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Linking Exploration and Exploitation to the Venture Capital Industry

An investigation on the rationales adopted, decision-making, and performance

Dissertation Thesis

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by

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To my parents

ACKNOWLEDGEMENTS

The decision to do and to discuss a doctoral dissertation was taken four years ago and, finally, I have accomplished the goal. While the topic, to be honest, has changed quite dramatically throughout the years, the idea of researching the field of venture capital investing has its roots from a clear inspiration received at the beginning of this path from my supervisor, Professor Rosario Faraci.
Despite several challenges and obstacles that I have stumbled across in this process, it has been a privilege and a great pleasure to do research about such an interesting topic which is nowadays receiving a renovated attention among both scholars and practitioners.
Writing a thesis is more lonely work than I ever anticipated. Notwithstanding this, it would not have been possible to complete this dissertation without support from a number of persons to whom I owe a huge debt of gratitude.

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INTRODUCTION

1.1 Introduction

Knowledge lies at the heart of human progress both in economic and social sense. The growing interest researchers have shown in knowledge, its management and development reflects the fact that we live in an *Information Era* where knowledge, and the related concepts of information and innovation, are considered at the basis of economic rent generation. Understanding the mechanisms of the virtuous power of knowledge provides interesting challenges for researchers in management, in particular. One of them is about how firms as social institutions deal with knowledge, from the search of knowledge resources to the acquisition and consequential management of the acquired knowledge stocks.

A knowledge-based view of the firm (Grant, 1996b; Kogut and Zander, 1992, 1996) has defined the argument that firms possess unique advantages of coordination, learning and action, which are fundamental for successful creation of knowledge and, consequently, beneficial effects on innovation and firm's growth. The mechanisms by which this is achieved include the combination and exchange of various firms' knowledge resources.

Most research into organizational learning (Levitt and March, 1988; Huber, 1991) and the knowledge-based view of the firm (Spender, 1996; Nonaka, 1991, Nonaka and Takeuchi, 1994) focuses upon the acquisition and creation of organizational knowledge. By viewing the organization as the entity which creates, manages and deploys knowledge, what makes this possible, in other words the organizational processes through which individuals engage in these activities, may be obscured. March frames organizations as containing '*knowledge in their procedures, norms, rules, and forms. They accumulate such knowledge over time learning from*

their members' (March, 1991, p. 73). This learning process involves 'forms, rules, procedures, conventions, strategies, and technologies around which organizations are constructed and through which they operate', the so-called "routines" (Levitt and March, 1988, p. 320). Focusing the analysis at the organization level directs too attention to the mechanisms through which this 'organizational knowledge' is created while offers little understanding on how managers can influence these processes.

Organizational knowledge pertains to the set of known accumulated within the firm's experience, through the organizational learning process (Levinthal and March, 1993; Zollo and Winter, 2002). From organizational learning it can be argued that the process that leads to knowledge acquisition encompasses search routines and learning from experience, ending with the integration and formalization of the knowledge acquired.

Organizational and strategic management theories distinguish two processes of organizational knowledge creation and adaptation: the exploitation of existing knowledge and competences through refinement, incremental improvement and adjustment, and, specularly, the exploration of new knowledge through experimentation, discovery, variation (March, 1991).

Exploitation, however, improves existing competences, which can be beneficial in the short term but, conversely, can result insufficient for survival (Levinthal, 1991). Exploration, on the other side, becomes relevant in the long-range strategy of a firm, expressing an important mode for adaptation to environmental dynamism which is common in the current technological and commercial economies.

1.2 Why do we study exploration and exploitation in the venture capital industry?

The nature of exploration is usually associated to concepts such as search, variation, flexibility, experimentation, innovation, and risk-taking (March, 1991; Lewin et al., 1999). To grasp the essence of exploration several contributions from the literature on organizational learning refer to exploration as "the pursuit of new knowledge and boundary-spanning search for discovery of new approaches to technologies, businesses, processes or products (Sidhu et al., 2004, p.916; Levinthal and March, 1993; McGrath, 2001).

Closely rooted into the concept of exploration is the idea of greater or lesser scope of external knowledge acquisition. Evidently, greater or lesser search efforts increase or reduce the knowledge stocks from the external environment which are included within the boundaries of the organization.

The centrality of knowledge acquisition to exploration is evident in various theoretical perspectives. Scholars frame exploration as "accessing to external knowledge through inter-firm alliances" (De Clercq and Dimov, 2008); as a "diversification of knowledge assets"(Matusik and Fitza, 2012); as a "knowledge generation", including all the activities which increase an organization's stock of knowledge (Lorenzoni and Baden-Fuller, 1995).

Notwithstanding the strong interest in the role of knowledge which has placed exploration firmly at the centre of researchers' agenda, because the extent to which an organization engages

in exploration - or its opposite orientation, exploitation - is thought to influence learning, knowledge generation, innovation and performance (Sidhu et al., 2004), several studies focused, for instance, on the manufacturing industry context and hi-tech industries, but no understanding on the exploration vs exploitation orientation has been provided in a specific industry context: the Venture Capital one (hereafter, VC).

Paradoxically, as significant is the interest on exploration among researchers and as clear is the central role that knowledge plays in VC investing, the understanding of the link between the two and the pursuit of exploration remains undiscovered in this specific context.

Nevertheless, is well known that VCs primarily rely on knowledge resources. In fact, VCs apply knowledge resources in their investment activity and the decision-making behind their investment choices (e.g., Dimov and Shepherd, 2005; Sapienza, 1992). They provide knowledge to the portfolio companies they invest in, and get back knowledge from their investment experience, each investment contributes to broaden.

VCs use content knowledge (technical, financial, managerial, governance knowledge) to select and to manage the portfolio companies they are engaged with. VCs even link this knowledge stock to other actors of the industry interacting with them as partners in syndications or, basically, as advice-providers, in so doing, they broaden and integrate their knowledge (e.g., Matusik and Fitza, 2012).

The relevance of knowledge as a central aspect in VC investing has led scholars to devote research on a knowledge perspective of VCs activity.

Among the most recent works, De Clercq and Dimov (2008) examined the performance effects of internal versus external knowledge access in VC. They focused their investigation on two knowledge-driven strategies: (i) developing knowledge internally through learning; (ii) accessing knowledge externally through alliances. They chose the VC context as a setting in which both knowledge strategies are commonly detected and instrumental for firm performance. Later, Dimov and de Holan (2010) examined VC firms' investment decisions, concerning the investment market to enter, as related to the breadth and depth of knowledge and experience. Focusing on VCs search for new opportunities and the successful performance related more to close or distant market invested in, the researchers investigated on the relationship between the scope of knowledge and experience and the recognition and pursuit of opportunities, by referring to the depth of knowledge and experience (as a sort of narrow scope or, in other words, exploitation) or, alternatively, to the breadth of knowledge and experience (as a sort of wide scope or, in other terms, exploration).

Finally, Matusik and Fitza (2012) devoted a study on the interplay between diversification versus specialization towards knowledge stocks in the VC context, especially focusing on VCs investing under uncertainty conditions (the most common environmental conditions they invest in). The authors analyzed how and to what extent more diverse versus more specialized knowledge stocks impact on performance, demonstrating the existence of a trade-off among the two orientations and a positive effect on performance when each of those is particularly high.

Moving from the above premises, in light of the existing open debate and to fill the gap argued at the beginning of this section, we decided to contribute to the discussion on the knowledge stocks acquisition in VC investing, by adopting a different perspective from specialization versus diversification of knowledge (Matusik and Fitza, 2012), or internal versus external knowledge flows (De Clercq and Dimov, 2008), or breadth versus depth of knowledge

and experience (Dimov and de Holan, 2010). Taking inspiration from previous works, our inquiries were: "Why do we not investigate on exploration and exploitation in VC?", and "Would it be more appropriate to talk about exploration rather than diversification, and exploitation rather than specialization?", and, moreover, "Will VCs be more explorative or exploitative?, and, finally, "How and to what extent will the greater or lower orientation among the two impact on VC decision-making and performance?".

1.3 Research aim

The research aim to accomplish for this dissertation is the following:

> The aim of this dissertation research is to link exploration and exploitation rationale to the Venture Capital industry, understanding the measurement dimensions and the effects on both decision-making and performance of VCs

To develop the research, we constructed a theoretical framework adopting the knowledge-based and social capital theories, and perspectives from the evolutionary economics and organizational learning literatures.

We base the investigation of exploration and exploitation rationale in the VC industry context assuming that the explorative vs exploitative orientation are explained by knowledge stocks acquisitions (e.g., De Clercq and Dimov, 2008; Mom et al., 2007). VC firms primarily rely on applying knowledge resources in the selection, evaluation and management of their investment opportunities (e.g., Matusik and Fitza, 2012; Dimov and Shepherd, 2005; Sapienza, 1992). Consequently, the identification of an exploration vs exploitation orientation in the VC context even though not fully knowable, is at least identifiable.

Dimensions to adopt a measurement approach for this phenomenon in the VC context are up to now undiscovered. Notwithstanding the lack of understanding on the possible factors adoptable to measure these rationale in the context under analysis, we base our investigation on the view that the approach proposed in organizational learning literature, by adopting an evolutionary economics perspective, and tested in a different research area (Sidhu et al., 2004; 2007), can be adapted for the VC context.

A greater or lower exploration vs exploitation orientation - as conceptualized before – is hypothesized to impact on the decision-making process adopted by VCs. VCs' decision processes are affected by information, and more specialized information leads to less accurate, less effective and less comprehensive decisions, which, consequently, result in lower decision-making performance; while, conversely, less specialized information is less detrimental to an effective, systematic and comprehensive decision-making activity, resulting in better decision processes (e.g., Zacharakis and Shepherd, 2001; Zacharakis and Meyer, 2000). More exploitation or more exploration orientation – as more specialized knowledge-information – is expected to affect decision-making in the VC industry. In this relationship a moderating effect is

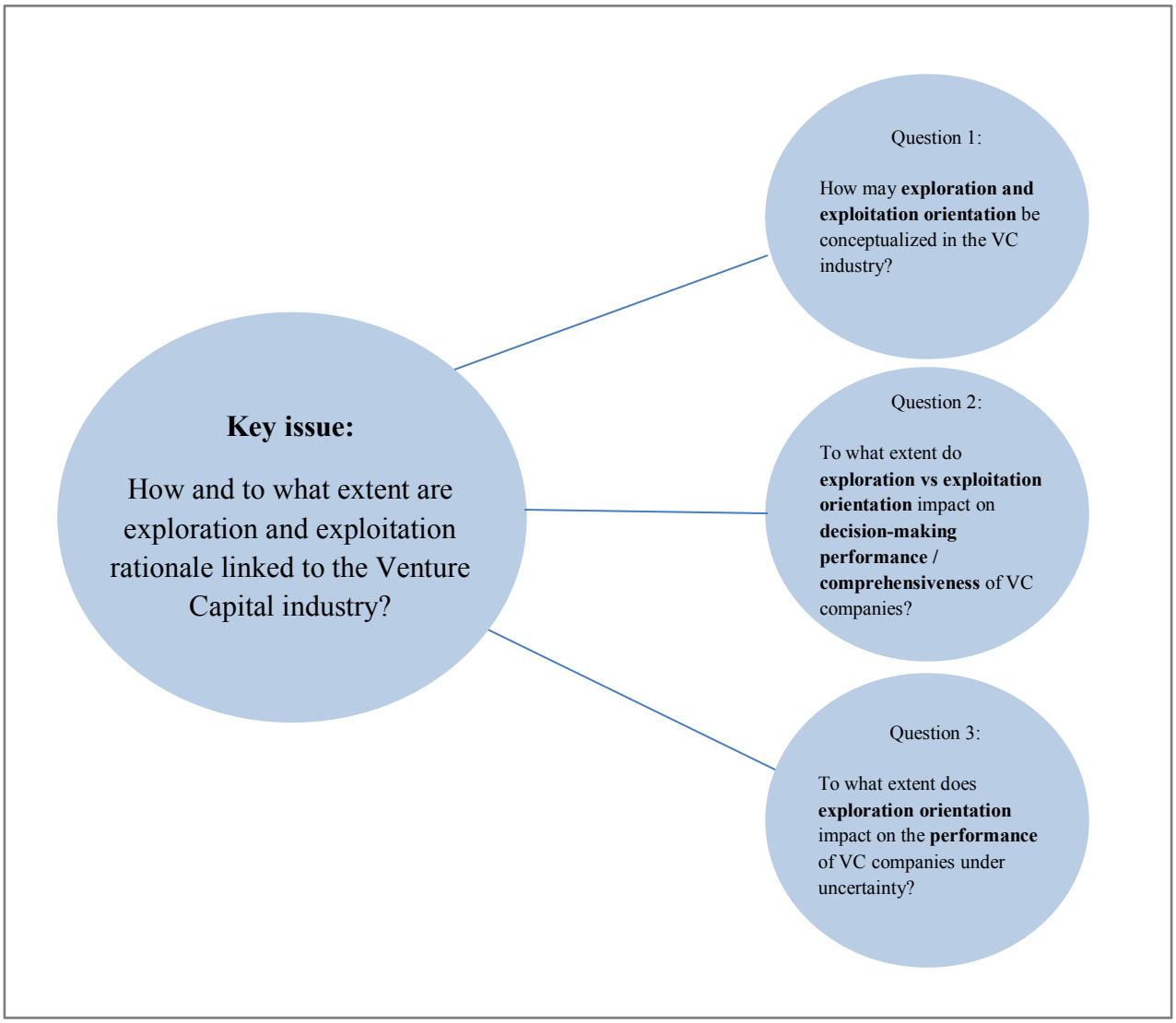
hypothesized to be induced by the experience of VC decision-makers in the industry (e.g., Shepherd et al., 2003).

