knowledge of their portfolio companies to create new knowledge. We extend prior literature by investigating whether incumbent biopharmaceutical firms effectively realize the potential strategic (technological) value of their investment portfolios and under which conditions knowledge access and integration are more likely to occur.

The chapter is structured as follows. It begins with an overview of corporate venture capital (CVC) investments and the knowledge-based view (KBV). Then, we propose our primary hypothesis that examines the main effects of portfolio companies on incumbent firms' R&D activities. Next, we propose two further hypotheses that examine the moderation effects of

structural separation and absorptive capacity on the main hypothesis (three-way interactions). After that, we describe our quasi-experimental research design and difference-in-differences (DID) methodology and explain our results. Finally, we discuss our key findings and contributions and provide recommendations for future studies that address the limitations of our study.

BACKGROUND

The resource-based view (RBV) of the firm views organizations as bundles of resources (Barney, 1991; Penrose, 1959; Rumelt, 1984; Teece et al., 1997). To the extent that these firm-level resources are valuable, rare, inimitable and non-substitutable, they may explain how incumbent firms capture comparative competitive advantage since resources are firm-specific and heterogeneously distributed among firms in the same industry (Dierickx & Cool, 1989). In the context of our study, we are particularly interested in knowledge as a critical firm-level resource that produces innovation outcomes.

The knowledge-based view (KBV) of the firm considers that knowledge is the primary resource underlying value creation, heterogeneity, and competitive advantage (Barney, 1991; Felin & Hesterly, 2007; Grant, 1996, 2002; Kogut & Zander, 1992). Knowledge is a critical and productive resource that generates firm market value (Grant, 1996). The accumulation of various knowledge sets fosters the recombination of knowledge, leading to new knowledge creation that results in novel innovations (Galunic & Rodan, 1998; Henderson & Cockburn, 1994). Therefore, the effective management of knowledge resources constitutes an essential firm capability that can help incumbent firms sustain competitive advantage and performance (Barney, 1991; Grant, 1996; Penrose, 1959).

Prior literature has discussed the strategic importance of acquiring knowledge beyond an incumbent firm's boundaries to obtain new resource combinations (Keil, 2004; Wadhwa & Kotha, 2006). Similarly, Teece (1992; 2007) discussed the limits of incumbent firms relying uniquely on internal R&D activities and described the blurring of firm boundaries, because research and development increasingly involves complex modes of collaboration where new knowledge is co-produced and/or distributed among organizations to generate innovation outputs

(introduce new processes, products and/or services to the marketplace). From an incumbent firm's perspective, exploration beyond one's organizational boundaries allows an incumbent firm to acquire, transfer and integrate distinct knowledge resources across organizational boundaries (Henderson & Cockburn, 1994). Incumbent firms complement internal R&D efforts with external R&D efforts to access more knowledge, to better understand technology developments, and to pursue more market opportunities since these incumbent firms collaborate with more individuals and organizations (Cassiman & Veugelers, 2006; Enkel et al., 2009). External knowledge sourcing aims to complement familiar and unfamiliar knowledge that is heterogeneously distributed among organizations, in order to foster knowledge recombination (Nahapiet & Ghoshal, 1998; Von Hayek, 1945; Wadhwa et al., 2016). Incumbent firms, therefore, depend on internal and external research and development activities to subsequently develop new knowledge that is (market) salient and (technologically) relevant — the production of new knowledge contributes in turn to advantageous incumbent firm performance through increased sales, profits, and productivity (Ahuja & Katila, 2001; Deeds & Hill, 1996; Gavetti & Levinthal, 2000; Griliches, 1998; Katila & Ahuja, 2002).

Incumbent firms engage in a myriad of search modes to acquire, transfer and integrate external knowledge, including corporate venture capital (CVC) investments. CVC investors are motivated to address shifts in market and technological demand. They engage in a sustained search process that involves the identification, selection and integration of external startups' unfamiliar (to an incumbent firm) knowledge resources. Dushnitsky and Lenox (2005b) examined the antecedents of CVC investor formation, and found that incumbent firms make minority equity investments in innovative external startups with strategic intent in order to discover novel market and technological opportunities. They also found that periods of technological ferment in a particular industry are associated with increased levels of CVC investments in that industry, which provides further evidence of the strategic behaviors that underlie CVC investments.

In the context of the biopharmaceutical industry, Reaume (2003) found that CVC investments provided formal interfirm ties that afforded strategic advantages to incumbent firms, such as access to unfamiliar technological knowledge. Dushnitsky (2012) found that incumbent biopharmaceutical firms that engaged in CVC investments, outperformed their rivals both in innovative performance (patenting) and financial performance. Maula et al. (2013)

conceptualized CVC investments as early warning signals that help to direct managers' attention to new developments in the environment. According to Ma (2020), deterioration in an incumbent firm's core innovation areas (quantity and quality), but not in peripheral areas explain an incumbent firm's decision to become a CVC investor in the first place. Therefore, the motivation for CVC investments is associated with timely and relevant access to markets for technologies (Ceccagnoli et al., 2018; Siegel et al., 1988), and learning is consequently associated with increases in internal innovation (Ceccagnoli et al., 2018; Chesbrough & Tucci, 2002; Dushnitsky & Lenox, 2005a, 2005b; Hamm et al., 2018; Keil et al., 2004, 2008; Narayanan et al., 2009; Schildt et al., 2005; Wadhwa et al., 2006, 2016).

HYPOTHESES

Effective knowledge integration rests on the appropriate use and timings of CVC investments that align technologies and markets. Knowledge integration on its own does not necessarily fulfill the promise of the CVC investment mode. However, knowledge integration that aligns with timely market demands allows an incumbent firm to commercially exploit new market opportunities. To make effective use of potential strategic knowledge embedded in portfolio companies through the CVC investment mode, an alignment between technologies and market conditions in which demand for these technologies is highly salient, at specific moments in time. That is, the entire point of CVC investments as a strategic tool, is the timely realization of knowledge integration in an incumbent firm. The strategic potential of an investment portfolio can be acted upon at appropriate moments in time, based on a match between technological and market conditions.

Although an incumbent firm has the potential to access knowledge resources from its portfolio companies to create new knowledge at any time, it is essential for incumbent firms to draw upon appropriate technological knowledge inputs (situated within their investment portfolio), based on relevant market conditions. The effective *realization* of potential value in CVC investments is characterized by the timely outside-in integration of knowledge into an incumbent firm's own internal R&D apparatus (i.e., relevant new knowledge production aligned with market demand). CVC investors act as intermediaries to redistribute knowledge embedded

in their portfolio companies in furtherance of helping their respective incumbent firms to produce new recombinant knowledge at opportune times, marked by highly-salient market conditions. In summary, portfolio companies are expected to contribute to incumbent firms' internal R&D, because that is the underlying motive and organized function of CVC investors, who are organized to identify external startups, evaluate startups and their associated technologies, match these with interested internal business units, and use advantaged access to portfolio companies in order to respond to market-based technological ferment. We refer to the effective transfer of knowledge as knowledge integration, in which the potential strategic value of opportunities are realized by an incumbent firm. We expect that CVC investments enable incumbent firms to transfer outside-in knowledge from relevant portfolio companies as market-driven opportunities arise.

H1: CVC portfolio companies have a positive effect on an incumbent firm's knowledge in a timely manner, based on relevant market conditions.

The realization of potential value, in our study, refers to the subsequent transfer and integration of external knowledge from a focal CVC investor's investment portfolio into its parent's internal research and development (R&D) apparatus. While a CVC investor may recognize an external startup venture's potential contribution to an incumbent firm's R&D by making an investment, the parent firm may never realize or exploit the potential of the innovation value stored in its investment portfolio (investment set). CVC investors have preferential access to unique knowledge resources embodied in their respective portfolio companies, but there is no guarantee that *potential* strategic value will be *realized* in a timely manner since the outside-in transfer of relevant knowledge from portfolio companies to an incumbent firm may never occur. Schildt et al. (2005), for example, found that CVC investments provided the weakest level of learning in comparison to other interorganizational modes such as alliances, joint ventures, or mergers and acquisitions. We argue that the organizational position of CVC investors represents one factor that can influence the extent to which outside-in knowledge transfer and integration occurs. We expect the structural separation of a CVC investor to impede the *timely* transfer of outside-in knowledge that resides in investment portfolios, in contrast to structural integration. Under the contingency of structural separation, we theorize that

coordination with business units is rendered more difficult and visibility to senior decision makers is reduced, which collectively undermine the appropriateness of CVC investors' selective focus of attention on certain issues and answers.

Before we explain how our proposed mechanisms can impede outside-in knowledge transfer and integration processes, let us briefly introduce some relevant literature on structural autonomy and decision making. The prevailing view in the extant literature is that structural separation affords subunits the necessary autonomy to make selection decisions that may contravene with headquarters' preferences. Teece (1992) argued that structural separation affords small organizational units more autonomy in their decision making power. Increased autonomous decision making is associated with commensurate reductions in bureaucratic and overtly political or conflictive behaviors, which are endemic to complex, hierarchical incumbent firms. In recent empirical studies that investigated the impact of CVC investor governance on the transfer of knowledge from portfolio companies to incumbent firms, the consensus is that a structurally separated CVC investor enjoys more autonomy and decision making power (Yang et al., 2016). Similarly, Siegel et al. (1998) was one of the first studies to examine the performance of CVC investors based on structural separation — these authors found that structural separation resulted in better CVC performance than structural integration. However, much of the CVC literature that adopted the incumbent firm's perspective while investigating structural separation, considered increased CVC performance to constitute less complementary (more explorative) search. The conceptualizations of “*less autonomous*” and “*more autonomous*” in relation to CVC investor decision making power based on structural position, have also been referred to as “*tight*” and “*loose*” couplings, respectively (Dushnitsky, 2004). Dushnitsky (2004, 2008) introduced a taxonomy of CVC investor governance structures, which ranges from tightest to loosest couplings to an incumbent firm: direct investments, wholly owned subsidiary, dedicated fund, and limited partnership (LP). The “*dedicated fund*” and “*LP*” governance structures refer to the third-party delegation of corporate VC to independent venture capitalists (IVC) that have purely financial objectives, rather than strategic objectives in relation to the transfer and integration of technological knowledge to a respective incumbent firm. According to Dushnitsky (2008), “*direct investments*” are tightly coupled to the associated incumbent firm, whereas “*wholly owned subsidiaries*” are loosely coupled. Souitaris et al. (2012, 2014) refer to these as endo- and exo-isomorphism institutional logics, in which the CVC investor in the former is turned more

inwards towards an incumbent firm (strategic), while the latter is turned more outwards towards the independent VC community (financial), respectively.

While the literature often highlights the decision-making advantages of autonomy for CVC investors, few studies address the tradeoff between structural separation and structural integration in the CVC mode. The classification of IVCs as financial investors, and CVCs as strategic investors, goes much deeper than whether performance outcomes are financial in nature (MacMillan et al., 2008). To behave as a strategic investor implies that a CVC investor must orchestrate vast knowledge resources within large incumbent firm settings, replete with complex path dependencies that arise from previous decisions and capital expenditures in particular technological trajectories, in addition to a myriad of business units and subunits competing for limited organizational resources and survival. In contrast, IVCs experience relatively few of the internal decision-making politics, conflicts and coordination complexities that characterize incumbent firms. Incumbent firms and their CVC investors with strategic aims differ fundamentally from professional financial investors (Gaba & Bhattacharya, 2012). CVC investors are often described in the literature as intermediaries, brokers or boundary-spanners that link internal and external players. When transferring and integrating outside-in knowledge resources from portfolio companies, CVC investors span internal networks and capabilities that involve considerable within-firm or intrafirm coordination (Monteiro & Birkinshaw, 2017). Incumbent firms are characterized as complex settings that require CVC investors to be proximate, to exhibit persistence and to enact considerable entrepreneurial agency. Incumbent firms are highly-complex socialized environments, where frequent relational interactions are crucial to obtain more effective knowledge collaboration. Outside-in knowledge transfer and integration requires coordination among organizational subunits, which may offer internal resistance to externally-sourced knowledge. Basu et al. (2016) highlighted the importance of reducing internal resistance to reframe perceived threats as opportunities in business units. A few empirical studies highlight integration practices that enable CVC investors to achieve their role as knowledge brokers between portfolio companies and subunits inside incumbent firms (e.g., Basu et al., 2016; Wadhwa & Kotha, 2006). These practices refer to the complex coordination of internal players during all stages of CVC investment search and integration processes. Throughout the various stages that comprise the CVC mode, a CVC investor needs to enhance cooperation and coordination with internal business units by means of ongoing communication,

high-quality social networks based on trust, regular access to expertise, and a genuine understanding of a business unit's orientation. For example, when evaluating and selecting investment opportunities, CVC investors need to collaborate with internal business units in order to understand their preferences and operating strategies, their current technological trajectories, as well as their critical knowledge gaps. CVC investors must also be able to draw on the technical and business expertise of internal business units, in order to successfully evaluate technological and market opportunities reflected in prospective external startups and invested portfolio companies. CVC investors also educate business units on key enabling technologies to influence and recalibrate their viewpoints. These transfer and integration processes continue in the post-investment stages after a CVC investor has invested in a particular portfolio company. The enactment of these critical practices requires some sustained form of structural integration.