Additionally, a greater exploration orientation (vs a lower exploitation orientation) - with regards to knowledge stocks acquisition, as established in the first stage of the research - in the context investigated is expected to have specific beneficial effects on the performance of VCs. VCs act under uncertainty, in a high-velocity and, consequently, high-risk environment (e.g., Matusik and Fitza, 2012; McMullen and Shepherd, 2006). Uncertainty plays a moderating role on how and to what extent these rationales impact on performance (e.g., Matusik and Fitza, 2012).

The theoretical framework that addresses the aim of this dissertation gives an answer to three main critical questions, each related to the issues mentioned above and followed by a number of sub-questions.

In the following figure (Figure 1-1) it is shown the breaking down of the research aim into the three main critical questions.

Figure 1-1 Key Issue in the Dissertation Research and Three Critical Questions



1.4 The context of venture capital investing

This dissertation focuses on independent VC firms and captive investors with commercial objectives, hence ignoring other players of the funding capital industry, for example, public or university-related VCs.

VC is a form of financing for an entrepreneurial venture where the VC company acts as a financial intermediary.

Research has indicated that an important aspect of the VC-entrepreneur relationship relates to the former's monitoring of the latter's actions in order to reduce agency risks by evaluating the entrepreneur's behavior and performance through information transfer (Gorman and Sahlman, 1989; Barry et al., 1990; Sahlman, 1990; Sapienza and Korsgaard, 1996; Bergemann and Hege, 1998).

In fact, VCs play a double role: they monitor the performance of the investee periodically and interfere with the decision-making process, affecting the strategies the firm adopts for commercial ends. In other words, VCs invest, manage and return institutional investors' money by funding the entrepreneurial ventures (portfolio companies), contributing to their growth and expansion and, finally, as concern the most successful investments, exiting from the investment by selling the company to a public or corporate investor (De Clercq and Dimov, 2008).

VCs select the investments to build up their portfolio in the vein to reduce company-specific risks and increase the returns from the investments.

Importantly, VC investments often involve multi-stage decisions as investors typically provide funds to entrepreneurial investors over several investment rounds (Wright and Robbie, 1998).

The successful performance of the investment activity of VC companies depends on how much they learn from prior investments – syndicated or independent - in terms of good exits and failures (Gupta and Sapienza, 1992; Wright and Lockett, 2003; De Clercq and Dimov, 2008).

✓ *VC decision-making activity*

In order to find suitable success ventures and develop them from being a promising business idea into a profitable investment, VCs shape the decision-making process that contributes to this objective. The fulfillment of this objective is dependent on the VC's ability to manage and facilitate the decision-making process. This is further supported by Butler et al., (1993) who mean that capital investment decisions must be ranked as one of the most important forms of decisions made in our economic society. To the individual enterprise, whether public or private, the success of these decisions will affect its survival and future prosperity.

In order to provide capital and enabling the future success of the entrepreneurial ventures invested in, VC firms use their decision-making process to gather the information needed in order to make a decision whether to reject or accept the venture proposal. However, the decision to invest presents a serious adverse selection risk. In light of this, the main purpose of the VC investment decision-making process is to reduce such risk (Fried & Hisrich, 1994).

In detail, adverse selection is detectable when one of the actors in the investing relationship is better suited to determine the quality of the product or service than the other (Pindyck &

Rubenfeld, 1995). In the case of the VC, this results in a difficulty for the VC to make a good prediction of the intentions of the entrepreneur. Thus, the purpose of the decision-making process is to provide a tool revealing what really concerns the venture under evaluation in order to be able to make a solid investment decision.

Given that VCs are highly selective in their funding decisions, interest has been paid by scholars to deepen the understanding of VC decision-making (e.g. Hoban, 1976; Tyebjee and Bruno, 1984; MacMillan et al., 1985, 1987; Khan, 1987; Hall and Hofer, 1993; Fried and Hisrich, 1994***;*** Muzyka et al., 1996; Shepherd, 1999; Zacharakis and Meyer, 2000; Zacharakis and Shepherd, 2001, 2005; Franke et al., 2006, 2008; Dimov et al., 2007; Petty and Gruber, 2011).

Previous studies offer insights on the evaluation criteria adopted in the screening process by VCs. A review of this literature suggests that the more employed selection criteria are (i) the firm's management team; (ii) the nature of the industry; (iii) the product or services embedded in the "value proposition"; (iiii) the financial potential (e.g., Tyebjee and Bruno, 1984; MacMillan et al., 1985; Muzyka et al., 1996; Franke et al., 2008).

The majority of these studies underestimated the cognitive differences in how VCs make decisions, although is well known how cognitive differences are potentially impactful on the exploitation of an opportunity and the investment performance (Venkatraman, 1997; Zacharakis and Shepherd, 2001).

The most common and pervasive cognitive bias is "overconfidence" (Griffin and Vary, 1996; Zacharakis and Shepherd, 2001), which can be detrimental to decision quality and accuracy by making the decision-making process much more intuitive rather than systematic, thus resulting in lower decision-making performance.

Decision-making processes employed by VCs vary in experience. Some studies provide evidence that experienced decision-makers in a given task may adopt superior decision processes compared to those with less experience (Anderson, 1983; Dreyfus and Dreyfus, 1986; Nosofsky, 1984, 1986, 1987). Conversely, other studies in the area of judgment/decision-making suggest that increasing experience does not always lead to better decisions (e.g., Camerer and Johnson, 1991). In light of the latter arguments, the relationship between growing experience and decision processes is expected to be curvilinear in nature (Shepherd et al., 2003).

- ✓ *VC performance*

The ultimate goal of venture capital investors is to exit their portfolio companies as profitably as possible. The main successful exit strategies considered in the literature are IPOs and divestitures by acquisitions, while the worst exits include distress trade sales, company buy-backs by the entrepreneur, liquidations, and bankruptcies (Manigart and Wright, 2013). The highest quality portfolio firms are usually associated with full exits, through IPO or acquisitions as well, while partial exits are associated with higher risk and return. Notwithstanding this statement, research on VC exits showed that several VC exits are partial exits, implying that VC firms show low propensity towards selling all the shares at once. This is consistent with information asymmetries between acquirers and sellers driving a partial exit (Cumming and MacIntosh, 2003).

In sum, the ultimate goal of VC investors is to reach high performance outcomes from their investments, by successfully exiting the portfolio companies. What contributes to the achievement of superior performance outcomes interests researchers in VC, in particular, when uncertainty - as a common condition under VCs funding and monitoring activity - threats VC performance due to the detrimental effects associated with higher investment risks (e.g., Matusik and Fitza, 2012).

Being able to study the market of venture capital firms has been a stimulating experience, since the venture capital firms constitute the foundation of the future success for startup companies and early-stage ones. Moreover, the rapid growth of the industry during the latest years has really put the industry in focus, resulting in the need to further investigate this segment of the economy.

Two tables summarize prior research on VC decision-making and performance.

Table 1-1 Prior research on VC decision-making

Study	Research Focus	Sample
Hoban (1976)	Predictors of venture success	3 US-based VC firms
Tybejee and Bruno (1984°)	Evaluation process and VC investment criteria	46+41 US-based VC firms
MacMillan et al. (1987)	Screening criteria and successful vs unsuccessful performance	67 US-based VC firms
Kahn (1987)	Investment characteristics and related successful outcome	36 US-based VC firms
Hisrich and Jankowicz (1990)	VC intuition and decision making	5 VCs (context unknown)
Hall and Hofer (1993)	Investments decision criteria	4 US-based VC firms
Fried and Hisrich (1994)	A model of VC investment decision-making process	18 US-based VC firms
Muzyka et al. (1996)	Factors adopted in the investment evaluation	73 Europe-based VC firms
Shepherd (1999)	VC evaluation of new venture survival	66 Australia-based VCs
Zacharakis and Meyer (2000)	Decision aids in VC decision making	53 US-based VC firms
Zacharakis and Shepherd (2001)	VC overconfidence in investment decisions	53 US-based VC firms
Shepherd et al. (2003)	VC experience and the influence on decision-making	66 Australia-based VCs

Franke et al. (2008)	VC evaluation of new venture proposals	51 Europe-based VCs
Dimov et al. (2007)	VC characteristics and investment selection	108 US-based and 51 Europe-based VCs
Petty and Gruber (2011)	Decision-making criteria and investment evaluation process	1 Europe-based VC firm

Table 1-2 Prior research on VC exits/performance

Study	Research Focus	Sample
Black and Gilson (1998)	Active stock markets and VC industry	US VCs vs German VCs
Bascha and Walz (2001)	IPO versus trade sale	-
Cumming and MacIntosh (2001)	Duration and investment type	112 US and 134 Canadian exited portfolio companies
Wang and Sim (2001)	Drivers of an IPO as exit strategy	21 Singaporean VC firms
Manigart et al. (2002)	Selection and moral hazard	576 Belgian VCs
Chang (2003)	IPO of internet startups	1.106 US startups
Dimov and Shepherd (2005)	Home-run and strike-outs	117 US VC firms
Cumming et al.. (2006)	Legality and VC exit	468 VC-backed firms from Asia
Sorenson (2007)	Two-sided selection versus influence	1666 US-based VCs
Bottazzi et al. (2008)	Active investors	119 European VC firms
Nahata (2008)	VC reputation and performance	12.224 US VC-backed companies
Gompers et al. (2009)	VC specialization and success	11.297 US-based VCs
Dai et al. (2012)	VC cross border investments and exit performance	2860 Asian VC-backed companies
Liu and Ritter (2011)	IPO underpricing	4510 US IPOs 1993-2008
Smith et al (2011)	VC fund financial performance	6.206 US VC funds
Cressy et al (2012)	VC diversification and funds performance	649 UK VC funds; 4751 VC-backed c.

Matusik and Fitza (2012)	Diversification vs specialization and performance	7.479 VC investments 1960-2000
Wang and Wang (2012)	Cross border VC performance	6536 VC- backed firms in 35 countries 1995-2005
Clarysse et al (2013)	Contribution of VC to the firm trade sale	133 acquired vs not-acquired UK VC-backed firms

1.5 Theoretical perspectives

The knowledge-based perspective

According to the knowledge based-view, a company has to be considered a sort of basket of knowledge stocks fundamental for the value creation and, consequently, the company success (Nelson and Winter, 1982; Spender, 1996).

Organizational knowledge pertains to the set of know-how accumulated within the firm's experience, through the organizational learning process (Levinthal and March, 1993; Zollo and Winter, 2002). From the organizational learning side it can be argued that the process that leads to knowledge acquisition encompasses search routines and learning from experience, ending with the integration and formalization of the knowledge acquired.

When a new opportunity appears, firms use the knowledge acquired to understand and evaluate the novelty, then absorptive capacity - as the ability to identify the value of new, external information, absorb it, and translate it into capabilities useful for business ends – represents an essential learning capability grounded in the firm's prior knowledge (Cohen and Levinthal, 1990). This capability develops continuously through the interplay between the current activities faceted by a firm and the prior knowledge (Van den Bosch et al., 1999).

A firm acquires knowledge by searching at a local level or incurring into boundary-spanning search. Local search is limited to resources within the boundaries of the firm current stock of knowledge (Stuart and Podolny, 1996). In contrast, boundary-spanning exploration is based on obtainment of knowledge by searching beyond the current expertise or organizational domains (Rosenkopf and Nerkar, 2001).

Knowledge acquisition – in terms of greater or lesser non-local search scope - is closely rooted into the concept of exploration. Evidently, greater or lesser search efforts increase or reduce the knowledge stocks from the external environment which are included within the boundaries of the organization.

The centrality of knowledge acquisition to exploration is evident in various theoretical perspectives. Scholars frame exploration as "accessing to external knowledge through inter-firm alliances" (De Clercq and Dimov, 2008); as a "diversification of knowledge assets"(Matusik and Fitza, 2012); as a "knowledge generation", including all the activities which increase an organization's stock of knowledge (Lorenzoni and Baden-Fuller, 1995).

- ✓ *Knowledge search*

More in detail, as concern the concept of "knowledge search", the central idea of the co-evolution framework leads scholars to follow an accurate approach anchored to the concept of "search". According to these studies, exploration vs exploitation are operationalized in terms of non-local versus local information- or knowledge-search behavior to discover new approaches towards technologies, products, and businesses; pursue new knowledge; experiment with new alternatives and business paths (e.g., Katila and Ahuja 2002, Rosenkopf and Nerkar 2001).
Sidhu et al., (2004, 2007) identified three knowledge search dimensions for exploratory search: supply-side, demand-side, spatial-side. Whether search is supply-side, demand-side, or spatially oriented, exploitative or local search implies that search efforts are almost restricted around the domain of current knowledge and competencies. In contrast, search may be non-local, extending into never explored domains or less-near areas.
Our conceptualization of exploration orientation – and the specular exploitation orientation – moves from the above premises.

The social capital theory

Central proposition of the social capital literature is that exploration can be facilitated by structures of relationships between individuals (Bourdieu, 1986; Burt, 1992, 2005; Nahapiet and Goshal, 1998; Portes, 1998; Adler and Kwon, 2002). The social capital mechanisms are active on multiple levels: individual, group, inter-unit, inter-organizational. Nahapiet and Goshal (1998) define social capital as "*the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit"* (p.243). Nahapiet and Goshal (1998) argued that because of social capital, organizations possess a unique advantage with regards to coordination of the creation of new knowledge. Specific characteristics of the network relations among individuals and groups can facilitate resources exchange and combination and thus account for new knowledge creation. Consistent with the literature on social capital is the distinction between internal social capital, or "bonding", and external social capital, or "bridging" (Adler and Kwon, 2002), depending on whether the focus is on the structure of relations between actors within or outside the organization boundaries.

- ✓ *Knowledge search*

From social capital perspective, exploratory search can be conducted across network connections. Sidhu et al., (2004, 2007) identified three knowledge search dimensions for exploratory search: supply-side, demand-side, spatial-side. An emphasis on the importance of a network-related dimension to express the non-local versus local search for knowledge as a signal of exploration versus exploitation orientation is consistent with the literature on social capital.

Relationship quality appears to be a factor for the transferability of knowledge. A condition on the benefits of the partners' knowledge to the firm is the number of partners and the familiarity with these a firm may possess. As concern the former, collaboration with a broad external network implies a broader scope of knowledge to access to, and thus enhances the chance a firm has to get knowledge for business ends (Wright and Lockett, 2003). As concern the latter, familiarity with exchange partners can facilitate access to information about external actors' behavior, reducing the costs related to locating and screening of those (Robinson and Stuart, 2001, De Clercq and Dimov, 2008). Moreover, prior interactions facilitate mutual trust, social connections, joint problem solving, thereby increasing the stock and quality of knowledge transferred (Uzzi, 1997; De Clercq and Sapienza, 2006).

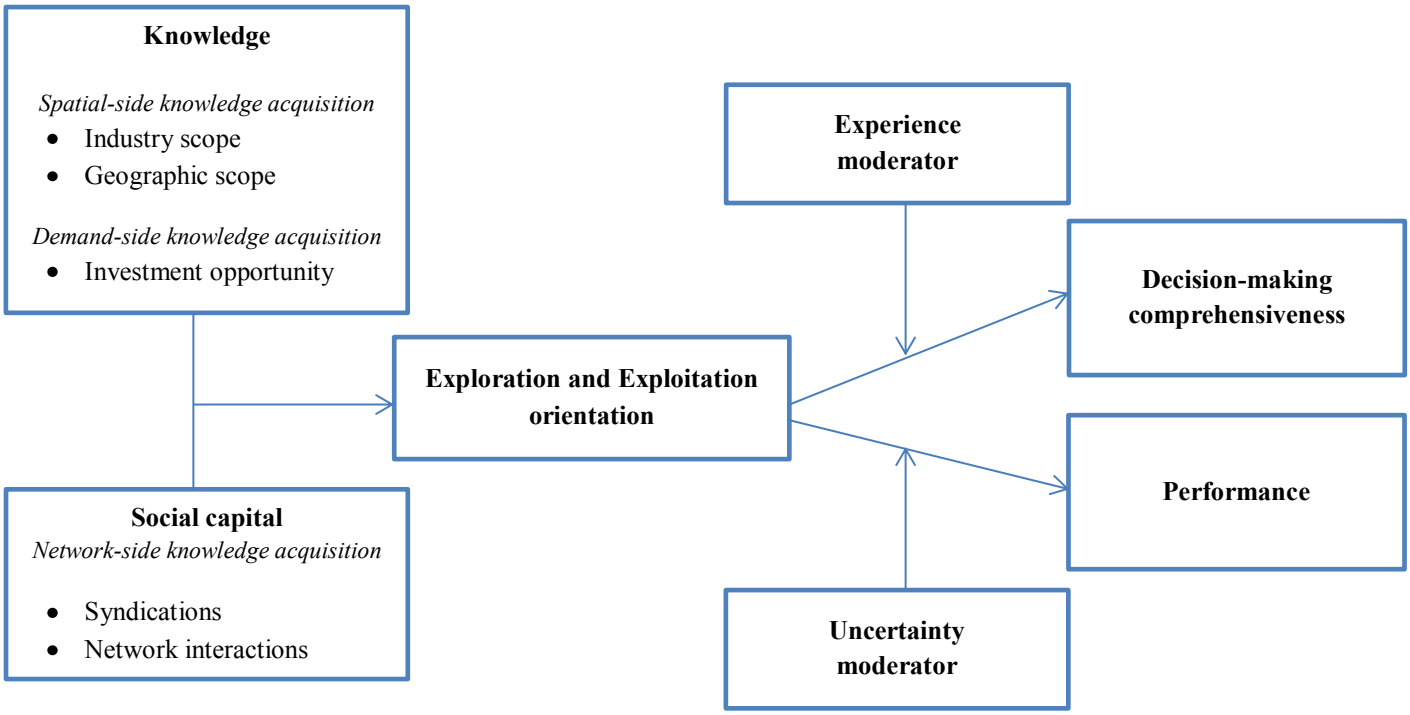
1.6 Research framework

The research framework for this dissertation draws on both theoretical perspectives above mentioned. This allowed to identify variables to provide a measurement instrument for exploration versus exploitation orientation that is at the basis of our research. The framework suggests also moderating variables.

The framework is focused on two levels of analysis: individual (VC managers) and firm level. It has to be noted that the theoretical perspectives outlined in the previous section have both been studied on multiple levels of analysis. On Figure 1-2, an encompassing framework for the studies in this dissertation is drawn.

Knowledge-related and network-related variables are adopted as dimensions of knowledge search at the basis of our conceptualization of exploration and exploitation orientation. Decision-making and performance are represented as dependent variables to measure how and to what extent a more explorative versus a more exploitative orientation - our independent variables - may impact on both critical aspects in VC activity (and research). The effects on the dependent variables are modified by organizational learning (experience) and environmental (uncertainty) moderators.

Figure 1-2 Encompassing Framework for the Studies in the Dissertation



Exploration and exploitation orientation are examined at individual level (Study 1 and 2) and firm level (Study 3). We conceptualized the specular concepts in terms of local versus non-local knowledge search and acquisition. The focus is on three knowledge search dimensions: spatial-side knowledge acquisition (SSKA), demand-side knowledge acquisition (DSKA), and network-side knowledge acquisition (NSKA). Moving from what Sidhu et al. (2004, 2007) proposed in their works in the vein to find a measurement instrument for exploration orientation, we have redrawn and adapted the above mentioned search dimensions to the VC context.

The position of **knowledge** is central in the framework. Organizational knowledge pertains to the set of known accumulated within the firm's experience, through the organizational learning process (Levinthal and March, 1993; Zollo and Winter, 2002). From organizational learning it can be argued that the process leading to knowledge acquisition encompasses search routines and learning from experience, ending with the integration and formalization of the knowledge acquired.

When a new opportunity appears, firms use the acquired knowledge to understand and evaluate the new opportunity, then absorptive capacity - as the ability to identify the value of new, external information, absorb it, and translate it into capabilities useful for business ends – represents an essential learning capability grounded in the firm's prior knowledge (Cohen and Levinthal, 1990). This capability develops continuously through the interplay between the current activities faceted by a firm and the prior knowledge (Van den Bosch et al., 1999).

A firm acquires knowledge by searching at a local level or incurring into boundary-spanning search. Local search is limited to resources within the boundaries of the firm's current stock of knowledge (Stuart and Podolny, 1996). In contrast, boundary-spanning exploration is based on obtainment of knowledge by searching beyond the current expertise or organizational domains (Rosenkopf and Nerkar, 2001), even concerning with network interactions and social connections (Nahapiet and Goshal, 1998).

Our conceptualization of exploration orientation – and the specular exploitation orientation – follows and extends previous literature on organizational learning and evolutionary economics by focusing on scope search on the three integral different dimensions outlined above.

As VCs primarily rely on knowledge resources and search for knowledge from the selection to the evaluation and management of the investment opportunities, we considered the VC context ideal to run the investigation.

Decision-making performance is typically intended in terms of accuracy, decision consensus, decision reliability, systematic processing, and related to bootstrapping models (e.g., Shepherd et al., 2003; Logan, 1990).

We adopt **decision comprehensiveness** (e.g., Miller, 2008; Forbes, 2007; Fredrickson, 1984; Fredrickson & Mitchell, 1984) as a representative construct of the decision-making performance, diametrically in contrast with the automatic processing or the intuitive processing which are detrimental to decision-making performance. Thus, we conceptualize decision quality in terms of decision comprehensiveness. This is defined as "*the extent to which an organization attempts to be exhaustive or inclusive in making and integrating strategic decisions"* (Fredrickson and Mitchell, 1984, p. 447). The inquiry about to what extent strategic decisions are comprehensive has been at the centre of studies on strategy formulation (Eisenhardt and Zbaracki, 1992), which state that the analysis and integration of a greater information stock in decision-making is beneficial to companies by increasing the strategic understanding of the context they work in. For example, decision comprehensiveness can improve firm performance in highly uncertain environments as companies need information about the trade-off between the market opportunities and threats (Forbes, 2007; Goll and Rasheed, 2005; Miller, 2008). VCs act in a highly uncertain environment and make strategic investment decisions. In light of this, we considered the VC context under investigation ideal to evaluate decision quality in terms of decision comprehensiveness.

Knowledge from non-local search provides a higher number of inputs and, consequently, a greater number of knowledge combination is available (Nelson and Winter, 1982; Fleming and Sorenson, 2001). The VC company may broaden the spectrum of competences by developing intuitions deriving from new inputs, improving decision-making and, consequently or independently, firm **performance** (Gavetti et al., 2005; Matusik and Fitza, 2012). The achievement of superior performance outcomes is the ultimate goal in VC investing. In light of this, our dissertation finally focus on the relationship between exploration orientation and VC performance.

The effects of exploration orientation and exploitation orientation on decision-making performance (decision comprehensiveness) and performance are subject to the influence of

moderators. Respectively, experience is identified as a moderating variable in the former case, while uncertainty represents the moderating variable in the latter relationship. Within the scope of this dissertation have been investigated just two moderators, which by no means should be considered exhaustive. The choice to focus on them was based on the following reasons:

Experience. As experience impacts on decision-making processes and controversial is the position towards the beneficial versus detrimental effects which more experience may have on decision accuracy, there is no doubt on the relevance of the concept on the relationship between strategic orientations showed by VCs (in this research expressed in terms of exploration and exploitation) and decision-making performance (represented by decision comprehensiveness). VCs may become more accurate in choosing the ‘‘right’’ companies as their experience increases; on the other hand, VCs may be affected by a curvilinear relationship between experience in the industry and decision quality, resulting in underestimation of valuable investment opportunities and, conversely, overestimation of investments less likely to experiment successful performance.

Moving from the work of Shepherd et al. (2003), the relationship between growing experience and decision processes is supposed to be curvilinear in nature. In other words, initially, growing experience enhances VCs' decision making capabilities. Lately, however, more experience may be detrimental to decision quality and comprehensiveness.

Uncertainty. This is an environmental moderator we adopt at a firm level of analysis, as moderating the relationship between exploration orientation and performance in VC. Considering the high-velocity and uncertain environment where VCs normally invest, uncertain conditions are commonly at the basis of most of VCs investment decisions, impacting on the performance outcomes they can achieve via the funding and monitoring activity of the portfolio companies.

1.7 Research questions

The following specific research questions are derived from the research aim and the research framework:

I. How may exploration and exploitation orientation be conceptualized in the VC industry?

a. Which are the dimensions to measure exploration vs exploitation orientation in the VC context?

b. Investigating at an individual level, are VC managers more exploration-oriented or more exploitation-oriented?

II. To what extent do exploration vs exploitation orientation impact on decision-making performance/comprehensiveness of VC companies?

a. Which will be the relationship between a more explorative-oriented VC or, conversely, a more exploitative-oriented VC and the decision-making performance/comprehensiveness achieved by the VC company?

b. How and to what extent does the VC experience moderate the relationship?