Therefore, the structural separation of a CVC investor from its parent firm can impede outside-in knowledge transfer and integration processes by rendering coordination with business units more difficult. Structural separation implies that a CVC investor may not be as knowledgeable about internal business units, in terms of their needs, preferences, or key contacts. Knowledge transfer processes rely on regular interactions with business units to know their issues, glean who the experts are to develop common ground, and to co-create previously unimagined knowledge recombinations. A greater number of regular exchanges with internal business units provide CVC investors with beneficial feedback loops that enable learning to take place (Dhanaraj et al., 2004). Without such feedback loops, CVC investors will likely be less capable in identifying appropriate interfirm knowledge transfers, which reduces the likelihood of intrafirm knowledge integrations based on outside-in knowledge resources stored in portfolio companies. The underlying rationale is that CVC investors' may selectively allocate their focus of attention on certain issues and answers that do not correspond to the needs of business units. Moreover, CVC investors of a structurally separated unit may not have previous work experience at the incumbent firm, which suggests that these CVC investors may be less knowledgeable about how to navigate policies and routines inside the firm, in addition to possessing less social capital to effectively access business units within the incumbent firm. Structurally-separated CVC investors may be regarded by internal business units as disconnected from exploitation activities, and therefore less likely to secure the commitment of business units. Monteiro and Birkinshaw (2017) explain that CVC investors, who have previously worked inside an

incumbent firm, are more likely to know who to talk to internally than structurally-separated CVC investors made up of former independent venture capitalists (IVC). More limited social capital can make it more difficult to identify the key champions or innovators within a business unit to garner support for a particular technology and/or external startup, or make it more difficult to understand whether a business unit might be a prospective match for a particular portfolio company.

Just as CVC investors need to align themselves with internal business units, CVC investors also need to align themselves with senior decision makers in an incumbent firm. It is the top level management teams that establish CVC investors in the first place to achieve growth or strategic renewal. Structurally-integrated CVC investors have the distinct advantage of sustaining those senior relationships over time, because the interdependencies that accompany structural integration improve the likelihood that these CVC investors will remain aligned with evolving renewal goals. Structurally-integrated CVC investors and senior management are jointly involved in adjustment activities at regular periods such as quarterly investment committee meetings and annual budget processes. As Yang et al. (2016) observed, direct investments are made through fully-internalized business units that are tightly controlled by the incumbent firm. The reduced decision-making and financial resource autonomy of structurally-integrated CVC investors, increases the frequency and nature of engagement between the two players and improves mutual alignment over time. Although structurally-separated CVC investors may enjoy more autonomy in decision making and more long term funding horizons, there may be a tradeoff. That is, less autonomy provides mechanisms for a CVC investor to cooperate more closely with senior management, which serves to increase its visibility and efficacy in pushing through an incumbent firm's knowledge-development plan that depends on outside-in knowledge transfers and integrations (Belderbos et al., 2018).

Visibility by senior management facilitates knowledge transfer and integration in a timely manner, because sustained and visible support from senior management shapes research and development priorities inside the firm. Therefore, structural separation can impede outside-in knowledge transfer and integration processes, because visibility and alignment to senior decision makers is reduced. A few scholars have documented some of the deliberate practices that CVC investors use to increase their visibility and alignment with senior management, such as

providing reports and/or presenting on trends in promising search fields at regular intervals in an advisory or feedback role (e.g., Basu et al., 2016). These practices enable CVC investors to influence developmental priorities, as well as to obtain feedback on the current preferences of senior management. The greater convergence of renewal goals between CVC investors and senior management, enables structurally-integrated CVC investors to make more appropriate choices about which portfolio companies to focus on in the transfer and integration processes. These choices, in turn, are more likely to be supported by senior management publicly. Visible political support offered by senior management is readily noticed by intrafirm players, who operate in highly political environments and compete for limited resources. Intrafirm players heed those senior management signals, and become more willing to collaborate with a CVC investor as a result. Greater alignment with senior management facilitates outside-in knowledge transfer and integration processes, because it enables CVC investors to make informed choices about how they selectively allocate limited attention. In contrast, structurally-separated CVC investors are associated with cognitive distance that undermines mutual alignment and weakens the political sponsorship of senior executives, and thus less likely to produce effective collaboration with intrafirm players.

We conceptualize a CVC investor's ability to integrate opportunities into a focal incumbent firm's research and development pipeline, as a dynamic capability. Dynamic capabilities are typically portrayed as systemic and rational processes. However, we adopt March and Simon's (1958) view on bounded rationality, and we propose that structural positions can either enhance or impede the accuracy of CVC investors' views on the appropriate knowledge to be transferred from portfolio companies and subsequently integrated within incumbent firms. CVC investors often comprise very small teams, and need to selectively accommodate considerable amounts of information. Too many portfolio companies can lead to marginally decreasing returns in innovation outcomes (Benson & Ziedonis, 2010), due to attentional limits. This implies that CVC investors selectively attend to certain issues and answers, at the expense of ignoring others, during the evaluation, selection and integration of opportunities. Improved coordination with business units, as well as improved visibility and alignment with senior management serve as critical mechanisms that enable CVC investors to make more appropriate selective choices. Under structural integration, CVC investors may become more relevant in their choices, as these are better aligned with business units and senior management. CVC investors

that are structurally integrated may therefore become more focused and more selective in their focus of attention. In contrast, CVC investors that are structurally separated may be more arbitrary in their selective focus of attention, which can further impede timely outside-in knowledge transfer and integration processes.

In summary, we argue that the transition from potential strategic value to realized strategic value in an investment portfolio, is contingent upon the structural position of a CVC investor vis-à-vis its parent incumbent firm. We have argued that the effective and timely transfer/integration of outside-in knowledge from portfolio companies is influenced by CVC investors' intrafirm coordination of business units and senior management relationships that jointly enhance the appropriateness of the CVC investors' selective focus of attention. We expect that the structural separation of CVC investors impedes cooperative coordination with internal business units and impedes visibility and alignment with senior management, which in turn negatively moderates the effects of CVC portfolio companies on an incumbent firm's knowledge.

H2: The structural separation of a CVC unit negatively moderates the effects of CVC portfolio companies on an incumbent firm's knowledge.

In contrast to the structural separation of CVC investors, incumbent firms' internal knowledge stocks can positively contribute to the *timely* transfer and integration of *relevant* outside-in knowledge that emanates from CVC investment portfolios. We argue that the progressive character of knowledge spillovers, the tacit quality of (valuable) knowledge, and the recombinant nature of knowledge help explain the role of absorptive capacity in strengthening the timely and relevant outside-in knowledge transfer from investment portfolios to incumbent firms.

According to scholars, incumbent firms endogenously obtain knowledge for innovation by searching for ideas and acquiring information externally, conditional on owning the necessary level of *absorptive capacity* (Cohen & Levinthal, 1990).² Numerous empirical studies have examined the role of absorptive capacity in the R&D performance outcomes of incumbent firms. An incumbent firm's internal R&D was positively associated with their use of external

² Based on Cohen and Levinthal (1990), absorptive capacity is conceptualized as "*the ability to evaluate and utilize outside knowledge is largely a function of the level of prior related knowledge*" (p. 128).

knowledge sources (Kleinknecht & van Reijen, 1992), which in turn enhanced internal R&D capabilities (Colombo & Garrone, 1996; Pisano, 1991; Veugelers, 1997). Ahuja and Katila (2001) studied the influence of absorptive capacity and technological acquisitions on incumbent firms' subsequent innovation outputs (measured as patents) in the biopharmaceutical industry. Bena and Li (2014) found that incumbent firms with stronger internal R&D capabilities were more likely to detect complementarities between internal and external knowledge. Similar benefits of absorptive capacity are also likely to exist in the CVC mode. Dushnitsky and Lenox (2005a) found that incumbent firms are more likely to pursue CVC investments in the first place when their internal R&D capabilities are strong because these incumbent firms can better acquire and integrate external knowledge embedded in their portfolio companies.

Knowledge-based disclosures between external startups and incumbent firms are commonplace even in industries that have strong intellectual property protection (IPP) regimes (Dushnitsky & Lenox, 2005a; Dushnitsky & Shaver, 2009). The process of accessing, transferring, and integrating unique knowledge resources embodied in respective investment portfolios is progressive because there are a series of mechanisms that begin with due diligence in the early stages of evaluation and continue with post-investment practices, such as ongoing sounding boards (Basu et al., 2016; Dushnitsky & Lenox, 2005a; Dushnitsky & Shaver, 2009; Souitaris & Zerbinati, 2014; Wadhwa & Kotha, 2006). Each practice involved in search and integration, from due diligence to sounding boards, relies on a different set of complex social interactions that occur over time. For example, due diligence typically involves at least two different aspects of outside-in knowledge transfer. The first type of knowledge transfer is information gathered about a prospective external startup to reduce adverse selection, including technological knowledge about its product and/or service. A CVC investor collects information from an external startup over multiple weeks or months and often consults internal experts to evaluate the quality of the startup's technology. These experts are generally part of an incumbent firm's R&D apparatus, at either the corporate or business unit level, and possess the requisite specialties and expertise (Dushnitsky & Lenox, 2005a). There are often face-to-face discussions between these experts and a CVC investor as they discuss the quality of a specific external startup or multiple prospects in a given search field. The ongoing process of meetings and discussions also helps to educate the CVC investor on specific technological domains.

An incumbent firm's prior internal knowledge helps transfer new knowledge to the CVC investor, who often behaves as a knowledge broker, redistributing knowledge inside an incumbent firm. In addition, social processes reduce information asymmetries and enhance individual human capital by empowering more people within the firm to learn, participate in these discussions, and eventually imagine possible collaborations with external startups (Cassiman & Veugelers, 2006; Enkel et al., 2009). The second type of knowledge transferred during the initial due diligence process is information about possible partnerships with internal business units. CVC investors typically arrange pre-investment sounding boards between external startups and internal business units. During these meetings, business units explore possible collaborations with external startups to lay the groundwork that might be executed subsequently in the post-investment period. The efficacy of these sessions rests mainly on the ability of business units to understand the novelty of specific technologies and the associated market opportunities that arise from the application of these technologies. These exchanges are likely to be cut short without requisite prior knowledge in specific technological fields.

Know-how is particularly difficult to communicate and share across individuals and organizational boundaries (Kogut & Zander, 1992). Tacit or implicit knowledge can limit engagement and technology transfer between an external startup and an incumbent firm (outside-in knowledge spillovers). An incumbent firm's prior internal knowledge helps transfer new knowledge to the CVC investor and internal business units, laying the foundation for subsequent knowledge transfers and integrations. The cumulative knowledge transfer process depends on prior knowledge and continues in the post-investment process, when more sounding boards are organized and brokered by CVC investors between interested business units and portfolio companies. Progressive knowledge transfer occurs by means of iterative engagement that creates internal demand for certain outside-in knowledge. Repeated engagement also helps to detect an appropriate timing for the knowledge resources of portfolio companies to be recombined with an incumbent firm's internal knowledge. The appropriate internal demand for particular technologies depends on the timing of market conditions (salience), and knowing where to pinpoint relevant knowledge in one's investment portfolio (relevance). Market conditions are associated with particular technologies becoming more or less relevant at certain moments in time and space (e.g., geographic-based, industry-based). The process described

above enhances a CVC investor's ability to decode the interactions between salience and relevance.

When market timing becomes salient, then a CVC investor plays its part in orchestrating recombinant innovation. Recombinant innovation generates new knowledge in the incumbent firm, by building on its prior internal knowledge as well as knowledge obtained from its portfolio companies. Ma (2020) discussed the function of CVC investors as either to “*build on strengths*” or to “*fix the weaknesses*”. The former refers to an incumbent firm that proactively seeks to explore, while the latter refers to a defensive posture due to a decrease of internal innovation or innovation deterioration. In either case, CVC investors acquire external knowledge in order to access new technologies that complement existing knowledge resources. External and internal knowledge combine to co-create and create recombinatory possibilities — the more there are possibilities, the more likely these will lead to knowledge integration and the creation of new knowledge in the incumbent firm. Recombining existing internal knowledge with new external knowledge increases the number of possible combinations, thereby expanding the number of novel innovations (Galunic & Rodan, 1998). In the CVC mode, Dushnitsky and Lenox (2005) explain how the more knowledge an individual already holds, the more effectively she understands the value of certain external knowledge. That recognition leads to more recombinations that complement existing knowledge resources with knowledge accessed from portfolio companies. Dushnitsky (2004) found that CVC investments are unlikely to occur in the first place, if no complementary value is perceived by the CVC investor. The formation of such a perception lies in prior knowledge and the processes described here.

Moreover, recombinant approaches to knowledge cognitively prime organizational actors to focus their joint attention on selective areas of integration. Prior knowledge and the set of opportunities embodied in investment portfolios serve to direct intra-organizational actors and promote selective attention. Selective attention reduces cognitive overload and enables CVC investors to serve more effectively as brokers — selective attention narrows the set of knowledge transfers and promotes overall knowledge integration efforts by allocating a more concerted effort on particular business units. Similarly, Siegel et al. (1998) advised search subunits to be free of time pressure and specialize their investments in only a few industries in order to enjoy better performance. This speaks to the constraints on attention that CVC investors can face, when they do not consider complementary knowledge resources. Their normative position echoed the

advice of Norton and Tenenbaum (1993), who studied independent venture capitalists (IVCs), and found that IVC investors should specialize in order to exploit their technical and product expertise. Their recommendation speaks directly to the absorptive capacity concept, but also places complementary knowledge in the context of attentional concerns. The authors went on to describe how small investor team sizes limit the knowledge domains in which they can operate effectively. Unlike IVC investors who are looking to minimize financial risk while maximizing financial returns, CVC investors are looking to obtain strategic outcomes related to knowledge resources. CVC investors and business units also have limited resources, including prior knowledge. Therefore, deliberate selective attention guided by prior knowledge limits the breadth of new information to be extracted and absorbed. This enables CVC investors to sustain attention and effort to particularly effective players, as well as to certain issues and answers (technologies). Sustained efforts that are selective increase the likelihood that business units and their R&D arms will absorb and act on valuable knowledge embedded in CVC investment portfolios.