III. To what extent does exploration orientation impact on the performance of VC companies under uncertainty?

a. Which will be the relationship between a more explorative activity and the performance achieved by a VC company?

b. How and to what extent does the relationship change under higher uncertainty conditions?
   b.1 What will be the moderating effect of investment stage?

1.8 Contributions

By addressing the research questions, this dissertation research makes important contributions to theory on exploration and exploitation, on the one side, and on venture capital, on the other side.

- ✓ *Knowledge-based view: a conceptualization of exploration and exploitation orientation towards knowledge acquisition by a local versus non-local search*

  The literature on exploratory learning and exploitative learning (March, 1991) focuses primarily on whether existing knowledge (exploitation) or new knowledge (exploration) is enhanced as a direct result of organizational learning.
  Approaching exploration from the evolutionary economics perspective and drawing on previous works (Sidhu et al.,2004, Sidhu et al., 2007), the studies in this dissertation research develop propositions on exploration and exploitation conceptualization with regards to the firm acquisition of knowledge by searching at a local level or incurring into boundary-spanning search. Knowledge is central to VCs investment activity. In fact, VCs apply knowledge resources in their investment activity and the decision-making behind their investment choices. In light of this, we applied our framework built by adopting the knowledge-based perspective to the VC context.

- ✓ *Social capital theory: the network-side knowledge acquisition as an additional dimension of exploration versus exploitation orientation*

  The beneficial role played by relationships between individuals, firms and organizations to facilitate exploration, through new knowledge resources, represents the central proposition of social capital theory (Nahapiet and Ghoshal, 1998; Adler and Kwon,

2002). Relations among partners and organizations can be beneficial for the exchange and combination of knowledge resources and thus account for new knowledge stocks. Our emphasis on the importance of a network-related dimension to express the local versus non-local search for knowledge as a signal of exploration versus exploitation orientation is consistent with the literature on social capital.

- ✓ *Exploration and exploitation orientation and decision comprehensiveness in VC*

  It is well known from literature that a linear relationship exists between confidence and the amount of specific knowledge, that is the greater the latter, the greater the former (e.g., Zacharakis and Shepherd, 2001; Elstein and Bordage, 1988). Thus, more specific knowledge increases confidence and decreases decision accuracy. The study in this dissertation develops a research framework on the basis of the mentioned relationship: more specific knowledge may be detrimental to decision-making performance by determining a higher propensity towards intuitive decision processes. Moving from the knowledge-based conceptualization of exploration and exploitation, we linked this perspective to the judgment/decision making literature to test the effect of exploration and exploitation orientation on the decision-making adopted by VCs, by expressing the decision rationality (in other words, decision quality) in terms of decision comprehensiveness.

- ✓ *The moderating role of experience in VC decision-making: more experienced VCs do not always decide better, but no significant moderating effect experience plays in the relationship between exploration and exploitation orientation and decision comprehensiveness*

  Decision-making processes employed by VCs vary in experience. "*Does more experience at the venture capital task result in better decisions?*". Scholars addressed this question due to the controversial findings gained from previous studies. In fact, some studies provide evidence that experienced VC decision-makers in a given task may implement superior decision processes compared to those with less experience. Conversely, other studies in the area of judgment/decision-making suggest that increasing experience does not always lead to better decisions. Moving from the work of Shepherd et al. (2003), such conditions have been considered the premises to consider highly experienced VC decision-makers more intuitive rather than conscious while performing the decision process. The relationship between growing experience and decision processes may be curvilinear in nature. Initially, growing experience enhances VCs' decision making capabilities. Lately, however, more experience may be detrimental to decision quality and comprehensiveness. Moving from these premises, hypotheses have been developed and tested on the moderating role of experience on the relationship between exploration vs exploitation orientation and decision accuracy (comprehensiveness).

- ✓ *Exploration orientation and performance in VC under uncertainty*

  Extant studies are interested in the role of knowledge in creating and sustaining competitive advantage, and creating economic value. According to the knowledge-based perspective, a firm is a repository of knowledge stocks, which are fundamental to the firm performance (Nelson and Winter, 1982; Spender, 1996). This has placed exploration at the center of researchers' agenda, because the extent to which an organization engages in exploration - or its opposite orientation, exploitation - is thought to influence also knowledge generation and performance (Sidhu et al., 2004). As VCs main activity is selecting the investments to build up their portfolio in the vein to reduce company-specific risks and increase the returns from the investments, performance is what they look for when investing. At the same time, when facing new opportunities, VCs adopt their knowledge to understand and evaluate them. Since knowledge is central to their activity, a study on the link between knowledge acquired and performance achieved is relevant in the VC context. Moving from the conceptualization of exploration orientation commonly adopted in the entire research dissertation - anchored to knowledge resources - we investigate on the relationship between such orientation and performance under the typical uncertain conditions VCs experiment when investing, especially as concern the staging of the investment they include in their portfolio composition.

- ✓ *Empirical tests in multiple VC industries*

  The study contributes with the strength of empirical evidence gathered in three distinct country contexts: (i) the dynamic and emerging VC industry of the Canadian country-context; (ii) the advanced and often investigated VC industry of the U.S. country-context; (iii) the interesting and criticized by investors VC industry of the European country-context. The studies in this dissertation offer a complementary perspective, the results of which are easily generalizable to other contexts of VC investing.

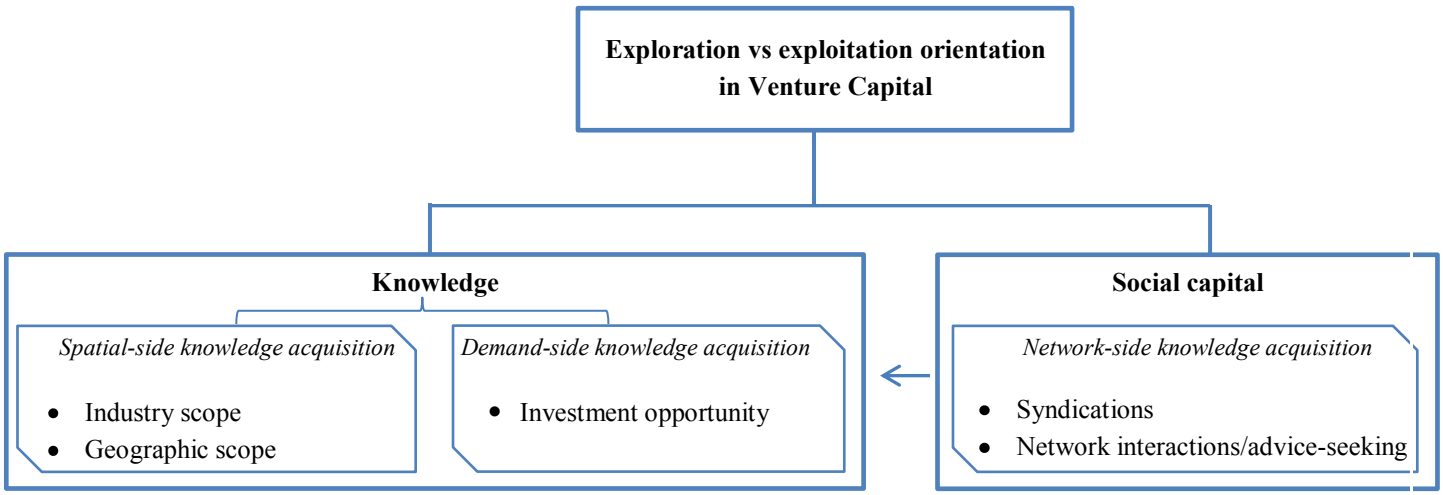
1.9 Overview of the studies

Three studies constitute the body of the empirical research in this dissertation. Each study is focused on specific structure of relationships from the research framework with a twofold aim. First, frame exploration and exploitation orientation in a novel context of investigation - the VC industry - and find evidence for the impact of a more explorative orientation (vs a more exploitative orientation) on decision-making and performance in VC companies. Second, make specific contributions to streams of strategic management and entrepreneurship literature, on the one side, and practice, on the other side. For this reason, the studies are presented as separate essays and the contributions are delineated in each of those.

In the first study we conceptualize exploration and exploitation orientation in the VC context, framing exploration and exploitation in terms of greater versus narrower search for knowledge resources in non-local domains. The study shows that explorative and exploitative orientations

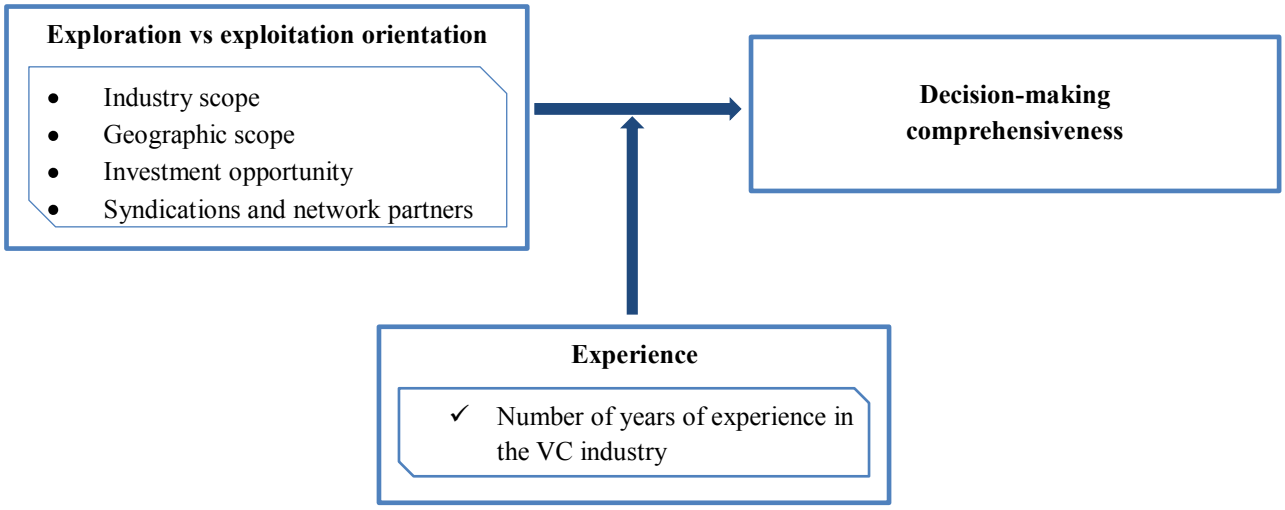
are detectable in the context of VC investing and a measurement instrument is proposed to operationalize the two according to the side from which knowledge is acquired: spatial-side, demand-side, network-side. Figure 1-3 provides a scheme of the conceptual model employed in this study.

Figure 1-3 Conceptual Framework – Study 1



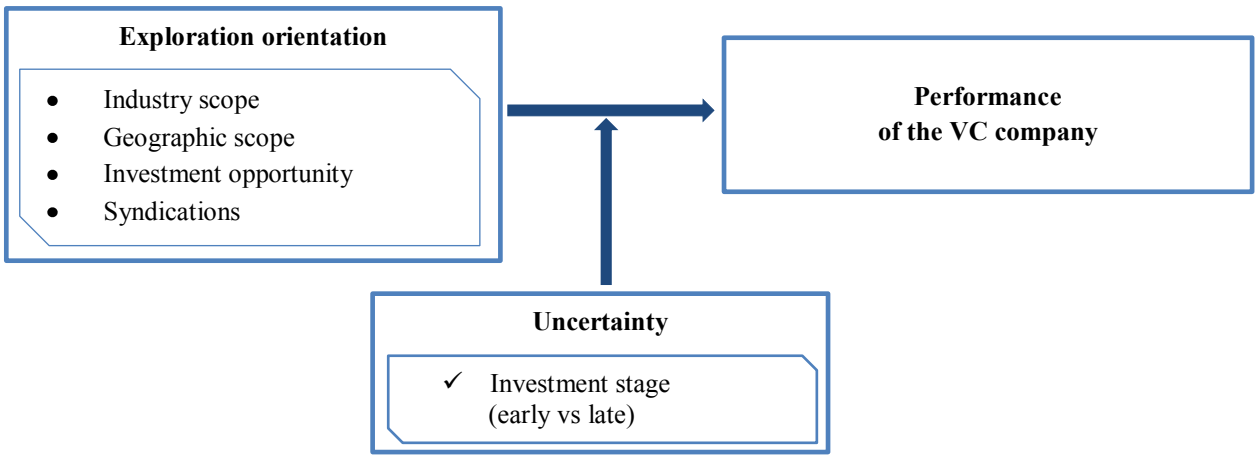
The second study applies the measurement instrument proposed in the first study to test to what extent exploration and exploitation orientation impact on decision-making performance. The search for knowledge resources remains central to our conceptualization of the specular orientations. Decision-making performance, in terms of decision quality, is expressed by decision comprehensiveness, as a representative construct of the decision-making performance, in contrast with the intuitive and automatic decision-making which is detrimental to decision quality and performance. Since decision-making processes employed by VCs vary in experience, we investigated the moderating role of experience in the relationship at the basis of our investigation. Figure 1-4 shows how the concepts for this study relate.

Figure 1-4 Conceptual Framework – Study 2



The third study explores the impact of exploration orientation on VC performance under high levels of uncertainty. Yet, exploration orientation pertains to the greater propensity showed towards a non-local search for knowledge resources with reference to three distinct knowledge domains - spatial-side (industry and geographic scope), demand-side (investment opportunity), and network-side (syndications and network interactions) – as conceptualized in the first-stage of the research. The moderating role played by uncertainty conditions – expressed in terms of the investment stage where VCs are involved and claimed to put their monitoring and funding efforts – is investigated. Figure 1-5 shows a conceptual map of the constructs and the relation hypothesized between them.

Figure 1-5 Conceptual Framework – Study 3



To run the empirical investigation, we adopted a quantitative approach. For the first two studies, we used surveys among 80 VC managers from VC firm members of the CVCA (Canadian Private Equity and Venture Capital Association). We derived VC contacts through Thomson One Banker database, which collects the list of VC members belonging to each VC national association at a global level. The surveys consisted of questionnaires addressed to a VC manager per firm, randomly drawn from the board members list available for each VC firm reported in the database. The surveys were conducted over a period of one month and a half during 2013.

The surveys used multi-item measurement scales we developed by adapting and, additionally, validating the measurement scales proposed by previous scholars for the specific purposes of this research (to measure exploration versus exploitation, Sidhu et al., 2004, 2007; to measure decision comprehensiveness, Miller et al., 1998; Alexiev, 2010). Respondents (50 on 80, with a final sample of 43 respondents after the purification procedure) were compared to non-respondents to establish representativeness and exclude non-response bias. Statistical procedures (factor analysis, in the first study, and regression analysis, in the second one) were used to test for hypotheses.

For the third study, we collected quantitative data on VC investments from Thomson One Banker database. Our final sample consisted of 335 US- and Europe-based VC firms, with 1,109 observations. An econometric model has been developed to run the analysis and test for hypotheses. However, at the current stage data are organized at a VC fund level. Since we intend to run the analysis at a VC firm level of analysis, we have to adapt data to obtain the final dataset to properly run the analysis. That is why as concern the third study results are not available yet and will be presented later.

Table 1-3 Overview of the Empirical Studies

	Study 1 ***Investigating exploration and exploitation orientation in the venture capital industry***	*Study 2* ***Exploration vs exploitation orientation and decision-making activity in the venture capital context***	*Study 3* ***Linking exploration orientation to performance in venture capital companies***
Aim of the study	To investigate on the exploration vs exploitation orientation in the VC context, developing a multi-dimensional measurement approach	To investigate the effects of a more explorative versus a more exploitative orientation on VCs decision-making performance (expressed as decision comprehensiveness)	To investigate the effects of a more explorative orientation on VC performance , especially under high levels of uncertainty
Phenomenon	Exploration and exploitation orientation in VC	Effects of E&E orientation on decision-making performance / comprehensiveness	Effects of E&E orientation on VC performance

Theoretical perspective	Knowledge-based view (Grant, 1996; Kogut and Zander, 1992); "Social capital theory" (Coleman, 1988; Nahapiet and Ghoshal, 1998).	Organizational learning (e.g., March, 1991; Levinthal and March, 1993; Zahra et al, 1999; Zollo and Winter, 2002); Knowledge-based view (Grant, 1996; Kogut and Zander, 1992);	Organizational learning (e.g., March, 1991; Levinthal and March, 1993; Zahra et al, 1999; Zollo and Winter, 2002); Knowledge-based view (Grant, 1996; Kogut and Zander, 1992);
Research questions	**I.** How may exploration and exploitation orientation be conceptualized in the VC industry? **a.** Which are the dimensions to measure exploration vs exploitation orientation in the VC context? **b.** Investigating at an individual level, are VC managers more exploration-oriented or more exploitation-oriented?	**III.** To what extent do exploration vs exploitation orientation impact on the decision-making performance/comprehensiveness of VC companies? **a.** Which will be the relationship between a more explorative-oriented VC or, conversely, a more exploitative-oriented VC and the decision-making performance/comprehensiveness achieved by the VC company? **b.** How and to what extent does the VC experience moderate the relationship?	**II.** To what extent does exploration orientation impact on the performance of VC companies? **a.** Which will be the relationship between a more explorative activity and the performance achieved by a VC company? **b.** How and to what extent does the relationship change under higher uncertainty conditions? **b.1** Which will be the moderating effect of investment stage?
Hypotheses / Propositions	**HP1:** *VCs are relatively more likely to explore than to exploit in terms of spatial side, demand side and network side knowledge acquisition.* **HP2**: *VCs are more likely to explore than to exploit as concern all the knowledge acquisition dimensions (SSKA, DSKA, NSKA), except for the geographical side knowledge acquisition.*	**HP1**: *The greater the exploitation orientation, with regards to each knowledge search dimension, the lower the decision comprehensiveness* **HP2**: *The greater the exploration orientation, with regards to each knowledge search dimension, the decision comprehensiveness.* **HP3a**: *The curvilinear relationship (inverted U-shaped) between exploitation orientation, with regards to all the dimensions, and the decision comprehensiveness will be moderated by the experience of the VC; more experience in the VC industry will make the relationship more pronounced.* **HP3b**: *The linear relationship (U-shaped) between exploration orientation, with regards to all*	**HP1a**: *There will be a U-shaped relationship between exploration, with regards to the industry VCs invest in, and performance* **HP1b**: *There will be a U-shaped relationship between exploration, with regards to the geographic area VCs invest in, and performance* **HP1c**: *There will be a U-shaped relationship between exploration, with regards to the investment opportunity VCs include in their portfolio, and performance* **HP1d**: *There will be a U-shaped relationship between exploration, with regards to the co-investing partners (syndications), and performance* **HP2**: *The U-shaped*

		the dimensions, and the decision comprehensiveness will be negatively moderated by the experience of the VC; more experience in the VC industry will make the relationship less pronounced.	*relationship will be moderated by the investment stage; early stage investments will make the relationship more pronounced than in the cases of late stage investments.*
Research method	Quantitative approach: Multivariate analysis. Survey among CVCA members and Factor Analysis on data collected	Quantitative approach: Multivariate analysis Survey among CVCA members and Linear Regression Analysis on data collected	Quantitative approach: Econometric analysis
Sample	43 Canadian VC members of CVCA listed in Thomson One Banker Database	43 Canadian VC members of CVCA listed in Thomson One Banker Database	335 US- and Europe-based VC firms (1,109 observations) collected from Thomson One Banker Database
Dependent variable	Exploration vs exploitation orientation	Decision comprehensiveness	Performance
Independent variables	✓ Industry scope ✓ Geographic scope ✓ Investment opportunity ✓ Syndications ✓ Network interactions	✓ Industry scope ✓ Geographic scope ✓ Investment opportunity ✓ Syndications and network partners	✓ Industry scope ✓ Geographic scope ✓ Investment opportunity ✓ Syndications (co-investing partners)
Moderators	None	Experience	Uncertainty: ✓ Investment stage
Results	Hypotheses 1 and 2 supported	Hypotheses 1 and 2 supported; Hypotheses 3a and 3b partially supported	Hypothesis 1d supported. Further analysis is going to be launched

1.10 Structure of the dissertation

Table 1-2 depicts the structure of this dissertation. After the introductory chapter, the three empirical studies are presented. Finally, a concluding chapter summarizes the findings, presents the implications for both theory and practice and offers suggestions for future research.

Table 1-4 Dissertation Contents

Chapter	Title
Chapter 1	Introduction and theoretical framework
Chapter 2	Study 1. Investigating exploration and exploitation orientation in the venture capital industry
Chapter 3	Study 2. Exploration vs exploitation orientation and decision-making activity in the venture capital context
Chapter 4	Study 3. Linking exploration orientation to performance in venture capital companies
Chapter 5	Conclusions, implications, limitations and suggestions for future research

Chapter 2

INVESTIGATING EXPLORATION AND EXPLOITATION ORIENTATION IN THE VENTURE CAPITAL INDUSTRY

2.1 Abstract

Exploration and exploitation have been firmly placed at the center of researchers' agenda, but no previous studies investigated towards these rationales in the VC context. This study uses insights from the literature on co-evolutionary economics and organizational learning to test the specular orientations in terms of non-local versus local search for knowledge. By adopting the knowledge-based view and social capital lenses, a measure is proposed to operationalize the constructs in the VC context of research and to test which orientation prevails among VCs. Promising results have been obtained pertaining to the validity of the operational scales proposed. The empirical evidence from 43 VC managers from the Canadian Venture Capital and Private Equity Association showed VCs are relatively more likely to explore rather than to exploit, with reference to the search for investment opportunities, for industry domains, and for partners interactions and syndications. We could not find the same evidence for the search for knowledge through the geographic scope of VCs investment. Limitations of the study and empirical and theoretical contributions are outlined.

Keywords: exploration orientation, exploitation orientation, venture capital, knowledge acquisition

2.2 Introduction

Extant studies have demonstrated a strong interest in the role of knowledge in creating and sustaining competitive advantage, and creating economic value. This has placed exploration firmly at the center of researchers' agenda, because the extent to which an organization engages in exploration - or its opposite orientation, exploitation - is thought to influence learning, knowledge generation, innovation and performance (Sidhu et al., 2004). Notwithstanding extant studies on this research area, there is no understanding on the exploration vs exploitation orientation in a specific industry context: the Venture Capital one (hereafter, VC).

Drawing on the evolutionary economics (Nelson and Winter, 1982) and organizational learning literature (e.g., Zollo and Winter, 2002; Ahuja and Katila, 2001; Rosenkopf and Nerkar, 2001; Zahra et al, 1999; Levinthal and March, 1993; March, 1991), we will approach exploration vs exploitation from a knowledge-based perspective (Grant, 1996; Kogut and Zander, 1992) and adopting the "social capital" theoretical lens (Coleman, 1988; Nahapiet and Ghoshal, 1998).

Scholars assume that knowledge acquisition is an important explanatory factor for exploration vs exploitation logics or activities within a company.

Accordingly, we assume that "exploration" vs "exploitation" are referred, simultaneously or alternatively, to knowledge resources. The centrality of knowledge acquisition to exploration is evident in several theoretical perspectives (e.g., Lorenzoni and Baden-Fuller, 1995; De Clercq and Dimov, 2008; Matusik and Fitza, 2012).

VCs apply knowledge resources in their investment activity and the decision-making behind their investment choices (e.g., Dimov and Shepherd, 2005; Sapienza, 1992). VCs use content knowledge (technical, financial, managerial, governance knowledge) to select and to manage the portfolio companies they are engaged with. VCs even link this knowledge stock to other actors of the industry interacting with them as partners in syndications or, basically, as advice-providers, in so doing, they broaden and integrate their knowledge (e.g., Matusik and Fitza, 2012).

Moving from the approach adopted by Sidhu et al. (2004), we propose a multidimensional instrument to measure exploration vs exploitation orientation - and the related rationales - in the VC industry. Three key dimensions of exploration vs exploitation orientation are identified in our context of analysis, modeled on the dimensions suggested by Sidhu et al. (2004) in a different research area.

These dimensions belong to a: spatial-side knowledge acquisition; demand-side knowledge acquisition; network-side knowledge acquisition.

VCs may build up their knowledge stocks focusing on a specific industry, or a restricted industry scope (*spatial-side*); or focusing on a specific geographic area, reducing the spatial distribution of their investments (*spatial-side*); or on a restricted number of investments opportunities (*demand-side*), engaging in follow-on investments to increase their investment experience and relying on their existing skills and knowledge resources. If VCs show this orientation, we state that they are "exploitation-oriented" and adopt "exploitative strategic rationales".

Conversely, VCs may build up their knowledge stocks broadening their industry scope, and investing in distinct industry segments (*spatial-side*); or diversifying the spatial distribution of their investments with a broad geographic scope (*spatial-side*); or exploring new investment opportunities more than re-investing in a company previously backed (*demand-side*). If VCs show this opposite orientation, we state that they are "exploration oriented" and adopt "explorative strategic rationales".

Additionally, VCs link their knowledge stocks to others, through more or less partners interactions in syndicated investments or, basically, an external advice-seeking, in so doing, accessing diverse information through their knowledge of others in the network they belong to (e.g., Matusik and Fitza, 2012; Brander et al., 2002). Thereby, VCs rely on a "social capital" and use it also to broaden their knowledge stocks.

We state that VCs with more partners interactions and different co-investing partners are more "exploration-oriented" or show a stronger "exploration rationale" than VCs with less co-investing activity, or a completely lack of co-investing, as well as VCs with less partners interactions (*network-side*).

Moving from the above propositions, we will test for hypotheses concerning a higher or lower exploration orientation showed by VCs according to the measurement instrument we suggest to adopt.

Despite studies on exploration and exploitation and VCs are usually conducted at the firm-level (e.g., Matusik and Fitza, 2012; He and Wong, 2004); or business-unit/fund level (e.g., Hochberg et al., 2007; Jansen et al, 2006), we decide to apply our investigation at the individual level of analysis, in detail, the manager-level (e.g., Mom et al., 2007).