The biopharmaceutical industry represents a knowledge-intensive industry with strong intellectual property protection (IPP), and in which external startups and incumbent firms regularly patent their innovations and collaborate through CVC investments and complementary knowledge transfers. It is, therefore, an ideal context for studying the role of prior knowledge (absorptive capacity) in subsequent outside-in knowledge flows from portfolio companies to incumbent firms. In addition, the biopharmaceutical industry is ideal for examining appropriate and timely demand for particular technologies, based on particular market (ferment) conditions. In the biopharmaceutical industry, technologies are associated with particular viruses. Each therapeutic area for a particular virus relies on particular clusters of scientific developments and technological knowledge — the effective integration of knowledge requires the ability to realize the strategic potential of an investment portfolio at the appropriate time.

We expect that the *timely* transition from potential strategic value to realized strategic value is contingent upon the *relevant* knowledge resources of an incumbent firm. We argued that the progressive character of knowledge spillovers, the tacit quality of (valuable) knowledge, and the recombinant nature of knowledge help explain the role of absorptive capacity in strengthening the timely and relevant outside-in knowledge transfer from investment portfolios to incumbent firms. Prior knowledge (internal R&D) matters in transferring and integrating

knowledge from portfolio companies to incumbent firms because absorptive capacity allows incumbent firms to engage in a selective and sustained effort as it evolves. We predict that incumbent firms with comparatively higher levels of absorptive capacity will utilize more relevant CVC investment portfolio companies at more opportune times than incumbent firms with comparatively lower levels of relevant absorptive capacity.

H3: A high level of absorptive capacity of an incumbent firm positively moderates the effects of CVC portfolio companies on an incumbent firm's knowledge.

METHODS

Sample

We constructed a panel dataset of global biopharmaceutical investors that made corporate venture capital (CVC) investments in biopharmaceutical startups between 2000 and 2018. Our reliance on a single industry allows us to capture differential performance within the same intellectual property protection (IPP) regime and control for industry-specific IPP effects on firm innovation CVC performance (Dushnitsky & Shaver, 2009; Lavie et al., 2010). The biopharmaceutical industry is appropriate for studying outside-in knowledge spillovers in the external corporate venturing context because it is highly knowledge-intensive, routinely patents innovations, and deeply collaborative (Devarakonda & Reuer, 2018; Rothaermel & Thursby, 2007; Zucker et al., 2002). In addition, incumbent biopharmaceutical firms rely increasingly on external startups, for example, to mitigate highly uncertain and time-consuming drug development processes as part of research and development (R&D) efforts (CB Insights, 2021; Diestre & Rajagopalan, 2012). CVC investment activity by biopharmaceutical incumbent firms has existed for at least 50 years. For example, Johnson and Johnson's (J&J) venture arm JJDC was set up in 1973; SR One, the venture arm of GlaxoSmithKline (GSK), was established in 1985; and the Roche Venture Fund goes back to the early 1990s. Katila et al. (2008) and Dushnitsky (2012) highlighted the use of corporate venture capital (CVC) investments in external biopharmaceutical ventures by incumbent biopharmaceutical firms as a means to mitigate the uncertainty associated with new drug discovery and development. According to

Crunchbase (2021) and Grassano et al. (2021), R&D expenses in health-related industries (US and EU) in either absolute numerical terms or as a share of revenue, are among the highest of any industry except for Information and Communications Technology (ICT) or automobile/transport-related industries. Our data include 210 CVC investors belonging to 171 incumbent biopharmaceutical firms that invested either directly, through a dedicated CVC investment unit, or both, and 882 biopharmaceutical portfolio companies.

Biopharmaceutical Industry Trends

Scannell et al. (2012) coined the expression “*Eroom’s Law*” to describe how the cost of research and development (R&D) on new drugs approved by the United States Food and Drug Administration had risen exponentially since the 1950s, and that R&D productivity rates had collapsed by 50 percent every 9 years. “*Eroom’s Law*” is simply “*Moore’s Law*” written in reverse, signaling how innovation productivity patterns differ in the biopharmaceutical industry in contrast to the information and communication technologies (ICT) or semiconductor industries. A recent article that appeared in the The Journal of the American Medical Association (JAMA) found that incumbent biopharmaceutical firms between 2000 and 2018 were more profitable than S&P 500 Index incumbents in other industries (Ledley et al., 2020). However, Ledley et al. (2020) also found that biopharmaceutical firms had significantly higher median research and development (R&D) expenses as a fraction of revenue in comparison to incumbents in other industries, and that therefore there was no significant difference in net income margin profitability between 2014 and 2018. The findings suggest that even with comparatively high median annual gross profit margins (on par with technology firms such as Alphabet and Microsoft), R&D activities related to drug discovery and drug commercialization appear to be far less productive. Although biopharmaceutical incumbents spent \$200bn US Dollars on R&D in 2020, the cost to create a new drug has gone up by two orders of magnitude over the past 50 years (CB Insights, 2021). According to CB Insights (2021), return on investment for drug R&D has declined by over 80 percent since 2010. Incumbent biopharmaceutical firms experience decreasing returns on investment for drug research and development (R&D), and encounter increasing competition from (tech) incumbents and startup entrants across the biopharmaceutical value chain. R&D in the biopharmaceutical industry involves at least the drug discovery and the drug development stages (Henderson & Cockburn, 1994), and the entire developmental cycle

typically requires between seven and twelve years to complete, if successful. However, it is believed that up to 85 percent of R&D initiatives in the biopharmaceutical industry fail (Petrides et al., 2002), despite the high capital expenditures involved that continue to rise at a mean annual growth rate of 8.5 percent (DiMasi et al., 2016).

The recognition of a need for reconfiguration and renewal (Stuart & Podolny, 1996) may lead incumbent firms to pursue search beyond their firm boundaries (March, 1991). Examples of external knowledge sources are academic and government labs (Cohen et al., 2002), other incumbent firms accessed through, for example, strategic alliances or mergers and acquisitions (Ahuja & Katila, 2001; Capron et al., 1998; Gulati, 1995; Hagedoorn & Schakenraad, 1994; Powell et al., 1996), regional networks of employees and firms (Almeida & Kogut, 1999; Saxenian, 1990), or from specialist crowds (Dahlander & Piezunka, 2014) or through newly developed expert online digital platforms that allow organizations to receive external services, ideas, or resources (Eckblad & Golovko, 2016). For example, incumbent firms such as Novartis and Pfizer have established external R&D facilities in partnership with universities and hospitals, and others such as Eli Lilly, Bayer, and GSK have created crowdsourcing platforms to source solutions (Reaume, 2003; Schuhmacher et al., 2018). External knowledge can also be obtained through informal channels such as conferences or trade fairs, purchasing equipment, or establishing informal contacts (Veugelers & Cassiman, 2004). These modes aim to set up interfirm ties with other organizations and individuals, which is crucial for knowledge search and transfer (Ingram, 2002). Scholarly work on technological innovation considers that recombining multiple research and development inputs is needed for the production of new knowledge. Incumbent firms compete and cooperate with external startup ventures that embody novel technologies and products/services (Covin & Miles, 1999). Schumpeter expressed contrasting views on the organizational locus of knowledge production. Schumpeter's writings on recombinant innovation are often referred to as "*early Schumpeter*" and "*later Schumpeter*" — the former (1934) referred to innovative entrepreneurs in smaller firms, whereas the latter (1942) referred to innovative entrepreneurs within large, incumbent firms with bureaucratic modes of economic organization and vast resources to undertake uncertain research and development (R&D) activities. However, in intensive knowledge/technology industries, such as biopharmaceuticals, both smaller ventures and larger incumbent firms allocate considerable sustained time, effort and financial resources to conduct R&D under uncertainty. Moreover, there

also exists considerable collaboration between smaller ventures and larger incumbent firms in knowledge intensive areas of the economy, such as the biopharmaceutical industry. New drug development in the biopharmaceutical sector, as an example, entails the recombination and integration of different types of specialist knowledge that is distributed across organizational boundaries. There is considerable consensus in the scholarly literature that external search improves drug development activities in the biopharmaceutical industry.

Just as competitive forces characterize the relationship between incumbent firms and external startups, so do cooperative forces. Many incumbent firms in the biopharmaceutical industry engage in corporate venture capital (CVC) investments, as an additional external search mode (CB Insights, 2021; Dushnitsky & Lenox, 2005). In addition to investing financial capital, incumbent pharmaceutical firms offer portfolio companies access to sophisticated labs and valuable marketing and distribution channels. According to *The Economist*, lab space has become the most expensive type of commercial real estate above street level in the US (*The Economist*, 2021). Incumbent firms make CVC investments in external startups with strategic intent, in order to learn about new technological and market opportunities. Corporate VC investments are minority equity investments in external startup ventures that are made either directly by an incumbent firm or indirectly by specialized units associated with an incumbent firm (Basu et al., 2016; Dushnitsky & Lenox, 2005; Wadwha & Kotha, 2006). According to Dushnitsky (2012), a CVC investment is commonly understood as a “*minority equity investment by an established corporation in a privately held entrepreneurial venture*” (p. 157). The CVC investment relationship enables both an incumbent firm and its invested portfolio companies to address gaps in resources and capabilities, and to potentially increase their respective innovation performance (Hallen et al., 2014). CVC investments allow CVC investors and their respective incumbent firms to access and to learn about potentially valuable knowledge that their portfolio companies are developing (Basu et al., 2011; Basu et al., 2016; Dushnitsky & Lenox, 2005; Keil et al. 2008). More recently, incumbent firms in the information and communications technology (ICT) industry are themselves building strategic relationships with biopharmaceutical startups. Established tech firms Facebook, Amazon, Microsoft, Google and Apple (FAMGA) recently accelerated digital disruptions in the biopharmaceutical industries, among others (CB Insights, 2021). For example, FAMGA invested more than 3.6bn US Dollars in external biopharmaceutical startups over an 18-month period from 2020 to 2021 that competed against

incumbent biopharmaceutical firms (CB Insights, 2021). Therefore, FAMGA is both a direct competitor of incumbents in traditional industries, and an indirect competitor as an investor in external startups that compete against established incumbents.

Data Sources

We used several sources to create our empirical sample and gather data on CVC investors, incumbent firms, and associated portfolio companies. Although many archival data sources provide labels for corporate VCs, we repeatedly find these flags across data sources unreliable. Therefore, we took a manually-driven data collection approach to identify relevant CVC investments in the biopharmaceutical industry. We recruited two student research assistants to manually verify each step of the data sampling and collection process to ensure high levels of interrater reliability. Our primary data source was Crunchbase, one of the widely used databases for venture capital research (Retterath & Braun, 2020). First, we identified 2,458 possible biopharmaceutical investors by querying the following keywords in the *short description* and *long description* variables in Crunchbase: *pharmaceutical*, *biopharmaceutical*, *biotechnology*, and *healthcare*. The query also returned investors that did not match our description of a strategic CVC investor, as described above. Next, using descriptions from Crunchbase, the investor website, and desk research via Google Search, we manually identified the associated incumbent firm for each relevant CVC investor. Then, we triangulated our sample by collecting the North American Industry Classification System (NAICS) or NACE for each incumbent firm involved in CVC investments by manually matching *name* and *country* variables in the Orbis data source. We retained 210 CVC biopharmaceutical investors based on a verified association with 171 incumbent firms belonging to NAICS 3254 (pharmaceuticals) and NAICS 541714 (biotechnology). The resulting sample of biopharmaceutical firms satisfied our definition of a strategic CVC investor. As a quality check, we generated a list of the 100 pharmaceutical and biotechnology firms with the highest revenue between 2012 and 2020. All incumbent firms on the list also appear in our sample. For each incumbent firm, we identified the universe of the technologies in which they filed for a patent. We used the International Patent Classification Scheme's (IPC) technology group definitions. We captured 4,173 unique technology groups in the patents of our sample, as classified by the USPTO. The overall composite panel dataset we

assembled has 1,217,451 observations structured as the following tuple: incumbent firm — patent technology group — year.

Measures

For any given biopharmaceutical incumbent firm's investment portfolio, composed of portfolio companies that develop different technologies, transfer rates to the focal incumbent firm will likely vary among portfolio companies. Henderson and Cockburn (1994) highlighted the limits of aggregation methods in research and development (R&D) empirical studies. Therefore, we adopted a technology-level approach to portfolio companies rather than an aggregated portfolio-level approach.

Dependent variable. Patents and patent citations are used to measure an incumbent firm's innovative performance and interfirm knowledge flows, as well as used widely in empirical research that covers biopharmaceutical sector (Ahuja & Katila, 2001; Dushnitsky & Lenox, 2005a; Hall et al., 2001; Henderson & Cockburn, 1994; Jaffe et al., 2000; Katila, 2002; Schildt et al., 2005). Incumbent firms can cite other patents previously granted to external organizations, such as external startup ventures or portfolio companies, to disclose the knowledge foundations of a particular patent (Schildt et al., 2005). We capture whether a new patent application embodies knowledge transferred from an incumbent firm's portfolio companies to its internal R&D, designated by prior art citations within a patent application. We examined every patent application submitted by 171 incumbent firms to determine whether any of the associated portfolio companies in our sample were cited in a given year. We matched patent applications in the United States Patent and Trademark Office (USPTO) data source to our previous CVC investors and portfolio companies data previously obtained from Crunchbase, using a matching method proposed by Tarasconi and Menon (2017). As with every step described in the sampling process above, matched results were manually verified with the help of two student research assistants. Our dependent variable measures the number of times a given incumbent firm cites its portfolio companies in a given technology group in a given year (the data structure tuple is Incumbent Firm — Technology Group — Year). We implement an inverse hyperbolic sine transformation to conduct our analysis. This transformation allows us to employ a linear model. Unlike the logarithmic function, whose domain is the set of positive real numbers only, this function is defined at zero also.