VC firms act through VC funds as investment responsible. Each fund is managed by a group of individuals (the VC managers) who make investment choices and manage the knowledge stocks adopting the shared view and policy of the firm and acting to achieve a common investment goal. Thus, the adopted rationale at the manager-level is representative of the orientation of the VC firm. Therefore, the choice to set our investigation at the individual level will not be detrimental to the reliability and representativeness of the findings.

Moving from the above premises, the purpose of the study is to contribute to the academic dialogue on organizational learning and entrepreneurship. In detail, the study aims to an in-depth understanding of the strategic rationales adopted by VCs, more specifically, in their decision processes behind their investment choice, investigating on whether and how exploration vs exploitation rationales may be identified in VC, and which orientation prevails.

This study represents the first stage of a multi-phase research project. In fact, in the future two studies we aim to go further the findings to examine (i) the decision-making quality, and (ii) the VC investment performance consequences related to differences in exploration or exploitation orientation showed by VC managers.

The study achieves three goals. First, it provides a suitable measure to contribute to a systematic empirical research into exploration versus exploitation in the VC context. Second, the study contributes to extant literature on venture capital and organizational learning by identifying some key dimensions to test exploration orientation (or the specular one) in a fully novel field of research: the VC industry. Third, by starting to disentangle the context in which alternative search strategies could determine performance results, it pushes research frontiers beyond the

long-accepted common idea that both non-local exploratory knowledge search and local exploitative knowledge search are vital for firm survival and performance (March 1991).

In the following sections, we develop arguments and advance hypotheses with regard to possible dimensions of exploration vs exploitation orientation in the VC context. Then, we present our model, the methodology adopted - providing details concerning the item generation, the sample, data collection and measurement instruments – results and concluding discussions.

2.3 Literature review and hypotheses

Exploration and exploitation over the literature: an evolutionary economics perspective

The literature on exploratory learning and exploitative learning (March, 1991) focuses primarily on whether existing knowledge (exploitation) or new knowledge (exploration) is enhanced as a direct result of organizational learning.

Notwithstanding the consensus towards exploration and exploitation as important for organizational learning, there is quite some ambiguity about their conceptual meaning. March (1991, p. 71) describes exploration as "things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation" and exploitation as "things related to terms such as refinement, choice, production, efficiency, selection, implementation, execution".

Further research has conceptualized both rationales depending on the specific field or specific resource those were referred to, suggesting their multi-faceted nature. For instance, Koza and Lewin (1998) consider exploration as implying "innovation, invention, risk-taking, developing new capabilities, entering new businesses, and investments in the firm's absorptive capacity." Conversely, Rothaermel (2001) and Levinthal and March (1993) describes exploration as devoted to the "pursuit of new knowledge" (Rothaermel, 2001, p. 689).

In spite of the various and helpful effort to furnish insights into the nature of exploration and exploitation from a conceptual viewpoint, so far not enough research has been devoted to investigate the phenomenon from a measurement and theory-testing viewpoint. The conceptual specification has been superficial and has not clarified the exact theoretical domain and conceptualization as distinguished from the two concepts antecedents and outcomes. Indeed, Volberda (1998) argues on flexibility as an antecedent of exploration, while organizational learning literature suggests innovation to be an outcome of exploration due to the latter's effects on the enhance of change and variety into the organization (McGrath 2001).

Moreover, a crucial question has received few answers so far, both from an academic and a managerial standpoint: Why do some organizations show more exploration orientation while, conversely, others show more exploitation orientation? This question comes from several observations of the heterogeneity in the exploration orientation among organizations. In fact, while some companies promotes high levels of exploration, act proactively and are involved in continuous experiments involving also external partners (Brown and Eisenhardt, 1997; Volberda,

1998, Grant and Baden-Fuller, 2004); other organizations prefer to exploit the current knowledge, act only in local environment and interact just with familiar partners (e.g., Porac and Thomas, 1994; Spender and Grant, 1996).

To overcome the lack of understanding and to answer the inquiry above , some recent works adopted the evolutionary economics perspective. This has recently emerged as a relevant organizational framework to investigate on organizational behaviors and outcomes as the combined effect of managerial and environmental pressures (Lewin and Volberda, 1999; Volberda and Lewin, 2003; Sidhu et al., 2004). The central idea of the co-evolution framework leads scholars to follow an accurate approach anchored to the concept of "search".

According to this works, exploration vs exploitation are operationalized in terms of non-local versus local information- or knowledge-search behavior to discover new approaches towards technologies, products, and businesses; pursue new knowledge; experiment with new alternatives and business paths (e.g., Katila and Ahuja, 2002, Rosenkopf and Nerkar, 2001).

This stream of research has laid more emphasis on supply-side search and less on demand-side and geographic search. As concern the first one – *the supply-side search* - building on ideas of bounded rationality (Cyert and March, 1963), routines (Nelson and Winter, 1982), and past investments in specific knowledge (Cohen and Levinthal, 1989), Stuart and Podolny (1996) noted that firms put more efforts to search in the vicinity of current capabilities, a crucial aspect to the firm development and growth process. Other scholars referred to technological trajectories which are limited to a local search (Dong-Jae and Kogut,1996); narrow R&D search scope (Helfat, 1994). Regarding the second one – *the demand-side search* – especially in the marketing literature, there is a long tradition of demand-side or customer-oriented search, motivated by the innovation opportunities that may result from brand extension, product repositioning, targeting of new market segments according to various needs (Day 1994, Kohli and Jaworski 1990, Cooper and Inoue 1996). As regard the latter – *the spatial search* – search may be geographically centered, due to the emphasis on seeking for opportunities in different geographic areas, not limited to proximity (Chang 1995, Barkema et al., 1996, Hitt et al., 1997). Moreover, geographic search represents a crucial orientation even for the opportunity to have access to a greater variety of knowledge resources for recombination, because firms can link in to multiple regional knowledge networks (Almeida and Kogut, 1999) and gain information not available at a local level (Kuemmerle, 1999; Ahuja and Katila, 2004).

Approaching exploration from the evolutionary economics perspective and drawing on previous works (Sidhu et al., 2004, Sidhu et al., 2007), we argue that the distinction between different search sides is relevant because firms differ in terms of searching in or experimenting with different geographic areas as separate from the idea that they differ in terms of supply and demand-side search. In fact, for instance, one firm may be spatially more exploratory than another, while, conversely, may show a more exploitative orientation towards the demand- or the supply-side.

Clearly, a separate measure for the constructs is needed because the essence of spatial search is not captured by supply- or demand-side search. Whether search is supply-side, demand-side, or spatially oriented, exploitative or local search implies that search efforts are almost restricted around the domain of current knowledge and competencies. In contrast, search may be non-local, extending into never explored domains or less-near areas.

The backdrop above enhances our focus on the need of a multidimensional measure of exploration orientation.

Unlike previous works (Sidhu et al., 2004; Sidhu et al., 2007) that focused on the manufacturing industry to develop a suitable measurement scheme to answer the inquiry stressed above, we chose the VC industry.

Knowledge acquisition and exploration versus exploitation orientation

The nature of exploration is usually associated to concepts such as search, variation, flexibility, experimentation, innovation, and risk-taking (March, 1991; Lewin et al., 1999). To grasp the essence of exploration several contributions from the literature on organizational learning refer to exploration as "the pursuit of new knowledge and boundary-spanning search for discovery of new approaches to technologies, businesses, processes or products (Sidhu et al., 2004, p.916; Levinthal and March, 1993; McGrath, 2001).

Closely rooted into the concept of exploration is the idea of greater or lesser scope of external knowledge acquisition. Evidently, greater or lesser search efforts increase or reduce the knowledge stocks from the external environment which are included within the boundaries of the organization.

The centrality of knowledge acquisition to exploration is evident in various theoretical perspectives. Scholars frame exploration as "accessing to external knowledge through inter-firm alliances" (De Clercq and Dimov, 2008); as a "diversification of knowledge assets"(Matusik and Fitza, 2012); as a "knowledge generation", including all the activities which increase an organization's stock of knowledge (Lorenzoni and Baden-Fuller, 1995).

Drawing on these approaches, we conceptualize exploration (and the specular exploitation) in terms of knowledge acquisition activities. In this view, we state that the greater the scope of external knowledge acquisition, the greater the exploration orientation showed by an organization; conversely, the narrower such scope, the greater the exploitation orientation.

According to the knowledge based-view, a firm has to be considered a sort of basket of knowledge stocks fundamental for the value creation and, consequently, the company success (Nelson and Winter, 1982; Spender, 1996).

Organizational knowledge pertains to the set of known accumulated within the firm's experience, through the organizational learning process (Levinthal and March, 1993; Zollo and Winter, 2002). From organizational learning it can be argued that the process that leads to knowledge acquisition encompasses search routines and learning from experience, ending with the integration and formalization of the knowledge acquired.

When a new opportunity appears, firms use the knowledge acquired to understand and evaluate the new opportunity, then absorptive capacity – that is the ability to identify the value of new, external information, absorb it, and translate it into capabilities useful for business ends – represents an essential learning capability grounded in the firm's prior knowledge (Cohen and Levinthal, 1990). This capability develops continuously through the interplay between the current activities faceted by a firm and the prior knowledge (Van den Bosch et al., 1999).

A firm acquires knowledge by searching at a local level or incurring into boundary-spanning search. Local search is limited to resources within the boundaries of the firm current stock of knowledge (Stuart and Podolny, 1996). In contrast, boundary-spanning exploration is based on obtainment of knowledge by searching beyond the current expertise or organizational domains (Rosenkopf and Nerkar, 2001).

Our conceptualization of exploration orientation – and the specular exploitation orientation – follows the above summarized literature. However, drawing on previous works (Sidhu et al., 2004; Sidhu et al., 2007) we extend previous literature by focusing on scope search on three integral different dimensions. Two dimensions have been redrawn by following the conceptualization suggested by researchers in evolutionary economics and previously discussed: *demand-side knowledge acquisition* (DSKA) and *spatial-side knowledge acquisition* (SSKA).

A third dimension – *network-side knowledge acquisition* (NSKA) - is framed as related to a firm's interactions with external partners. Clearly, inter-firm alliances facilitate inter-organizational learning (Lane and Lubatkin, 1998), and firms accessing to external knowledge brought by selected partners (Grant and Baden-Fuller, 2004).

The beneficial role played by relationships between individuals, firms and organizations to facilitate exploration, through new knowledge resources, represents the central proposition of social capital theory. Nahapiet and Ghoshal (1998) define social capital as "the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships an individual or social unit has" (p.243). Relationships among partners and organizations can be beneficial for the exchange and combination of knowledge resources and thus account for new knowledge stocks. The "bridging social capital" is the one referred to external relationships a firm establishes with actors outside the boundaries of its existing network (Adler and Kwon, 2002).

Our emphasis on the importance of a network-related third dimension is consistent with the literature on social capital and networks mentioned above.

A condition on the benefits of the partners' knowledge to the firm is the number of partners and the familiarity with these a firm has. As concern the former, collaboration with a broad external network implies a broader scope of knowledge to access to, and thus enhances the chance a firm has to get knowledge for business ends (Wright and Lockett, 2003). In regards of the latter, familiarity with exchange partners can facilitate access to information about external actors' behavior, reducing the costs related to locating and screening of those (Robinson and Stuart, 2001, De Clercq and Dimov, 2008). Moreover, prior interactions stimulate mutual trust, social connections, joint problem solving, thereby increasing the stock and quality of knowledge transferred (Uzzi, 1997; De Clercq and Sapienza, 2006).

In view of this, our conceptualization of exploration orientation emphasizes also a network-side knowledge acquisition search dimension.

The knowledge focus on interpreting exploration orientation is justified by the aim to broaden the investigation on an operational measure of exploration, considering the focus on information previous works have already shown (Sidhu et al., 2004; Sidhu et al., 2007). Moreover, conscious of the risk of a measurement overlapping with measures of related constructs (such as strategic orientation) including experimentation and risk-taking as key items, we wanted to differentiate

our investigation from previous works and prevent any empirical limit represented by an overlapping of items. Future works can expand the basket of operational items, including those excluded (experimentation and risk-taking, in detail).

Knowledge acquisition and exploration orientation in the venture capital industry

VC is a form of financing for an entrepreneurial venture where the VC company acts as a financial intermediary. VCs play a double role: they monitor the performance and control the decision-making process of the investee.

In other words, VCs invest, manage and return institutional investors' money by funding the entrepreneurial ventures (portfolio companies), contributing to their growth and expansion and, finally, as concern the most successful investments, exiting from the investment by selling the company to a public or a corporate investor (De Clercq and Dimov, 2008).

VCs select the investments to build up their portfolio to reduce company-specific risks and increase the returns from the investments. The successful performance of the investment activity of VC companies depends on how much they learn from prior investments – syndicated or independent - in terms of good exits and failures (Gupta and Sapienza, 1992; Wright and Lockett, 2003; De Clercq and Dimov, 2008).

In the context of VC companies, VCs acquire knowledge from prior investments and show a learning capability - before mentioned as "absorptive capacity" – in the deal-flow process, from the evaluation and selection phases, to the management of the investment opportunities.

Previous research argued on the differences VCs show in the propensity to a greater or lower extent of their investments and, simultaneously, to a broader or narrower scope of their knowledge domains (e.g., Gupta and Sapienza, 1992; Dimov and Shepherd, 2005; De Clercq and Dimov, 2008, Matusik and Fitza, 2012).

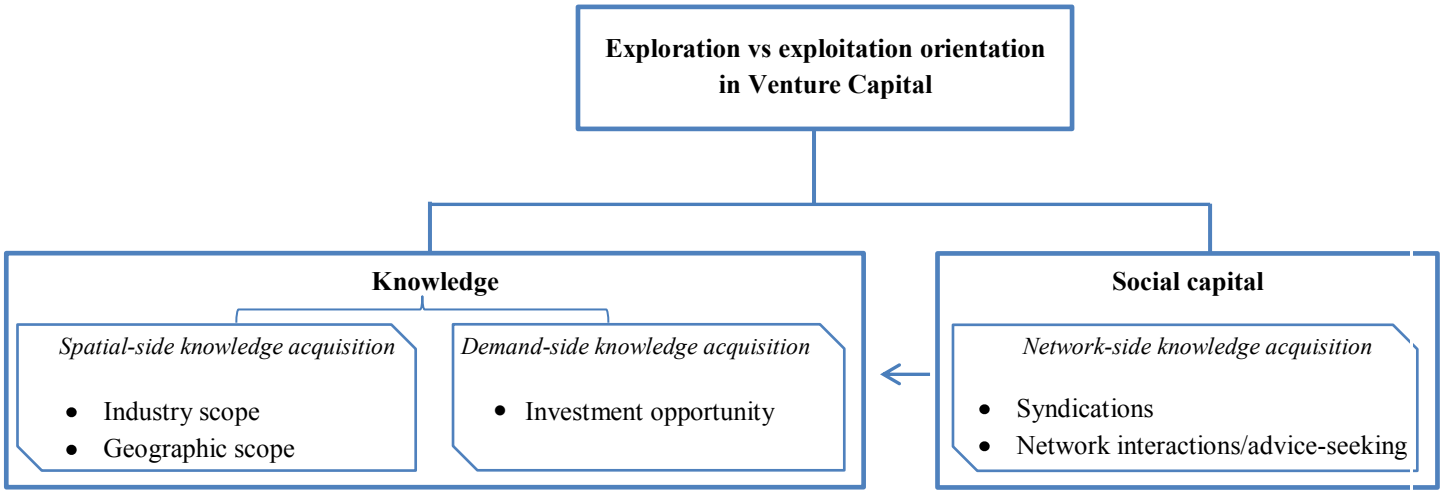
Knowledge is central to VCs investment activity. In fact, VCs apply knowledge resources in their investment activity and the decision-making behind their investment choices (e.g., Dimov and Shepherd, 2005; Sapienza, 1992). They provide knowledge to the portfolio companies they invest in, and get back knowledge from their investment experience, each investment contributes to broaden.

VCs use content knowledge (technical, financial, managerial, governance knowledge) to select and to manage the portfolio companies they are engaged with. VCs even link this knowledge stock to other actors of the industry interacting with them as partners in syndications or, basically, as advice-providers, in so doing, they broaden and integrate their knowledge (e.g., Matusik and Fitza, 2012).

Moving from these theoretical premises, we suggest a conceptualization of the rationale adopted by VCs in their search of knowledge in terms of exploration or, conversely, exploitation. Clearly, we conceptualize exploration (and the specular exploitation) in the VC context in terms of knowledge acquisition activities. In this view, we state that the greater the scope of external knowledge acquisition, the greater the exploration orientation showed by VCs; conversely, the narrower such scope, the greater the exploitation orientation.

In the search of knowledge resources, VCs show three types of knowledge search which match with the three dimensions of scope search we stressed above to build up our framework. We draw our conceptual framework as follows (Fig 2-1).

Figure 2-1 Conceptual Framework



Spatial-side knowledge acquisition (SSKA)

VCs build up their portfolio by scouting investment opportunities which are spatially distributed. The spatial distribution of VC investments can be referred, alternatively or simultaneously, to the industry scope and the geographic scope (e.g., Gupta and Sapienza, 1992).

Among VC investors, the pursuit of investment opportunities in a particular industry generally follows a two-step flow: (i) an initial step of uncertainty about the industry, in which only a restricted number of companies in the industry get VC investments from a restricted number of VC firms; (ii) in a following step, as the promise of the industry becomes positively revealed, more VC firms start investing in the industry, increasing the number of VC-backed companies in that industry. Investments in new industries are problematic because require paradigmatic shifts concerning the way to identify, evaluate and pursue the investment opportunity. This difficulty arises because the knowledge stock built on previous investments may be inadequate to judge emerging technology trends or to promise new profitable business development paths for the investment (Dimov et al., 2012). The lack of benchmarks and similar companies make the evaluation of new-industry-related investments difficult.

Notwithstanding the problem above stressed, VCs may consider investing in an unfamiliar industry as a purposeful opportunity seeking, enabling a different set of investment rules compared to those developed to manage previously faced investment situations. Moreover, different industries have different economics and market trends, thereby VCs which diversify

their portfolio and the risk associated to the investments managed may benefit from compensation mechanisms between different risk-sensitive industries (Gupta and Sapienza, 1992; Dimov and Martin de Holan, 2010; Matusik and Fitza, 2012). This point explains the propensity towards industry exploration VCs may show.

The VCs' propensity towards industry exploration can be explained by the fact that the unfamiliar industry context is a source of knowledge and may be perceived as a challenge to develop new skills to deal with a never explored industry and a nascent technology looming on the horizons. That is, even though the difficulties related to an uncertain industry domain, VCs explore new industries to broaden their spectrum of knowledge and, consequently, to develop the competences required to manage nascent technology-based investments. Thus, in line with our conceptualization of exploration orientation, we state:

Proposition 1a: The greater the exploration orientation of VCs, the greater the industry-investment market scope of their investments.

Conversely,

Proposition 1b: The greater the exploitation orientation of VCs, the lower the industry-investment market scope of their investments.

Search into never explored domains can be related, as well as to industry domains, to geographical markets. Different country contexts are source of value-adding knowledge for VCs, due to different human capital, different laws, different market trends, different cultures, and a different institutional context as a whole. The search for knowledge at a spatial side pertains both to the industry scope and the geographic scope of VCs investments.

Finding investment opportunities entails two important tasks. First, venture capitalists must acquire information about the existence and characteristics of investment opportunities. Second, they must evaluate the quality of these opportunities. Because the greater is the distance, the greater is the difficulty related to each of these tasks, scholars believe that investors prefer to invest locally (Sorenson and Stuart, 2001; Lutz et al., 2012). One of the reason supporting the higher propensity VCs show towards localized investments relies on the information asymmetries between partners located at a distance. Individuals have confidence with trusted partners and prefer to deal with close contacts to avoid investments managed under asymmetric information which may lead to unsuccessful investments performance and less investment returns (Sorenson and Stuart, 2001). Scholars found evidence of this high propensity to geographic proximity as concern early stage VCs and large investments relative to the fund size (Gupta and Sapienza, 1992; Lutz et al., 2012). In light of this, we focus on all types of VCs - those which invest both at a later and early stage – and ignore differences in terms of VC fund size, to generalize our investigation. Thus, we frame VCs knowledge acquisition through different geographic markets as exploration orientation and, consequently, state:

Proposition 2a: The greater the exploration orientation of VCs, the greater the geographic scope of their investments

Conversely,

Proposition 2b: The greater the exploitation orientation of VCs, the lower the geographic scope of their investments

Demand-side knowledge acquisition (DSKA)

VCs activity is strictly focused on seeking investment opportunities to invest the money raised from various investors with the purpose of achieving superior returns. The investment opportunity is represented by the entrepreneurial venture VCs select and evaluate to build up their portfolio. While some VC firms invest in companies that are in the process of exploring nascent ideas, not supported by any commercial technology or tested market (i.e. early stage companies), others prefer those companies with clear market dynamics as well as advanced and tested products (i.e. late-stage companies), to expand their existing business (Podolny, 2001; Dimov et al., 2006). Moreover, VCs may diversify their portfolio by investing in different early stage companies, spreading the financial risk associated among various industries and markets, or, conversely, may specialize their portfolio investing in deals of a specific financing stage, preferring to engage with follow-on investments more than with unexplored investment opportunities (Norton and Tenenbaum, 1993). A new opportunity is a source of knowledge, relative to the market, the industry, the human capital, the technological domain and the network associated to the entrepreneurial venture; differently, a follow-on investment increases the investor's experience on a specific domain. While the latter impacts more on the learning process and the VC's absorptive capacity, the former contributes to broaden the knowledge stock. In light of this, we suggest an interpretation of the knowledge search over the VC demand side – the investment opportunity – in terms of exploration, and assume:

Proposition 3a: The greater the exploration orientation of VCs, the lower the re-investment propensity.

Conversely,

***Proposition 3b*:** The greater the exploitation orientation of VCs, the greater the re-investment propensity

Network-side knowledge acquisition (NSKA)

VCs often syndicate with each other when they select a new investment opportunity and invest in it. Prior research has demonstrated that syndications facilitate portfolio diversification in terms of portfolio size (Kanniainen and Keuschnigg, 2003, 2004; Keuschnigg, 2004; Cumming, 2006; Jääskeläinen et al., 2006, De Clercq et al., 2010). Moreover, syndications among VCs reduce the information asymmetry and the related costs (Bergemann and Hege, 1998; Lockett and Wright, 1999, 2001; Wright and Lockett, 2003; Manigart et al., 2006;).

Syndication networks facilitate knowledge flow and monitoring. VCs may have complementary skills; value-adding advice and activities may benefit from the participation of more investors, each providing additional knowledge and competences to an investment deal. The search for knowledge through the syndicated partners is a way to diversify the knowledge stock a VC firm has, to broaden the spectrum of information and competences and, consequently, to add value to the investment performance, making it more profitable (Brander et al., 2002; De Clercq and Dimov, 2008). Drawing on our conceptualization of exploration orientation in terms of search for knowledge, we state:

Proposition 4a: The greater the exploration orientation of VCs, the greater the number of syndicated partners

Conversely,

Proposition 4b: The greater the exploitation orientation of VCs, the lower the number of syndicated partners.

In order to foresee and evaluate the potential of the technologies at the basis of the investment opportunity they are screening, VCs often search for new sources of information to enrich their knowledge stock, establish relationships with different communities of experts, and engage with a different network of partners (e.g. law, recruitment, consulting, academics, other VCs or even old portfolio firms and serial entrepreneurs) to support the new entrepreneurial venture. Especially when they invest in an unfamiliar industry and within a short timeframe, VCs network of social interactions serves as a relevant backbone to investment decisions and forms part of their absorbed investment experience that affects the way in which VC firms select, evaluate, and manage their investments (e.g. Guler, 2007; De Clercq and Dimov, 2008; Dimov and Milanov, 2010).

Clearly, the network among VCs is a source of information contributing to increase VCs knowledge stocks useful especially for evaluating potential investments across geographic and industry boundaries (Sorenson and Stuart, 2001, 2008). Concerning our research, the search for knowledge through the broadening of the social network interactions and, consequently, the advice-seeking coming from external partners is interpreted as a predictor of exploration orientation. Thus, we state:

Proposition 5a: The greater the exploration orientation of VCs, the greater the social network interactions and the external advice-seeking during the investment activity.

Conversely,

Proposition 5b: The greater the exploitation orientation of VCs, the lower the social network interactions and the external advice seeking during the investment activity.

Scholars have detected so far a balance between specialization and diversification in the VCs portfolio composition (e.g. Norton and Tenenbaum, 1993; Matusik and Fitza, 2012). By constructing a well-diversified portfolio, the unsystematic risk can be crossed over, leaving an investor exposed only to systematic risk effects. With a diversified portfolio, unlucky circumstances that determine lower returns on some assets are balanced by positive situations that determine additional returns on other assets (Norton and Tenenbaum, 1993, Da Rin et al., 2011) Venture capitalists may want to diversify across different industries and companies in order to reduce their risk exposure in any domain. Moreover, diversification can be beneficial to gain knowledge from various markets, industries and social networks, increasing the knowledge stock. Conversely, VCs may prefer to specialize the portfolio composition in order to deepen the experience within a specific domain, to share the knowledge in stock with other investors and gatekeepers, to earn a reputation in terms of experience and expertise and be able to "cultivate a deal flow based on networks of contacts and relationships" (Sahlman 1990, p. 500).