Independent variables. Our main relationship or treatment effect of interest (H1) examines the interaction between the *shock technology group* and *shock period* variables. The *shock technology group* variable refers to a specific cluster of technology groups as classified by the International Patent Classification (IPC) that are associated with the Influenza A virus subtype H1N1 (A/H1N1) or Ebola Virus Disease (EVD). Our empirical setting allows us to observe the effects of CVC investment portfolio companies on the knowledge outputs of incumbent firms during times of increased technological ferment and CVC investments, thereby controlling for unobserved confounding factors. We deemed the IPC technology groups associated with these viruses to be C12N15, C12N9, C07K16, C07K14. We labeled the *shock technology group* variable as 0 if a technology group found in a patent application does not belong to these groups or one if a technology group falls under the four technology groups. Technology groups indicate greater specificity than technology classes in patents, so we established a robust link between our environmental shocks and a specific cluster of relevant technologies impacted by either shocks. For example, Pfizer applied for a patent classified as C12N15. The “C12N” prefix refers to the IPC technology class of “*microorganisms or enzymes*,” whereas the “0015” suffix refers to the IPC technology group associated with “*recombinant DNA technology*.” The *shock period* variable is coded as either ‘0’ or ‘1’, where A/H1N1 is designated as ‘1’ between 2009 and 2011, and EVD is designated as ‘1’ between 2013 and 2015. Shock durations were set to a three-year window when the World Health Organization announced the outbreak of the disease. We established the robustness of our analysis by using a five-year duration also. Therefore, the interaction term generates four possible combinations used by our difference-in-differences (DID) estimation models (explained below). Our second hypothesis (H2) examines the moderating effect of the *structural separation* variable, which indicates either a direct investment made by an incumbent firm (‘0’), or an indirect investment made by means of a CVC unit (‘1’). We obtained the structural position of a CVC investor by reviewing the long and short description fields in Crunchbase and by consulting investor websites to determine structural autonomy. For example, according to our Crunchbase bulk data source, the M Ventures CVC investor is described as “*invests in innovative technologies and products with the potential to significantly impact Merck’s core business areas*.” Desk research using Google Search confirms our expectation that M Ventures is a subsidiary of Merck. “*The teams’ expertise range from pharmaceutical sciences, biotech*

business and venture investment. more about ... a subsidiary of Merck KGaA, Darmstadt, Germany.” In addition, M Ventures publishes its own website and publicly states that:

“M Ventures is the strategic, corporate venture capital arm of Merck KGaA, Darmstadt, Germany. From its headquarters in the Netherlands and offices in Germany, USA and Israel, M Ventures invests globally in transformational ideas driven by innovative entrepreneurs. Taking an active role in its portfolio companies, M Ventures teams up with management teams and co-investors to translate scientific discoveries into commercial success. M Ventures focuses on identifying and financing novel solutions to some of the most difficult challenges, through company creation and equity investments in fields that will impact the vitality and sustainability of Merck KGaA, Darmstadt, Germany’s current and future businesses.”

Based on careful examination of the descriptions, we labeled the M Ventures CVC investor as structurally separated from Merck (“1”), and investments made by the Merck KGaA CVC investor as direct CVC investments with no structural separation (“0”). Our third, and final, hypothesis (H3) examines the moderating effect of the *absorptive capacity* variable, which indicates the knowledge stock of a given incumbent firm’s internal research and development (Cohen & Levinthal, 1990; Wadhwa & Kotha, 2006). The variable counts the number of patent applications made by a given incumbent firm, per technology group in a window of the previous 20 years. We used USPTO data source to compute the knowledge stock of 171 incumbent firms from 1980-2018, using technology groups relevant to either exogenous shocks.

Control variables. We included several control variables in our empirical analysis to address several alternative explanations that may affect our *portfolio knowledge transfer* dependent variable. We collected all financial data on our incumbent firms in S&P Compustat (Capital IQ), using the procedure proposed by Arora et al. (2021). The *average claim count* variable was measured using the average number of claims made in patent applications per technology group per year (moving window of the previous 20 years) for any given incumbent firm in our sample. The variable controls for the value of an incumbent firm’s patent stock (Galasso & Schankerman, 2015). The *CVC investment experience* variable measures each CVC investor’s cumulative number of investments since its founding date (moving window), based on

Crunchbase bulk data (Dushnitsky & Lavie, 2010; Wadhwa et al., 2016). The inverse hyperbolic sine (IHS) transformation was applied to transform right-skewed variables that include zero or negative values. The *total assets* variable measures the firm size (Basu & Wadhwa, 2011; Katila, 2002; Wadhwa & Kotha, 2006) of each incumbent firm in our sample and is calculated on a yearly basis. The *capex intensity* variable indicates the ratio at which an incumbent firm reinvests its revenues into productive assets (Dushnitsky & Lenox, 2006; Yang et al., 2014). It was calculated by dividing *capital expenditures* by *net sales* for any incumbent firm in our sample per year of our sample timeframe. R&D expenditures influence a firm's propensity to innovate. The *R&D intensity* variable was calculated by dividing *R&D expenditures* by *net sales* (Dushnitsky & Lenox, 2005; Wadhwa et al., 2016). The R&D investment ratio affects an incumbent firm's productivity and competitiveness. The *operating cash flow* variable measures operating cash flow for the incumbent firms. Operating cash flow represents the level of unencumbered cash flow that a firm has to work with. Lastly, we controlled for *year fixed effects* using annual dummy variables that cover our sample timeframe (i.e., 2000 to 2018) to control for unobservable systematic differences between observed time units (Dushnitsky & Lavie, 2010; Katila et al., 2008).

Estimation Techniques

We employed a difference-in-differences (DID) approach to approximate an experimental research design that compares the outside-in knowledge performances of two groups. The DID approach evaluates the differential effect of a treatment effect on a “*treatment group*” versus a “*control group*”, using observational study data (Abadie & Cattaneo, 2018; Bettis et al., 2014; Chemmanur et al., 2014). Two exogenous shocks marked by the influenza A virus subtype H1N1 (A/H1N1) and Ebola Virus Disease (EVD) affect particular treatment groups. The treatment group comprises those firms that cite their portfolio companies in the relevant viral technology clusters (C12N15, C12N9, C07K16, C07K14). Technology groups that do not fall in this set of four serve as the control technology groups. We consider the three years after the initial outbreak of either virus for the treatment period. We estimate a linear model in a panel framework. Specifically, we estimate the following equation:

$$\text{portfolio knowledge transfer}_{igt} = \beta_0 + \beta_1 \text{technology group} + \beta_2 \text{shock period} + \beta_{12} (\text{technology group} \times \text{shock period}) + \beta_3 \text{structural separation} + \beta_4 \text{absorptive capacity} + \beta_{123} (\text{technology group} \times \text{shock period} \times \text{structural separation}) + \beta_{124} (\text{technology group} \times \text{shock period} \times \text{absorptive capacity}) + \beta_5 (\text{financial controls})$$

In this equation, *i* is an index for the firm, *g* for the technology group, and *t* for time in years. Although we depict random-effects models in the Table, our results remain qualitatively similar with the inclusion of firm-level fixed effects. We compared the effects of structural separation on our primary interaction term across the two groups (“No” versus “Yes” refers to Models 3 and 4, respectively), which is equivalent to a three-way interaction approach. For the absorptive capacity moderator in the third hypothesis, we perform subsample analysis using the median value of the measure for absorptive capacity to distinguish the samples. Any value below the median is coded as “0” and refers to “low” levels of absorptive capacity, and any value above the median is coded as “1” and refers to “high” levels of absorptive capacity. We compared the effects of absorptive capacity on our main interaction term across the two groups (“Low” versus “High” refers to Models 5 and 6, respectively), which is equivalent to a three-way interaction approach.

The difference-in-differences method also allowed us to eliminate the effects of firm-specific unobservable characteristics across time periods. The fundamental challenge with causal inference is that we never observe what would have happened to the treatment group if the treatment effect had not occurred. Therefore, to evaluate the presence of the common trends assumption in our DID analysis, we followed the procedure proposed by Abadie and Cattaneo (2018). We want to ensure that DID makes a pre- and post-treatment comparison between two groups that are comparable with each other before the treatment effect or exogenous shock. To establish multiple pre-intervention periods, we obtain a placebo estimate based on the effect of a nonexistent shock to either viruses, before the A/H1N1 and EVD viruses occurred in 2009 and 2013, respectively.³

³ Our post-hoc analysis (Table 4 and Table 5) found the placebo shock to be insignificant, which implies that no evidence could be found to argue against the presence of common trends (i.e., the treatment and control groups were similar before either exogenous shocks in our study).

RESULTS

Table 1 reports descriptive statistics and a correlation matrix. Table 2 contains the results from the difference-in-differences models for the A/H1N1 exogenous shock event. Table 3 contains the results from the difference-in-differences models for the EVD exogenous shock event. Tables 4 and 5 provide results for the robustness checks using placebos for A/H1N1 and EVD, respectively (see Table 4 and Table 5 for placebo). Tables 2 and 3 are organized as follows. We show the model with control variables only in Model 1. In Model 2, we introduce the main interaction of interest that is the treated technology groups, the dummy for the treatment period. And the multiplicative term of the two variables. We then split the sample based on whether the CVC unit is structurally separated or not and report the sub-sample analysis in Models 3 and 4. Finally, we split the sample at the median of absorptive capacity and report the estimates for these two sub-samples in Models 5 and 6.

Table 1

Descriptive Statistics and Correlation Matrix

Variable	Mean	S.D.	Min	Max	1	2	3	4	5	6	7	8	9	10
1. Portfolio knowledge transfer	.0020	.0702	0	5.9965	—	-.0069	.0685	.0227	.0272	.0034	-.0049	.0019	.0044	-.0040
2. Structural separation	.4072	.4913	0	1	-.0069	—	-.0176	-.0321	.2482	.2439	-.0721	-.1612	.2702	-.1695
3. Absorptive capacity	1.4123	1.5790	0	9.0204	.0685	-.0176	—	.6700	.0445	.0354	-.0404	.0350	.0338	-.0065
4. Average claim count	2.0445	1.6805	0	6.5013	.0227	-.0321	.6700	—	.0489	.0210	-.0359	.0418	.0326	.0045
5. CVC investment experience	1.2192	1.4286	0	5.3083	.0272	.2482	.0445	.0489	—	.4043	-.1206	-.0308	.3847	-.1068
6. Total assets	53.2189	44.9635	.0000218	212.949	.0034	.2439	.0354	.0210	.4043	—	-.2020	-.1707	.8549	-.1324
7. Caplix intensity	.0552	.0438	0	1	-.0049	-.0721	-.0404	-.0359	-.1206	-.2020	—	.3059	-.1839	-.0208
8. R&D intensity	.1727	.1128	0	.9986	.0019	-.1612	.0350	.0418	-.0308	-.1707	.3059	—	-.2001	-.0493
9. Operational cash flow	6.5395	5.3424	-.635442	22.201	.0044	.2702	.0338	.0326	.3847	.8549	-.1839	-.2001	—	-.1379
10. Private incumbent firm	.0401	.1963	0	1	-.0040	-.1695	-.0065	.0045	-.1068	-.1324	-.0208	-.0493	-.1379	—

Correlations $p < .05$. Rounded to 4 decimals.

To test our first hypothesis, we consider the coefficient of the interaction between the shock technology groups and treatment period. In Model 2 of Table 2, we find that this coefficient is positive but significant at conventional levels. However, In Model 2 of Table 3, we find that the coefficient is positive and significant ($p = 0.049$). This effect translates to an average effect of 145% increase from the mean citation rate to the portfolio companies in the affected technology groups in a three-year window after the outbreak.⁴ These results provide

⁴ Recall that we apply an inverse sine hyperbolic transformation to our dependent variable. The elasticity is given by $[\sinh(0+0.0106+0.0154)/\sinh(0+0.0106)]-1$.

confirmatory support for our first hypothesis (hypothesis 1), which predicted that CVC investors use outside-in knowledge embedded in their portfolio companies at opportune market demand periods.

Our second hypothesis considers whether the structural separation of the CVC unit from the incumbent firm influences the extent to which incumbents can draw on the portfolio firms' knowledge. To investigate this effect, we conduct a split sample analysis by separately examining the interaction effect tested in the first hypothesis. While Model 3 in Tables 2 and 3 shows the estimates for the subsample with no structural separation, Model 4 shows the estimates for the subsample where there is structural separation. In this setup, a test of hypothesis 2 compares the interaction coefficient between the treatment group and treatment period between Model 3 and Model 4.

Looking at the results for the H1N1 pandemic shown in Table 2, the coefficient of the interaction term is positive but not significant in Model 3 but negative and weakly significant in Model 4 ($p=0.072$). Comparing these two coefficients, we find the negative effect found in Model 4 is statistically different from the effect in Model 3 at the 10 percent level ($p=0.074$).

Moving on to the EVD pandemic results shown in Table 3, the interaction coefficients are positive but not significant in both Model 3 and 4. Taken together, these results offer partial support that structural separation of the CVC units can raise the organizational barriers in accessing the knowledge of portfolio firms. Our results remain invariant to including a three-way interaction term instead of a split-sample analysis.

Our third hypothesis contemplates the effects of absorptive capacity of the incumbent firms in shaping the degree to which they are able to draw on the portfolio firms' knowledge. To investigate this effect, we split the sample at the median level of absorptive capacity to compare the effects of low (i.e., below the median) and high (i.e., above the median) levels of absorptive capacity. Whereas Model 5 in Tables 2 and 3 shows the estimates for the *low* subsample, Model 6 shows the estimates for the *high* subsample. For hypothesis 3 as well, testing requires us to compare the coefficient of the interaction between treatment group and treatment period between Model 5 and Model 6.

Table 2

A/H1N1 Difference-in-Differences Models						
Variable	(Controls)	(Interaction)	(Structural Separation)		(Absorptive Capacity)	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
			No	Yes	Low	High
A/H1N1 Shock Period		.0019 † (.0012)	.0021 (.0016)	-.0001 (.0020)	.0004 (.0004)	.0057 * (.0026)
A/H1N1 Shock Technologies		.098 (.0061)	.191 (.0066)	.968 (.0096)	.269 (.0000)	.031 (.0077)
A/H1N1 Shock Period#A/H1N1 Shock Technologies		-.0127 * (.0065)	.0110 † (.0090)	-.0170 † (.0099)	-.0001 ** (.0002)	.0159 * (.0085)
Structural Separation	-.0019 ** (.0007)	-.0019 ** (.0007)		.072 (.0009)	-.0002 * (.0001)	-.0039 ** (.0015)
Absorptive Capacity	.009 (.0004)	.009 (.0004)	.0048 ** (.0015)	.0030 ** (.0009)	.032 (.0003)	.008 (.0060)
Average Claim Count	-.0016 *** (.0004)	-.0016 *** (.0004)	-.0019 ** (.0006)	-.0013 ** (.0004)	-.0001 † (.0001)	.0003 (.0005)
CVC Investment Experience	.0016 *** (.0003)	.0017 *** (.0003)	.0027 *** (.0008)	.0011 *** (.0002)	.0001 *** (.0000)	.0032 *** (.0006)
Total Assets	.000 (.0000)	.000 (.0000)	.001 (.0000)	.000 (.0000)	.000 (.0000)	.000 (.0000)
CapEx Intensity	.426 (.0056)	.443 (.0056)	.014 (.0057)	.052 (.0142)	.083 (.0006)	.338 (.0149)
R&D Intensity	.765 (.0032)	.743 (.0032)	.914 (.0035)	.731 (.0044)	.139 (.0004)	.863 (.0071)
Operating Cash Flow	.919 (.0001)	.883 (.0001)	.932 (.0001)	.908 (.0001)	.338 (.0000)	.816 (.0002)
Private Firm (dummy)	-.0014 † (.0007)	-.0015 * (.0007)	-.0016 * (.0006)		-.0001 † (.0001)	-.0024 (.0015)
Constant	.050 (.0008)	.038 (.0008)	.011 (.0009)	.074 (.0013)	.103 (.0001)	.155 *** (.0043)
Observations	.269	.255	.085	.135	.270	.000
Number of panelid	1,217,451	1,217,451	721,696	495,755	703,320	514,131
Wald Chi2	70,030	70,030	43,095	26,935	53,827	39,922
	472.300	548.915	386.092		1135.6	655.322

First row of each variable refers to the parameter estimates of the model. Robust standard errors are in parentheses.
P-values are indicated in the third row of each variable. *** p<.001, ** p<.01, * p<.05, † p<.1

Table 3

EVD Difference-in-Differences Models						
Variable	(Controls)	(Interaction)	(Structural Separation)		(Absorptive Capacity)	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
			No	Yes	Low	High
EVD Shock Period		.0000 (.0009)	-.0001 (.0013)	-.0016 † (.0009)	.0003 † (.0002)	-.0020 (.0019)
EVD Shock Technologies		.997 (.0057)	.919 (.0068)	.059 (.0085)	.091 (.0001)	.307 (.0073)
EVD Shock Period#EVD Shock Technologies		-.0106 † (.0078)	-.0100 (.0079)	-.0115 (.0142)	-.0002 ** (.0001)	-.0130 † (.0088)
Structural Separation	-.0019 ** (.0007)	-.0019 ** (.0007)			-.0002 * (.0001)	-.0039 ** (.0015)
Absorptive Capacity	.009 (.0041)	.009 (.0040)	.009 (.0048)	.009 (.0030)	.032 (.0003)	.008 (.0060)
Average Claim Count	-.0016 *** (.0004)	-.0016 *** (.0004)	-.0019 ** (.0006)	-.0013 ** (.0004)	-.0001 † (.0001)	-.0003 (.0005)
CVC Investment Experience	.000 (.0003)	.000 (.0003)	.003 (.0008)	.002 (.0002)	.098 (.0000)	.521 (.0006)
Total Assets	-.0000 (.0000)	-.0000 (.0000)	-.0000 * (.0000)	-.0000 † (.0000)	-.0000 † (.0000)	-.0000 (.0000)
CapEx Intensity	.426 (.0056)	.453 (.0056)	.015 (.0057)	.051 (.0142)	.083 (.0006)	.343 (.0149)
R&D Intensity	-.0003 (.0032)	-.0005 (.0032)	-.0003 (.0035)	-.0005 (.0044)	.0004 (.0004)	-.0017 (.0071)
Operating Cash Flow	-.919 (.0001)	.882 (.0001)	.930 (.0001)	.910 (.0001)	.338 (.0000)	.817 (.0002)
Private Firm (dummy)	-.511 (.0007)	.519 (.0007)	.935 (.0006)	.394	.415 (.0001)	.596 (.0015)
Constant	-.0014 † (.0007)	-.0015 * (.0007)	-.0016 * (.0006)	-.0019	-.0001 † (.0001)	-.0024 (.0015)
	.050 (.0008)	.038 (.0008)	-.0016 † (.0009)	-.0019 (.0013)	.074 (.0001)	.102 (.0043)
	.269	.260	.086	.137	.270	.000
Observations	1,217,451	1,217,451	721,696	495,755	703,320	514,131
Number of panelid	70,030	70,030	43,095	26,935	53,827	39,922
Wald_Chi2	472.300	462.566	401.746	et(chi2)		645.915

First row of each variable refers to the parameter estimates of the model. Robust standard errors are in parentheses.
 P-values are indicated in the third row of each variable. *** p<.001, ** p<.01, * p<.05, † p<.1

Table 4

A/H1N1 Placebo Models						
Variable	(Controls)	(Interaction)	(Structural Separation)		(Absorptive Capacity)	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
			No	Yes	Low	High
2006 Placebo Shock Period		.0009 (.0011)	.0020 (.0018)	-.0018 (.0011)	.0001 (.0001)	.0036 (.0024)
A/H1N1 Shock Technologies		.0120* (.0061)	.0115 (.0070)	.0120+ (.0062)	-.0002** (.0001)	.0145+ (.0077)
2006 Placebo Shock Period#A/H1N1 Shock Technologies		.0072 (.0070)	.0047 (.0070)	.0150 (.0244)	-.0001 (.0001)	.0107 (.0098)
Structural Separation	-.0019** (.0007)	-.0019** (.0007)			-.0002* (.0001)	-.0039** (.0015)
Absorptive Capacity	.0041*** (.0010)	.0040*** (.0010)	.0048** (.0015)	.0030** (.0009)	.0003 (.0002)	.0060*** (.0016)
Average Claim Count	-.0016*** (.0004)	-.0016*** (.0004)	-.0019** (.0006)	-.0013** (.0004)	-.0001+ (.0001)	.0003 (.0005)
CVC Investment Experience	.0016*** (.0003)	.0017*** (.0003)	.0027*** (.0008)	.0011*** (.0002)	.0001*** (.0000)	.0032*** (.0006)
Total Assets	-.0000 (.0000)	-.0000 (.0000)	-.0000* (.0000)	.0000+ (.0000)	-.0000+ (.0000)	-.0000 (.0000)
CapEx Intensity	-.0017 (.0056)	-.0019 (.0056)	-.0006 (.0057)	-.0047 (.0143)	-.0008 (.0006)	-.0026 (.0149)
R&D Intensity	-.0003 (.0032)	-.0005 (.0032)	-.0003 (.0035)	-.0005 (.0044)	.0004 (.0004)	-.0017 (.0071)
Operating Cash Flow	-.0000 (.0001)	-.0000 (.0001)	.0000 (.0001)	-.0001 (.0001)	.0000 (.0000)	-.0001 (.0002)
Private Firm (dummy)	-.0014+ (.0007)	-.0015* (.0007)	-.0016* (.0006)		-.0001+ (.0001)	-.0024 (.0015)
Constant	-.0009 (.0008)	-.0009 (.0008)	-.0016+ (.0009)	-.0020 (.0013)	.0001 (.0001)	-.0155*** (.0043)
Observations	1,217,451	1,217,451	721,696	495,755	703,320	514,131
Number of panelid	70,030	70,030	43,095	26,935	53,827	39,922
Wald Chi2	472.300	471.517	528.984			649.043

First row of each variable refers to the parameter estimates of the model. Robust standard errors are in parentheses.

*** p<.001, ** p<.01, * p<.05, + p<.1

Table 5

EVD Placebo Models						
Variable	(Controls)	(Interaction)	(Structural Separation)		(Absorptive Capacity)	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
			No	Yes	Low	High
2006 Placebo Shock Period		.0009 (.0011)	.0020 (.0018)	-.0018 (.0011)	.0001 (.0001)	.0036 (.0024)
EVD Shock Technologies		.0120* (.0061)	.0115 (.0070)	.0120+ (.0062)	-.0002** (.0001)	.0145+ (.0077)
2006 Placebo Shock Period#EVD Shock Technologies		-.0072 (.0070)	.0047 (.0070)	.0150 (.0244)	-.0001 (.0001)	.0107 (.0098)
Structural Separation	-.0019** (.0007)	-.0019** (.0007)			-.0002* (.0001)	-.0039** (.0015)
Absorptive Capacity	.0041*** (.0010)	.0040*** (.0010)	.0048** (.0015)	.0030** (.0009)	.0003 (.0002)	.0060*** (.0016)
Average Claim Count	-.0016*** (.0004)	-.0016*** (.0004)	-.0019** (.0006)	-.0013** (.0004)	-.0001+ (.0001)	.0003 (.0005)
CVC Investment Experience	.0016*** (.0003)	.0017*** (.0003)	.0027*** (.0008)	.0011*** (.0002)	.0001*** (.0000)	.0032*** (.0006)
Total Assets	-.0000 (.0000)	-.0000 (.0000)	-.0000* (.0000)	.0000+ (.0000)	-.0000+ (.0000)	-.0000 (.0000)
CapEx Intensity	-.0017 (.0056)	-.0019 (.0056)	-.0006 (.0057)	-.0047 (.0143)	-.0008 (.0006)	-.0026 (.0149)
R&D Intensity	-.0003 (.0032)	-.0005 (.0032)	-.0003 (.0035)	-.0005 (.0044)	.0004 (.0004)	-.0017 (.0071)
Operating Cash Flow	-.0000 (.0001)	-.0000 (.0001)	.0000 (.0001)	-.0001 (.0001)	.0000 (.0000)	-.0001 (.0002)
Private Firm (dummy)	-.0014+ (.0007)	-.0015* (.0007)	-.0016* (.0006)		-.0001+ (.0001)	-.0024 (.0015)
Constant	-.0009 (.0008)	-.0009 (.0008)	-.0016+ (.0009)	-.0020 (.0013)	.0001 (.0001)	-.0155*** (.0043)
Observations	1,217,451	1,217,451	721,696	495,755	703,320	514,131
Number of panelid	70,030	70,030	43,095	26,935	53,827	39,922
Wald Chi2	472.300	471.517	528.984	e(chi2)		649.043

First row of each variable refers to the parameter estimates of the model. Robust standard errors are in parentheses.
 *** p<.001, ** p<.01, * p<.05, + p<.1

The estimates from Model 5 and 6 of Table 2 and Table 3 reveal a pattern in accord with our third hypothesis. Turning to Table 2, the estimates of the interaction term in Model 5 is negative and significant at the 10 percent level ($p = 0.078$). Although this coefficient is positive in Model 6, it is not statistically significant. We did not find any statistically significant difference between the coefficients across the two models ($p=0.7$). Although these estimates from the H1N1 pandemic allude to the effects of absorptive capacity, they remain inconclusive. However, the results from the EVD pandemic provide more substantial evidence for the importance of absorptive capacity. Just as in Table 2, in Model 5 of Table 3, the coefficient of the interaction term is negative in the low absorptive capacity sample ($p=0.055$). Furthermore, this coefficient is positive and weakly significant in the high absorptive capacity sample shown in Model 6 ($p=0.065$). The difference between the coefficients is also significant ($p=0.055$), implying that absorptive capacity is essential for firms to benefit from the portfolio firms' knowledge. Taken together, these results provide support to our third hypothesis.

DISCUSSION

This study examined the nature of outside-in knowledge transfers from portfolio companies to incumbent firms during specific periods that underwent technological and market ferment. We found support for our first hypothesis, which posited that CVC investors would use relevant knowledge embedded in portfolio companies to generate new knowledge during salient periods of ferment. Although the Influenza A virus subtype H1N1 (Table 2) and Ebola Virus Disease (Table 3) pandemics had positive coefficients and small standard errors, we found statistical significance for EVD only. This finding is consistent with the notion that EVD is less well scientifically understood and thus is an instance of a substantive shock to the industry.

Based on the main interaction effects, we observed that the coefficient for the structural separation variable is negative across all models. However, only the moderating effect on the main interaction in the case of the A/H1N1 virus period is significant. These patterns imply that CVC investors with more independence from their respective incumbent firm hierarchies and greater autonomy in decision making may also face important tradeoffs between flexibility and the ability to transfer and distribute external knowledge inside their respective firms. This

tradeoff raises possible challenges that more structurally separated CVC investors may face in fulfilling their organizational mandates from senior executives to provide a search function on behalf of an incumbent firm. The implication is that there is a strong need for CVC investors to possess strong capabilities in internal coordination for distributing knowledge across business units and using social capital to communicate effectively and influence decision-makers at all levels.

In addition to the effects of structural separation on outside-in knowledge transfers, we found supporting evidence for prior knowledge inside incumbent firms' research and development apparatus. The coefficient for the absorptive capacity variable was positive and largely significant across all our models (except model 5), which suggests the importance of internal research and development activities for integrating external knowledge. Furthermore, the moderating effect of absorptive capacity on our main interaction effect was negative in low absorptive capacity conditions (Model 5) across both virus periods of market and technological ferment (Table 2 and Table 3). We believe that this provides even further evidence that moderate to high stocks of internal knowledge are a prerequisite for effective external knowledge acquisition, transfer, and integration. However, we noted that the coefficient of our average claim count variable was negative across all models and tables, except model (6). This implies that prior knowledge contributes positively to outside-in knowledge transfers and integrations, but that higher quality levels of prior knowledge constrain outside-in knowledge transfers and integrations.

We captured knowledge buildup by the incumbent by finding all instances when incumbent firms cited previous patent citations of their portfolio companies. We learned that this outside-in knowledge integration process occurs often, on the whole, and particularly when unexpected market events signal the salience for particular technologies. This finding provides strong evidence that CVC investors in the biopharmaceutical industry rely on CVC investments as a strategic tool to renew incumbent firms' knowledge resources. In particular, many CVC investors are able to successfully acquire and transfer knowledge resources that serve as inputs in the subsequent recombinant creation of new knowledge — the resulting knowledge integration indeed appears to be relevant to salient market demand conditions. This finding is a testament to the practitioners that make the CVC investment mode work well.

Overall, we found evidence

1. that incumbent biopharmaceutical firms require external knowledge as further input to internal knowledge resources,
2. that the CVC mode is used with a strategic aim and that the CVC unit serves as an intermediary of internal and external knowledge,
3. that portfolio companies (investment portfolio) constitute a reserve of quasi-internal/external unfamiliar knowledge, and
4. that research and development performance of these incumbent firms is partially based on ties with portfolio companies.

Lastly, we found that many CVC investors often operated in resource-constrained organizational environments where greater outside-in knowledge transfers and integrations were associated with incumbent firms' lower total assets, capex intensity, or even R&D intensity. We believe these patterns also reflect the structural realities of the biopharmaceutical industry that we described earlier in the chapter, in which research and development productivity is relatively low. Given the high cost of research and development, incumbent firm profits may be lower than other knowledge-intensive industries, such as ICT and semiconductors. We are inclined to consider that scholars found an increase in internal R&D activity associated with CVC investments (Dushnitsky & Lennox, 2005; Hamm et al., 2018; Ma, 2020; Wadhwa et al., 2016). In other words, R&D intensity in our study is measured by dividing net sales into R&D expenditures.

This study contributes to a better understanding of the organizational processes involved in achieving the strategic mandate asked of CVC investors by senior management within incumbent firms, including contextual conditions that weaken and strengthen knowledge transfer and integration processes. Consequently, we believe that the CVC investment mode offers incumbent firms an organizational mechanism to seek knowledge and competitive advantages by exploiting knowledge opportunities (Ireland et al., 2003).

According to Huang and Madhavan (2020), the potential value of CVC investments to the incumbent firm is inconclusive and conflictive about corporate-strategic outcomes. We believe that one reason for contradictory findings may be that the CVC literature often includes financially-oriented CVC investors that behave similarly to independent VC firms in the same

sample as strategically-oriented CVC investors. For example, Monteiro and Birkinshaw (2017) found that a greater autonomy of CVC investors resulted in a better knowledge transfer process because of lower conflicts with internal business units, more investments in rivals, and reduced concerns of knowledge misappropriation. As conceptualized in this study, the rationale describes financially-oriented CVC investors purposefully detached from their respective incumbent firms in terms of “*strategic intent*.” We believe that another reason may come from the inconsistent connotation of CVC innovation performance. Several studies on CVC innovation performance are about the relative performance of portfolio companies, independent of incumbent firm outcomes (e.g., Alvarez-Garrido & Dushnitsky, 2016; Chemmanur et al., 2014; Park & Steensma, 2013).

In extant research, the innovativeness measure of an incumbent firm does not connect to particular knowledge obtained from a specific portfolio company (e.g., Belderbos et al., 2018; Dushnitsky & Lenox, 2005; Ma, 2020; Wadhwa & Kotha, 2006; Wadhwa et al., 2016). Studies on the specialization or diversification of investment portfolios often refer to merely an industry classification. As far as we know, this is the first study to connect specific technologies in portfolio companies to specific technologies in incumbent firms and specific technologies that comprise episodic rises in market demand. We provide evidence that strategic CVC investments can work in particular settings, from the incumbent firm’s perspective, despite the internal complexities of incumbent firms. This study might offer alternative insights into the work of previous scholars. For example, Dushnitsky and Shaver (2009) describe a paradox in which external startups in strong intellectual property protection (IPP) regimes are more likely to seek investments from CVC investors in the same industry because CVC investors share similar norms regarding fair knowledge appropriation. We believe that the firms and startups in our study exemplify this pattern in which collaboration and knowledge transfer readily take place to make significant advances in the marketplace and make urgent contributions to the health and well-being of individuals and societies.

Limitations and Future Directions

Our sample of incumbent biopharmaceutical firms could have included incumbent firms that did not have strategic ambitions for CVC investments as a primary motive because archival data does not accurately present this classification, if at all. However, we believe the potential

issue does not affect the robustness of our results because we use the patenting behaviors of incumbent firms to evaluate outside-in knowledge flows. We do not merely assume that CVC investors are gaining knowledge from investment portfolios (one possible signal of strategic intent) but directly observe some aspect of outside-in knowledge transfers.

On a related note, patent applications may not capture all types of knowledge created within an incumbent firm. For example, we do not account for non-codified outside-in knowledge transfers that may have resulted from CVC investments, potentially underestimating the knowledge benefits of CVC investments to incumbent firms. Another possible limitation of our study may come from the unobserved heterogeneity of portfolio companies because we could not obtain team-level, product-level, or firm-level characteristics for all 882 portfolio companies. However, we believe that our use of placebo models and fixed-effects addresses this type of endogeneity (see Table 4 and Table 5). We encourage more quantitative research emphasizing internal dynamics within incumbent firms about CVC investments or, more generally, in external corporate venturing activities of any kind.

The strategic ties between large and small firms and the nature of win-win scenarios remain scant in the literature. We believe that this rests on understanding the nature of investments and technologies invested and how this helps to renew the resources and capabilities of incumbent firms. Some excellent qualitative insights have described the “*why*” of some of the inward-facing practices enacted by CVC investors (e.g., Basu et al., 2016; Souitaris & Zerbinati, 2014). Building on studies like these and ours may require looking more deeply inside incumbent firms’ research and development activities, which depends on having contacts or finding better sensors and novel ways of gathering information on new product developments.

We measured new patent applications that do not capture the eventual commercialization of “*know-how*” and technologies. After all, the full realization of CVC investments and innovation would be the success of new product or service launches. Moreover, external corporate venturing is not only about learning about disruptive technologies (Basu et al., 2011; Dushnitsky & Lenox, 2005; Wadhwa & Kotha, 2006) but also about implementing such technologies within an incumbent firm. In addition, our study did not measure specific practices associated with integration processes that help reduce the resistance, hostility, or conflicts of internal business units that undermine joint action and collective co-creation. For example, information on board seat membership, collaborative blueprints, information sessions concerning

trends, or meetings would have helped better understand the relative impact between structurally-separated CVC investors and structurally-integrated CVC investors. Finally, measuring research and development effort by proxy is an insufficient approach, in our view, because the details and characteristics of research and development inputs matter in innovation outcomes.

Equifinality certainly exists in creative acts, but conditions in large organizational settings often seem to be hostile to deviations from the status quo that carry significant uncertainties and failures. March (1971) described working on these types of initiatives as “*foolishness*,” which was meant more as a thoughtful wink at the individual perils of entrepreneurial agency than as a rebuke of these efforts. March, also a published poet, referred to the chaos of organizational decision-making as a “*garbage can*” process. Suppose society is to receive the breakthroughs it deserves. In that case, we do not have an infinite number of chances to get this right. We should work to curtail individual and collective talent misappropriation through compromised decision-making. Incumbent firms matter in our economies and provide a pool of talented individuals with deep expertise in so many organizational functions and valuable social capital and distribution networks that reach around the globe. In addition to investing financial capital, incumbent biopharmaceutical companies offer external startups access to sophisticated labs and valuable marketing and distribution channels. Individual entrepreneurship is not for everyone, yet making established incumbent firms more adaptable is a necessary form of the entrepreneurial spirit that is sometimes not fully appreciated.

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GENERAL CONCLUSION



Our three empirical studies investigated how attentional processes influenced decision-making in the CVC investment mode concerning the evaluation of opportunities, the selection of opportunities to invest in, and the integration of external knowledge embodied in portfolio companies. These constitute critical organizational moves that involve decision-making shaped by the selective focus of attention. Accordingly, our unit of analysis is the decision-making unit that drives these decision-making processes, which we refer to as CVC investment units. Altogether, if we were to suppositionally string our three studies together following the same CVC investment unit, we could:

- Better understand the way in which intrafirm players interact with the CVC investment unit to evaluate opportunities in relation to the incumbent firm's strategic agenda;
- Better understand investment behaviors, based on how intrafirm processes interact with deal flow;
- Better understand subsequent integration of external knowledge as a function of CVC investment unit structural characteristics.

By reconstructing the sequence of decision making involved from evaluating opportunities to transferring external knowledge to the incumbent firm, from the corporate perspective, we conceivably follow incumbent firms' search and integration pathways of strategic renewal from chaos and *potential* disembodied experimentation to *realized* disembodied experimentation using the CVC investment mode (Keil et al., 2008).¹ Scholarly work on the

¹ This, of course, is a thought exercise as we do not actually track the same CVC investment units across our three empirical studies. The first study is a single-case in the financial services industry, the second study includes only high-tech industries, and the third study includes only the biopharmaceutical industry. These are knowledge intensive industries that undergo continual renewal. This ensures that we study multiple industries in the third and fourth waves of the CVC investment mode, as suggested by Dushnitsky (2012). March (1991) described exploration beyond the firm's boundaries as a process of search, and Cohen and Levinthal (1990) described the difficulties of absorbing or integrating external knowledge without the requisite internal knowledge resources.

CVC investment mode is linked to the literature on corporate entrepreneurship, which has addressed the dual role of strategic management and entrepreneurship in strategic renewal (Lampe et al., 2020). Acquiring knowledge to obtain new resource combinations and create firm-level structural change, especially to seek and obtain knowledge beyond an incumbent firm's boundaries, are entrepreneurial acts aimed at achieving strategic renewal. As with many entrepreneurial acts, they are fraught with difficulties and disappointments. This dissertation aims to untangle some of these entanglements by adopting a social constructivist approach that positions complex social situations and interactions at the center of CVC investment processes. Foundational work on the limits of rational decision-making (e.g., March & Simon, 1958) provides the intellectual pillars of a socialized view. We apply the attention-based view (ABV) to the CVC investment mode. The ABV defines an incumbent firm's strategy "*as the pattern of organizational attention, the distinct focus of time and effort by the firm on a set of issues—problems, opportunities, and threats—and on a particular set of action alternatives—skills, routines, programs, projects, and procedures*" (Ocasio et al., 2018: 156). The ABV has only once been applied to the CVC investment context (Maula et al., 2013) but never previously applied to CVC investment units.²

Across our three studies, we adopt the view that there are limits on CVC investment unit-level attention, which guide the selective focus of attention and decision making that either intentionally or unwittingly shape organizational choices and outcomes. The flow of our studies has a temporal dimension to it, as it moves through the CVC investment unit stages of decision making, but so do the studies themselves. In particular, the first and third studies in which sustained attentional processing (elapsed time) and the timing of outside-in knowledge transfers are essential to the operations of CVC investment units.

The chapter is structured as follows. First, we discuss five methodological and theoretical contributions that we make to the CVC investment literature. Then, we suggest some potentially

² Maula et al. (2013) studied the temporal timing of top management teams' (TMT) attention to salient technological shifts in the environment, as a function of the type of social capital operationalized as either homophilous and heterophilous interorganizational ties. CVC investment units were referred to as heterophilous ties, but only co-investments with independent venture capitalists (IVC) were actually measured. Co-investments with IVC could have occurred by means of corporate strategy, M&A, or R&D units instead. The authors' argument was that heterophilous ties helped to inform TMTs about these shifts early on, and thus TMTs allocated attention to these salient issues in a more timely manner (i.e., appeared in annual reports and shareholder letters) than incumbent firms that did not establish heterophilous ties.

valuable areas in which future research could contribute to disruptive trends in the CVC investment mode.

OUR CONTRIBUTION TO CVC INVESTMENT UNITS

The still-evolving CVC research has focused only on a limited set of traits of CVC investment units and crucially failed to peer inside the black box of CVC investment units to examine critical processes. Altogether, much of the scholarly work does not consider intrafirm processes unique to the CVC investment mode that intervene during external opportunities' evaluation, selection, and integration.³ The organizing processes of CVC investment units that drive coordination and communication functions underlying CVC investments are acutely understudied. The CVC investment phenomenon can be difficult to study with empirical robustness because CVC investments are highly strategic and, thus, are performed discreetly by incumbent firms. Moreover, public disclosure requirements for CVC investment activities are minimal for publicly-listed incumbent firms and virtually non-existent for privately-held incumbent firms (Hamm et al., 2018; He & Tian, 2018). Despite these challenges, the three empirical studies in the dissertation aim to investigate the dynamics of selective attention operating in CVC investment units between 1992-2020. This period coincides with the rise of the Internet, cloud-based software, and related enabling technologies such as artificial intelligence. During the past three decades, most CVC investments, independent or corporate VC, were made in software-related ventures that embodied novel digital technologies (Eckblad et al., 2019). This period also covers the more recent third and fourth waves of the CVC investment mode, which scholars consider to reflect substantial alterations in the prevalence and practices of CVC investment units (Dushnitsky, 2012; Gaba & Meyer, 2008; Park & Steensma, 2012; Rossi et al., 2020). We also responded to Dushnitsky's (2012) call for empirical studies to cover different sectors beyond telecommunications and biotechnology industries, by analyzing in effect every knowledge-intensive industry participating in the CVC investment mode.

³ After nearly 40 years of scholarship on decision making in venture capital, Gompers et al. (2020) are still learning more about how IVCs make selection decisions. We see this as encouragement to keep digging deeper into the CVC investment mode, which we consider to be at least as complex, if not considerably more complex, than the IVC context.

In addition to the comprehensiveness of our temporal and industry sampling, our empirical studies contribute to the academic literature on CVC investments in other methodological and theoretical ways. We highlight three theoretical contributions and two methodological contributions, in particular.

Theoretical Contributions

The prevailing view is that CVC investment units mainly interact with external startups before investment to evaluate opportunities based on rational criteria that heavily emphasize external startups' immutable traits. The nature of the interaction is conceptualized as instrumental and highly dyadic between the CVC investment unit and a given external startup. We propose an alternative conceptualization in which pre-investment evaluations are formed by not only the rigid evaluation of individual startup characteristics but also the dynamic multilateral interactions between multiple internal and external players that resemble integration efforts. While the former is rule-based and determinable, the latter is emergent and difficult to predict.

By means of inductively-grounded fieldwork, a few scholars have revealed certain practices that CVC investment units engage in to interact with players inside the firm before investment (e.g., Basu et al., 2016; Souitaris, 2014). We build on such socialized perspectives to capture the social interactions between a CVC investment unit and multiple intrafirm players during the pre-investment stages of the CVC investment mode. Thus, we can better understand how the evaluation of opportunities is shaped by the macro patterns of selective focus of attention that a CVC investment unit allocates to certain players.

We draw on a social constructivist view offered by the ABV and sensemaking perspectives also to develop a hybrid view of opportunities in the CVC investment mode as both discovered and subsequently recreated. Any discussion on the precise nature of opportunities in the CVC investment mode has been largely absent in the CVC literature. Entrepreneurship scholars have pointed out that the definition of opportunities remains ambiguous. Davidsson (2015) proposed a set of interactions between sub-constructs to reduce conceptual overlaps in the literature on opportunities. In Davidsson's (2015) framework, opportunities are explained as interactions between actors, opportunity confidence (favorability), external enablers (specific technologies, demographics, regulatory changes), and new venture ideas. Shane and

Venkataraman (2000: 220) defined entrepreneurial opportunities as “*situations in which new goods, services, raw materials, and organizing processes can be introduced and sold at greater than their cost of production (...) require the discovery of new means-ends relationships.*” Similarly, Dutta and Crossan (2005, p.426) defined opportunities as a “*set of environmental conditions that lead to the introduction of one or more new products or services in the marketplace by an entrepreneur or by an entrepreneurial team through either an existing venture or newly created one.*” Davidsson (2015) noted that these definitions posit opportunities as external, objective, pre-existing, and inherently favorable. Opportunities throughout the dissertation refer first to external startups and are initially considered to be discovered from a CVC investment unit’s perspective (Shane & Venkataraman, 2000) because external startups pre-exist as independent entities in the environment that are potentially discoverable by any third-party actor.

In the CVC investment mode, the new venture ideas embodied in any given external opportunity reflect some degree of novelty to an incumbent focal firm and some degree of favorability assigned by an incumbent focal firm at the earliest stages of search (Davidsson, 2015). During the pre-investment evaluation stage, at least one member of a focal CVC investment unit must consider a focal external startup and its new venture ideas to be a potential opportunity for eventual investment selection, based on his/her understanding of the incumbent firm’s renewal goals, for even the early stages of evaluation processes to occur. Since the early stages of evaluation are our starting point for the dissertation, CVC investment units engage at first with discovered opportunities.

In the first study, the incoming flow of external startups added to the opportunity set reflects the outcome of discovery processes. A CVC investment unit’s opportunity set differs from the population of external startups in two ways. The set reflects those external startups that the CVC investment unit has encountered either through explicit practices, luck, or some combination. The set also reflects interest from at least one CVC investment unit team member. If a CVC investment unit team member talks to a co-founding member at a networking event and is not interested, that external startup will not appear on the opportunity set. Moreover, the opportunity set reflects an early stage of filtering new venture ideas by the CVC investment unit based on loosely defined search fields of interest. CVC investment units’ search fields are rarely a bucket list of specific opportunities. Based on ambiguity in an incumbent firm’s search fields,

the discovery view can only partially explain what CVC investment units do. Based on our interviews with a hundred CVC investment unit practitioners, we found that search fields are typically non-specific and refer to macro phenomena. These correspond to Davidsson's (2015) "*external enablers*" construct. For example, "*mobility*" or "*artificial intelligence*" are possible external enablers and constitute actor-independent opportunities at the macro-level. We subscribe to Davidsson's (2015) claim that favorability is actor-contingent so that mobility or AI will not be subjectively valued by CVC unit actors in the same manner. A CVC unit that marked "*artificial intelligence*" as one of its search fields, as a result of discussions at the highest levels of the organization, signals that the focal CVC unit does value the potential of that particular external enabler. This was the case at the major bank in the first study, which identified advances in the field of artificial intelligence as a possible source of opportunities. Using Davidsson's (2015) framework, the incumbent firm identified a set of external enablers and then used subjective selection processes to evaluate their opportunity confidence score for each. Those external enablers with the highest opportunity confidence evaluation then populated the focal CVC investment unit's codified search fields. Search fields provide sufficient structure to search boundaries for a CVC unit to initiate a search for external startups that apply some form of artificial intelligence, for example. Therefore, we conceptualize that CVC investment units start with external enablers for which they have high levels of opportunity confidence and then advance to new venture ideas as external startups are sourced and added to opportunity sets. External startups sourced by a CVC investment unit, using Davidsson's (2015) proposed framework, each possesses a new venture idea that reflects a focal player's interpretation of particular external enablers. CVC investment units engage subsequently on the micro-level of an external startup's new venture idea to arrive at an opportunity confidence score, although attributes of the ventures are also considered in selection processes. Artificial intelligence is not a sufficient level for a CVC investment unit to act on, as the details of the new venture idea are what allow the CVC investment unit to garner support inside an incumbent focal firm. The new venture idea makes it possible to identify internal needs and relate these to possible external solutions. What we have described thus far would fit neatly under Alvarez and Barney's (2007) discovery label and is consistent with Davidsson's (2015) claim that external enablers are typically associated with the discovery view.

However, this reasoning does not mean to imply that creation processes do not also occur in relation to opportunities in our empirical studies. The social interactions that occur inside an incumbent firm enact creation processes, as described by Alvarez and Barney (2007). A set of new venture ideas are disseminated inside the incumbent firm by CVC investment units, and CVC investment units subsequently work to gauge internal opportunity confidence for each opportunity through a series of sensemaking practices with distributed players. Sensemaking, in turn, involves sensegiving that “*consists of attempts to alter and influence the way others think and act*” (Huemer, 2012:241). In this manner, we consider multiple types of entrepreneurial players in relation to opportunities that are not normally considered in the current literature on entrepreneurial opportunities. As an opportunity undergoes evaluation by a CVC investment unit before the investment selection decision, the originally discovered opportunity may give way to a derivative form due to coming into contact with the incumbent firm and engaging in collective co-creation. This possibility is consistent with Bhidé (2000) and Klepper and Sleeper (2005), who found that many external startups had only a fuzzy concept about their new venture ideas in the early stages of development. The new venture ideas of external startups found in the opportunity set in the dissertation are understood to be dynamic, subject to networked (re)-creation processes, and at different stages of CVC maturity. In the CVC context, the developmental maturity of a new venture idea refers to selection stages (opportunity sets, investments sets, innovation sets) that involve some level of reformulation by discrete actors. Opportunities are considered to be multi-stage phenomena that continue to evolve long after the formation of an external venture as a result of ongoing interactions between various types of entrepreneurial players across various CVC investment selection stages. The extant literature has often not acknowledged the ongoing, dynamic nature of the opportunity construct after venture formation. Dynamic processes are driven by a network of entrepreneurial players, including CVC investment units and investment selection processes that provide ongoing learning feedback loops. This does not merely alter an original new venture idea, but it creates a version that is unique to an external startup-business unit dyad.

The social processes described above generate a multilateral, negotiated version of the new venture idea that achieves mutual “*buy-in*”. These processes lend further credence to our view that actor-independent opportunities do not really describe the CVC investment context. The mountain metaphor used by Alvarez and Barney (2007) to describe mountain climbing

(discovery) and mountain building (creation) is misleading, in our view, because mountains, by definition, occur naturally, free of human interventions. However, so-called objective external enablers in Daviddson's (2015) framework are always artificially produced by human actors previously involved in complex social processes. Technologies, regulations, and consumer preferences do not fall out of the sky due to dispassionate gravitational forces. Therefore, disentangling non-actor opportunities from actors in explaining how new economic activities emerge strikes us as fundamentally flawed, apart from the insight that each actor tends to evaluate a similar set of conditions differently (i.e., the separation of content and evaluation). This implies that many conditions are not necessarily good or bad but depend on the characteristics of a focal player and player dyads or triads in our CVC investment context. We agree with Daviddson's (2015) contention that opportunity confidence is a function of space, time, and application area.

Altogether, opportunities in the CVC investment context are conceptualized as somewhat distinct from opportunities described in the literature that lead to new venture creation. Strictly speaking, the latter results in the establishment of external startups offering a particular product or service that an incumbent firm could simply "buy" on the open marketplace. In this manner, an incumbent firm could merely deploy a simple form of search to discover the small, medium, and large companies that offer such products and/or services and then evaluate each as part of a procurement process to purchase or license a piece of software on behalf of an incumbent firm. This is precisely what chief technology officers / chief information officers and their teams do routinely. However, the CVC investment context differs when taking the incumbent firm's perspective because there are complex aspects of both "make" and "buy" decisions in relation to external ventures. Based on search and information costs adduced by transaction cost economics theory (Williamson, 1996), there must exist a sound rationale that explains why an incumbent firm chooses to create CVC investment units that form and broker ties with external startups to gain access to their codified new venture ideas. For the CVC investment mode to be employed, there must be accompanying multilateral developmental cycles based on early-stage co-creation processes that further evolve original new venture ideas and/or that reproduce forks inside an incumbent firm, analogous to cloning open source projects where each clone takes on a developmental life of its own over time. A pre-existing new venture idea indeed comes to the attention of a focal CVC unit in the form of an external venture entity through discovery, but for

a strategically-driven CVC unit to perform its function, the pre-existing new venture idea represents only a starting point that remains to be reformulated by a series of other entrepreneurial actors (creation forces). We conceptualize a more dynamic, more proactive perspective on opportunities, where CVC units have more decisions to make than simply "who?". Opportunities have previously been assumed to be fixed, whereby a CVC investment unit discovers and chooses this external startup over that one based on predefined conditions. However, it is not just "who?", but also "how?" and "when?". Accordingly, external opportunities in the CVC investment context are not merely static. We conceptualize this process as starting before an investment is ever made. This implies that two external startups with exactly the same characteristics might not be seen as favorable opportunities by even the same CVC investment unit. It will depend on how much a given external startup integrates with players inside the incumbent firm. Integration-like efforts undertaken by a CVC investment unit are not merely an interest in the original new venture idea but a commitment to co-creating some variant. That will depend on whether the CVC unit has managed to connect the external startup's new venture idea to the network of key internal players. The variation in evaluation decision outcomes is, therefore, considered to be driven less by venture characteristics or by fit according to predefined conditions, all things being equal than by how well distributed actors become connected in order to co-create derivative works in the time period that an external startup occupies an opportunity set. Opportunities across our three dissertation studies meet the description of a sequential, hybrid conceptualization of opportunity, from a focal CVC investment unit's vantage point, that comes into existence when first discovered and that evolves over time through social, collective creation processes that endure until the incumbent firm has made complete use of the outside-in transfer of external knowledge.

Finally, many mechanisms in the CVC literature borrow from the literature on venture capital or independent venture capital (IVC) firms. Across our three empirical studies, we have shown how interactions between internal and external players shape outcomes through the selective focus of attention from the CVC investment unit perspective. We briefly examine two examples of how mechanisms differ between the IVC and CVC contexts that concern the characteristics of investment portfolios and external startups. In the IVC literature, portfolio diversification is regarded as being a sound risk mitigation strategy to increase financial returns to investors. If the timing of one product or market category does not coincide with the IVC 10

to 12-year lifespan of the IVC fund, then diversifying across product and market categories increases the chances of an outsized gain in at least one other area. The same risk mitigation strategy does not as easily apply to strategically-oriented CVC investment units. Our first study has shown the selective focus of attention on certain opportunities as an outcome of complex social interactions among multiple players. Patterns of selective attention allocated to distributed players may well lead to highly diversified portfolios in some cases because that is what the players will have converged on through multilateral sensemaking deliberations. In other cases, the players may well converge on more homogenous investment portfolios. In the CVC investment mode, the question of portfolio diversification is not a predetermined optimization logic but rather mirrors social processes enacted by CVC investment units. What is deemed as low risk in the IVC context could very well be high risk in the CVC investment context if it were to be imposed as a result of a financially-driven belief *ex ante*. Similarly, there are differences in the mechanisms that play out in regard to an external startup's management team between the IVC and CVC contexts. In the IVC context, the prior work experiences of an external startup's management team could be perceived as a proxy for high quality and the ability to grow the venture quickly. In the absence of observable information and the risk of adverse selection, the IVC is looking to mitigate risk through the use of proxy signals that speak to the growth potential of the underlying venture. Venture growth is, after all, what generates financial returns for IVC, which need to increase the valuation of the underlying asset in order to sell off the asset at a prespecified moment in time. In the CVC investment context, the CVC investment unit may also use prior work experience as a proxy. However, the framing of what constitutes a risk to a CVC investment unit may differ from an IVC firm's perspective. From the vantage point of a CVC investment unit, the focal risk to mitigate is the risk that an external opportunity can not appropriately engage intrafirm players sufficiently to endure an intensive evaluation process that results in some form of derivative co-production, as described in an earlier point. The CVC investment unit needs to ensure that an external startup can hold relevant discussions with intrafirm players to sustain the evaluation process. Their prior technical and finance experience would be a proxy for this capability, in addition to the knowledge resources the experience also reflects. This alternative framing is directly manifested in our first empirical study, in which we found that the CVC investment unit selectively allocated attention to external opportunities in which founders had prior work experiences in finance and technology.

Empirical Contributions

First, in order to delve into the blackbox of CVC investment units in our studies, we needed to be sure that we meticulously sampled CVC investment units. The proper identification of CVC investment units allowed us to establish boundary conditions that can establish more robust causal relationships. For example, considering incumbent firms' innovativeness in relation to ties with external startups, without a clear sense of the focal CVC investment unit, delinks the relationship between knowledge sets. As a result of delinking, it becomes more likely that a researcher will examine incumbent firm patents in a manner that is disassociated from external knowledge that actually occurs within the investment portfolio. This can lead to claims where an action in one system is believed to trigger unrelated actions in another system, because the two action systems have been disassociated methodologically and theoretically.⁴ This point becomes especially poignant when one considers the strategic function of the CVC investment mode. There is a long tradition in the CVC literature of considering both the financial and strategic objectives of CVC investment units. We concede that ambiguity in the terminology exists, and that some purely financial results-driven actors also refer to themselves as CVC investment units. Ambiguity between pure financial and strategic actors was common in the archival data sources that we consulted, because these concepts are amalgamated by data providers. We adopt the position that financial objectives help CVC investment units to survive politically, but that the overwhelming primary function of a CVC investment unit is to provide its parent firm with the means to achieve organizational renewal goals (i.e., strategic objectives). CVC investment units in our first two empirical studies possess strong strategic intentions to be aligned with their parent firms' renewal goals, and to make evaluation decisions that result in the allocation of financial capital that takes minority equity positions in external startups that are aligned with organizational renewal goals. After an investment is made in an external startup, CVC investment units are conceptualized in our third study to facilitate timely, outside-in transfers of relevant knowledge from portfolio companies to incumbent firms that contribute to achieving innovation. Every care has been taken to remove CVC investment units from our empirical samples that do not possess the strategic intent to generate innovation outcomes for the parent

⁴ A number of CVC investment studies are susceptible to spurious claims, based on this faulty approach. In our third study, for example, we linked the patents of portfolio companies and incumbent firms to ensure these action systems are connected, through a clear identification of the CVC investment units involved in facilitating the outside-in transfer of external knowledge.

incumbent firm. Several criteria come into play: (a) CVC investment units should have strategic mandates, (b) CVC investment units should be active, and (c) noisy data should be avoided. We found that the overwhelming majority of studies on CVC investments, particularly those that relied on archival datasets, operationalized CVC investments simply as minority equity investments made by a firm. These investment transactions could have been made by pure financial investment firms that are marked as CVC investment units in virtually all the archival datasets that researchers typically rely on. Even when incumbent firms were properly identified, many scholars included CVC investment units with an entirely financial-returns mandate and/or investments made by internal business units, R&D units, M&A units, or corporate strategy/development units. Each of these investment modes differ from the CVC investment mode, and so results obtained may not generalize to CVC investment modes with a strategic mandate. Our empirical studies are based on multiple quantitative analytical techniques that use composite longitudinal datasets, which we painstakingly built from the ground up using a mixture of programmatic code and meticulous hand collection. Every effort has been made to exclude pure financial investment players, corporate and business-unit levels investments, and CVC investment units that pursue financial objectives as their primary strategy from our empirical samples. We aimed to retain and study CVC investment units that use financial instruments as a means to impact innovation outcomes for their parent organizations (technologies, markets, products). This was achieved by manually verifying information online through desk research for each CVC investment unit in our studies, to ensure that a CVC investment unit was associated with a parent firm that commercializes products and/or services to end users that depend on technological inputs, and to ensure that the CVC investment unit is active by making at least one investment per year. There are many CVC investment units listed in archival datasets that have virtually no investment activity, and therefore little to no capabilities of interest. These would not help us to understand how CVC investment units perform their function, since zombie CVC investment units are effectively defunct. Innovation theater and unreliable archival datasets contribute to the issue of zombie CVC investment units in empirical work. Not only are zombie CVC investment units a source of noise in data, but many CVC studies also make use of noisy data on portfolio companies to extrapolate traits of a CVC investment unit. We purposefully selected to not examine portfolio company characteristics in the second study, for example, because the variables we needed were found to be highly

inaccurate when we independently verified multiple archival datasets. We were unable to confirm the data previously attained, after contacting 150 randomly selected portfolio companies directly by telephone and/or email to ask about their founding years, capital fundraising timelines, and amounts raised. Data on startups are unfortunately terribly noisy in many archival datasets, given that these are very small firms with little to no reporting requirements. All data on startups in our first empirical study, for example, were manually collected using multiple online sources including startups' websites to ensure the quality of our data through data triangulation methods.

Second, aside from our single-case CVC investment unit at a major European bank in the first study, we used large sample sizes of CVC investment units in the other two empirical studies to ensure that we sufficiently powered our statistical models. Our sample size in the second study was 209 CVC investment units and 210 CVC investment units in the third study. It is not known exactly how many CVC investment units fit our strict criteria above, but we estimate it to be less than 2,000 CVC investment units globally at this point in time. Based on the rise in the formation of CVC investment units over the last decade, that population figure would have been considerably smaller at the start of our sampling period. In proportion to the current estimated population figure, we sampled at least 10 percent of the population of CVC investment units with strategic intent and capabilities to invest. In examining prior studies on CVC investments, our final sample sizes appear to be comparatively high, especially when considering the various archival datasets we used to triangulate and build our composite dataset according to the strict criteria we discussed above. Moreover, we avoided imputing missing values and retained only complete observations in our samples. We include examples from key papers in the CVC literature that disclosed or partially-disclosed the sample size of CVC investment units, but most CVC studies do not. Detailed descriptions of methodological approaches are almost always absent from CVC investment studies. Colombo et al. (2016) studied tie formation between startups and incumbent firms using 75 unique CVC investment units. Weber et al. (2016) studied 23 CVC investment units. Hill and Bikinshaw (2014) studied 95 CVC investment units. Anokhin et al. (2011) studied 163 incumbent firms, so this is subject to the possible issue of where investments originated from that we described above. Basu et al. (2011) studied 83 CVC investment units. Keil et al. (2008) studied 110 incumbent firms, but we do not know exactly from where the investments originated inside the incumbent firm. Dushnitsky and Lenox (2006)

analyzed startup exit events using 171 unique CVC investment units, presumably with sampling issues due to their reliance on VentureXpert categories and not excluding zombie units. Dushnitsky and Shaver (2009) studied CVC investment transactions, but their unit of analysis is startup ventures, of which 186 were funded by 87 unique CVC investment units. The final analysis analyzed 167 CVC investments (number of startups unspecified) and 87 unique CVC investors. Basu et al. (2016) investigated a sample of 17 unique CVC investment units also using inductive methods as did Gompers and Lerner (1998). One of the few CVC investment studies we found with a possibly larger sample size than ours was Chemmanur et al. (2014), who identified 562 unique corporate investment units, but examined the initial public offering (IPO) exit events of startup ventures associated with an undisclosed number of unique corporate investment units. Using deductive reasoning based on the information provided in the paper, we estimate that the final sample size cannot have been more than 462 and could well have been considerably less. Collecting information on organizational moves undertaken by incumbent firms considered to be strategic, is very difficult work that any CVC investment scholar faces. Incumbent firms tend to be discreet about much of this investment activity and do not readily or consistently disclose information about it (Hamm et al., 2018; He & Tian, 2018). In light of what may appear to be relatively small sample sizes in comparison to some areas of research, it is essential that scholars clearly describe identification and sampling approaches so that we may collectively make better sense of a difficult to observe phenomenon.

FUTURE RESEARCH

We conclude by suggesting a few opportunities for future research in addition to the ones already discussed in this chapter. We identified three relevant areas for researchers to consider in order to further our understanding of CVC investment units during their exploratory search and integration of opportunities: rely more on observable, longitudinal behavioral data, investigate hybrid human-computer coordination and decision making systems, and consider the negative externalities of innovations in markets for technologies. First, we encourage our colleagues to reach further into the blackbox of CVC investment units by gaining access to new types of information systems, such as online platforms that some CVC investment units currently use to manage parts of their scouting and evaluation processes. This would allow researchers to collect

time-stamped data in large enough sample sizes so as to sufficiently power statistical analyses and recreate temporal and sequential decision making. In addition, the data would refer to actual behaviors rather than self-reported, post-hoc accounts. We were very fortunate to obtain such access to this type of data in our first study. Second, consider the role of automated decision-making tools. In addition to human members of CVC investment units, digital autonomous agents contribute to decision-making, as well. Future research on CVC investments should examine how digital tools are assisting and/or replacing human decision-making during various stages of the exploratory search process. The use of automation in CVC investment coordination and decision making is still in the very embryonic stage, but search subunits do already consult many of the same information systems to source deals, such as CB Insights, PitchBook, and Crunchbase. At the moment, CVC investment units appear to rely on these information channels as a comparatively small share of their overall opportunity identification strategies, but we expect their reliance to increase over time as competition for deals continues to increase. These online platforms enable practitioners to save simple queries and to receive automatic notifications whenever a new external startup venture matches particular query criteria. Since there is no global central registry for newly-created startups and limited disclosure requirements for private companies, each information source captures different startups, and many startups are not covered initially. External startups that are listed early in their existence often include inaccurate information, according to our own independent analyses. The current use of these data sources represents a very basic form of algorithmic decision-making. However, when information systems are increasingly relied on for sourcing deals, then that represents additional selective filters in the decision-making process. The use of “*spray and pray*” tactics currently pursued by less than five venture capitalists (VCs) globally, such as Tiger Global Management since 2020 and Softbank since 2017, may have widened to a select few investors in the coming years that have access to significant levels of excess capital. However, CVC investment units are more likely to pursue higher precision selection in order to achieve their idiosyncratic strategic renewal capabilities. Therefore, CVC investment units will rely increasingly on digital tools to achieve those levels of perceived precision. However, as the application of artificial intelligence has repeatedly demonstrated during recent decades, there are unintended negative consequences and pervasive limits to the quality of data that such systems rely on — the non-obvious selection effects of “*garbage in, garbage out*” may lower the quality

of opportunity sets, as well as undermine overall search processes by propagating regional or founder biases, for example. Third, future research on the CVC investment mode should consider the negative externalities of innovation. Given the saliency of certain health, climatic and social justice issues, these trends are likely to constitute disruptive external enablers (Davidsson, 2015) for the foreseeable future that should not be ignored by incumbent firms. The empirical studies in the dissertation treat innovation with an agnostic view, which is akin to a positive bias — because any use of enabling technologies in artificial intelligence and life sciences in our studies, for example, is deemed to be a positive outcome by default. We do not evaluate the external opportunities' products or services or processes in sufficient detail in order to evaluate their economic impact on individuals, firms, and societies. *Does an external startup's product misappropriate users' privacy? Is an external startup's product safe for human health? Does the external startup's product or service discriminate based on algorithmic bias?* Issues of health and safety and social justice are crucial in the context of enabling technologies such as artificial intelligence and critical sectors such as healthcare, among others, in which there are many examples of inadvertently poorly-designed products or services and/or deliberately rogue actors. In addition, we propose that usefulness should also be considered in innovation research. Not everything that is new is an innovation, and not all innovations are equally useful or beneficial — yet, we did not distinguish between levels of product or service or process utility in our empirical studies. *Does an external startup's product provide a better (necessary) service? Does the product or service help to solve a critical issue?* Such a perspective would encourage researchers to pay greater attention to whether CVC investment units are, for example, disproportionately sourcing harmful opportunities, or disproportionately selecting harmful opportunities, or disproportionately facilitating the integration of harmful implementations of technologies into their respective firms' research and development (R&D) operations. The moral valence of certain opportunities has potential policy implications when one considers the importance of venture capital allocation in shaping the future composition of markets for technologies.

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JOSHUA ECKBLAD (Blois, France 1974) is a part-time, tenured faculty member of the Tilburg School of Economics and Management (TiSEM) at Tilburg University in the Netherlands. He graduated summa cum laude and received his bachelor's degree in economic history from NC State University in the US in 2001. He then worked as an Internet startup entrepreneur in Madrid, London and Paris for 15 years and co-founded six startups (three of which were subsequently acquired) that leveraged machine learning to facilitate team collaboration. His role was geared towards product design, and often involved ethnographic approaches to observe business processes in large organizations across Europe and the US. He also worked in management consulting specializing in digital innovation and served as the director of innovation at a boutique consultancy in Paris, before moving into academia. He received a research master's degree in organization and strategy from Tilburg University in 2016. This dissertation was written between September 2016 and May 2022 as part of his Ph.D. research with the Department of Management at Tilburg University.

This dissertation takes the corporate perspective, and seeks to understand inconsistencies in decision making enacted by corporate venture capital (CVC) investment units. CVC units are often portrayed as rational instruments deployed to obtain corporate innovation and to achieve renewal goals, by gaining privileged access to external startups' knowledge resources. However, the dissertation proposes a behavioral framework, based on the attention-based view, that demonstrates how the selective attention of CVC units subsequently affects the availability of particular organizational moves. This implies that certain issues and answers are (deliberately or non-deliberately) attended to, while others are ignored. Patterns of selective attention in conjunction with sequential decision-making processes signify that future decisions or organizational moves are highly dependent on the attentional structures of prior decisions. The first study of the dissertation explains why the observed variance in a CVC unit's selective focus of attention (measured as variance in evaluation durations) results from the unit's interpretation of a corporate firm's renewal goals. The second study explains how a CVC unit's investment behavior can slow down (measured as the number of investments), no matter how many prospective external opportunities are scouted through syndication networks. Finally, the third study explains how CVC units differ in their abilities to transfer and integrate external knowledge embedded in their CVC portfolios. Altogether, the dissertation highlights behavioral characteristics of corporate innovation, and in particular, how CVC units' selective focus of attention is conditioned by social and emergent factors that in turn shape the particular set of opportunities that a corporate firm can use in pursuit of innovation and strategic renewal.

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