Some scholars have found evidence in the context of VC of a trade-off between diversification and specialization of knowledge stocks, which are considered beneficial for a VC firm performance if alternatively existing in a VC firm, but not simultaneously (Matusik and Fitza, 2012). Others demonstrated that external or new knowledge flows (versus internal or existing ones) better improve VC firms performance, translating the external knowledge sources into competitive advantage (De Clercq and Dimov, 2008). Led by the need to achieve superior investment returns, to seek for new investment opportunities we suppose VCs will be oriented towards a greater non-local search for knowledge, exploring more than exploiting the knowledge flows. Notwithstanding the partial agreement towards the existence of a balance between a local versus non-local search for knowledge, hence an explorative versus an exploitative orientation, we move from the findings of De Clercq and Dimov (2008), and hypothesize:

Hypothesis 1: *VCs are relatively more likely to explore than to exploit in terms of spatial side, demand side and network side knowledge acquisition*.

Firms exploring a novel domain are less experienced on the relative dynamics and characteristics. Entering a new market (industrial or physical) can become less effective because the elements that foster success in one environment can become inertial forces and limit a firm's flexibility in a radically different environment (Tripsas, 2009). Due to the evidence showed in literature (e.g., Sorenson and Stuart, 2001; Lutz et al., 2012) concerning VCs low propensity to invest in foreign markets, physical more than industrial, we hypothesize:

Hypothesis 2: *VCs are more likely to explore than to exploit as concern all the knowledge acquisition dimensions (SSKA, DSKA, NSKA), except for the geographical side knowledge acquisition.*

2.4 Research method and data collection

Sample and data collection

To test the hypotheses an empirical investigation has been conducted among the VC members of the CVCA (Canadian Private Equity and Venture Capital Association).

The Canadian country context has been adopted by scholars researching on VC (Cumming, 2006; Cumming and Johan, 2008, 2010) due to the novelty in terms of area of investigation (compared to the US context) and the recent development of the Canadian VC industry, that has attracted a growing research interest.

Since the CVCA represents both private equity and venture capital investors, we included in our initial sample only the VCs.

We collected data on VCs from the CVCA VC members list available on Thomson One Banker electronic database. An initial sample of 90 VC firms has been collected. A first screening procedure reduced the population to 80 firms due to the lack of available contacts for the VCs excluded by the sample. Through direct access to the mailing list with address and management team information of the VCs associated, we derived a "n" population matching with the "N" one because no stratification was necessary.

As source for the analysis, we used a survey administered in a web form. To increase the likelihood to survey only knowledgeable respondents due to the typically low propensity of VCs to give access to confidential information, we sent the survey only to board members. The selection was random, choosing the third contact from every company contact list in the database. A cover letter explaining the purpose of the research accompanied the questionnaire.[1]

We chose to conduct the study at an individual level (VC manager) rather than at a firm level for a double reason: (i) the low propensity of VCs to take part to research investigations, hence, the difficulty an investigation at a firm level would represent; (ii) the rationale adopted at the manager-level are representative of the orientation of the VC firm (as well explained in the introduction).

Three reminders over a period of one month and a half have been necessary to increase the likelihood to get a satisfactory response rate.

After the initial mailing, if we did not get any response, we sent a reminder note and we recurred to direct email contacts (after 10 days). We sent a final reminder note after the three-week period.

To test for non-response bias, we examined differences between respondents and non-respondents. A t-test showed no significant differences ($p > .05$) between the two groups based on the management team size, VC firm age, and firm size (in terms of funding capital). The result indicated that differences between respondents were not related to nonresponse bias.

To overcome possible limitations related to the single-informant data, we tried to survey a second member of each VC respondent company and, then, calculate an agreement score for

[1] An individual feedback-report will be sent to each respondent. Additionally, we will draw up a general report for the CVCA with our findings and the individual performance feedbacks of each member participating in the survey

item-study variable. Actually, we realized the difficulty of such a purpose, due to the low propensity of VCs to participate to any kind of investigation.

Finally, we received 50 filled questionnaires, with a response rate of 62%. This response rate was distributed among the three reminders as follows: a 18% response rate after the first reminder; a 40% response rate after the second reminder; a 62% response rate after the final reminder.

After a clean-up of records with missing data a final sample of 43 respondents (VC managers) was reached.

The sample consisted of both male (90%) and female (10%) VC managers. The average respondents age was 46 year old, ranging between 30 to 64 year old. The 50% of the respondents got an MBA; the 31% had an educational background in the management field area, the 26% had an engineering educational background, a 12% had a law educational and an economics educational background, while the remaining percentage was distributed between healthcare, physical sciences and physiology educational background. The 73% of the VCs had a previous professional experience as an entrepreneur.

The firms had on average 17 full-time staff members, with firm size ranging between 3 to 55 employees. Firm age was on average 18 years, ranging from 2 to 60 years. The respondents were General Partner (53%), Associate (19%), Fund Manager (11%), Principal (10%), CEO (7%). The average total capital commitment was around 455 million dollars. The 50% of the VCs were engaged in the cleantech, software, biotech and digital industry. Finally, the 50% of VC firms were specialized in all investment stages, from seed capital to expansion capital, the 20% in all stages excluding the seed capital; the 20% in all stages excluding the expansion capital; the remaining 10% were specialized only in early stage investments.

Exploration and exploitation orientation measures

Exploration versus exploitation orientation was described previously as greater or narrower knowledge search in non-local domains. As an appropriate scale for exploration and exploitation at an individual level of analysis in the VC context was not yet available in the literature, we constructed scales for exploration and exploitation moving from previous works (Sidhu et al., 2004; Mom et al., 2007; Sidhu et al., 2007). We originally developed a 10-item scale for exploration and exploitation according to the three identified dimensions of exploration (SSKA, DSKA, NSKA). We reduced the first set of items to 6 items for exploration and exploitation, with two items for the SSKA dimension, one item for the DSKA dimension and three items for the NSKA dimension. The items were developed as statements regarding knowledge-gathering propensity in relatively local versus non-local domains. More in detail, the *exploration scale* measured the extent to which a VC manager showed an exploration orientation during his experience in the VC company he currently works in. Conversely, the *exploitation scale* measured the extent to which a VC manager showed an exploitation orientation under the conditions previously mentioned.

The items have been measured on a 5-point Likert scale anchored at "weakly involved/oriented" and "strongly involved/oriented".

To illustrate, for SSKA dimension, two of the exploration-related statements were (A) "Searching of investment opportunities in new industries/markets never explored/invested in", (B) "Investment activities located far from your local geographic context"; two of the exploitation-related statements were (C) "Searching for opportunities in the industry and business invested before", (D) "Investment activities located considering the geographic proximity with the VC company (closer is better)". We assumed that while a VC with a greater exploration orientation would score high on all two items A and B, resulting in a high average score, a VC with a relatively greater exploitation orientation would score higher on the two items C and D, which are specular if compared to the first two.

We similarly developed an item to measure for DSKA. The exploration-related statement was (A) "Searching of new investment opportunities". Conversely, the exploitation-related statement was (B) "Reinvestment in firms already invested before". We expected the more exploration-oriented VC would score high in the first, while the more exploitation-oriented VC would score high on the specular statement (B).

Finally, with reference to NSKA, three of the exploration-related statements were (A) "Investment activities requiring new network interactions (manager, other VCs from the same network, academics, industry experts)", (B) "Investment activities requiring external advice seeking (from other organizations)", (C) "Investment activities syndicated with new partners (so requiring new partners interactions)". Conversely, three of the exploitation-related statements were (D) "Investment activities requiring just existing network interactions (interactions with existing contacts, such as manager, academics, VCs of from the same network, consultants)", (E) "Investment activities requiring just internal advice seeking (within your own company)", (F) "Investment activities syndicated always with the same partners (so not requiring new partners interactions)". We again expected the more exploration-oriented VC scored high in the first three (A, B, C), while the more exploitation-oriented VC scored high in the specular statements (D, E, F).

To validate the item edition procedure, we tested the reliability of the scales for the overall exploration and exploitation items and for each of the dimensions measured by a multi-item scale (SSKA and NSKA). No validation test has been applied to the DSKA dimension due to the single-item measure not allowing to apply any reliability test.

A confirmatory factor analysis (CFA) has been applied to purify the scale and led to the final measurement instrument, as shown in Table 2-1.

All the reliability coefficients are satisfactory. The reliability of the summated scales as represented by Cronbach's alpha[2] is 0.70 for the overall exploration scale and 0.78 for the overall exploitation scale. Is well known that the coefficient is satisfactory when the resulting values are higher than 0.70, identifying an acceptable coefficient. As concern the single dimensions (SSKA and NSKA), the Table 2-2 illustrates the results. In detail, as concern the exploration-related items, the Cronbach's alpha for the SSKA dimension is 0.71 and for the NSKA dimension is 0.70 (DSKA not applicable); as concern the exploitation-related items, the coefficient for the SSKA dimension is 0.77 and for the NSKA is 0.79 (DSKA not applicable).

[2] Cronbach's alpha as a coefficient of internal consistency is calculated as $\alpha=mw(\Sigma s\lambda 1/2s-1)/\Sigma s\lambda 1/2s(mw-1)$, with λs the something diagonal element of Λ as computed in the orthonormalization step during the last iteration. For values higher than 0.70 the reliability of the coefficients tested is satisfactory.

The overall results of the confirmatory factor analysis are represented in Table 2-1. The chi-square index and the goodness-of-fit index (GFI) were (1) exploration orientation: χ^2_{df}=139.88, $\chi 2$ /d^2=2.26 (p=0.000), GFI=0.000; (2) exploitation orientation: χ^2_{df}=155.027, $\chi 2$/d^2=2.09 (p=0.000), GFI=0.000. Fixed factors models estimated to assess component unidimensionality are satisfactory (GFI<0.080; p-value<0.001). We did not calculate the incremental-fit index (IFI).

All the dimensions had acceptable fits, indicating the subscales to be unidimensional. The model thus implies dimensional independence, with each search dimension being distinct but correlated to the others, proving that our conceptualization of exploration versus exploitation orientation has a basis into empirical reality.

Table 2-1 Reliability and CFA-model Fit Results

		Cronbach's Alpha	Chi-Square	p-value	Chi-Square /df	GFI
Exploration Orientation	6	*,70 Acceptable*	139.88	0.000	2.26	0.000
Exploitation Orientation	**6**	*,78 Acceptable*	155.027	0.000	2.09	0.000

Table 2-2 Results of the Reliability Test and Final Measurement Instrument

Variabile	Scale Items	Cronbach's alpha
	Exploration	
Spatial Side	**1.** Searching of investment opportunities in new industries/markets never explored/invested in **2.** Investment activities located far from your local geographic context	0.71
Demand Side	**1.** Searching of new investment opportunities	Not applicable
Network side	**1.** Investment activities requiring new network interactions (manager, other VCs from the same network, academics, industry experts) **2.** Investment activities requiring external advice seeking (from other organizations) **3.** Investment activities syndicated with new partners (so requiring new partners interactions)	0.70
	Exploitation	
Spatial Side	**1.** Searching for opportunities in the industry and business invested before **2.** Investment activities located considering the geographic proximity with the VC company	0.77
Demand Side	**1.** Reinvestment in firms already invested before	Not applicable
Network Side	**1.** Investment activities requiring existing network interactions (interactions with existing contacts, such as manager, academics, VCs of from the same network, consultants) **2.** Investment activities requiring internal advice seeking (within your own company) **3.** Investment activities syndicated always with the same partners (so not requiring new partners interactions)	0.79

Analysis

Table 2-3 contains the descriptive statistics. The correlations among the reported variables indicate that the exploration and exploitation measures are not strongly correlated with one another. Table 2-4 shows the Kendall's tau-b correlations among the specular dimensions referred to exploration and exploitation orientation. All the specular variables are negatively and significantly correlated (p-value<0.05). The only less significant correlation is the one between "*Overall exploration*" and "*Overall exploitation*" (p-value=0.089).

Table 2-3 Descriptive statistics

	Overall Exploration	*Overall Exploitation*	*Exploration Spatial Side*	*Exploration Demand Side*	*Exploration Network Side*	*Exploitation Spatial Side*	*Exploitation Demand Side*	*Exploitation Network Side*
Valid	43	43	43	43	43	43	43	43
Missing	0	0	0	0	0	0	0	0
Mean	3,9	3,1	3,6	4,2	3,9	3,4	2,6	2,4
Median	4,0	3,0	4,0	5,0	4,0	3,0	2,0	2,0
Mode	4,0	3,0	4,0	5,0	5,0	3,0	2,0	2,0
Skewness	-,715	2,905	-,601	-1,386	-1,036	,313	,707	,655
Std. Error of Skewness	1,014	0,294	,92940	1,19384	1,18312	1,00717	1,31353	1,14022
Kurtosis	-,462	6,748	-,525	,897	,167	-,963	-,662	-,487
Std. Error of Kurtosis	,709	,709	,709	,709	,709	,709	,709	,709
Minimum	2,00	3,00	2,00	1,00	1,00	2,00	1,00	1,00
Maximum	5,00	4,00	5,00	5,00	5,00	5,00	5,00	5,00

Table 2-4 Kendall's tau-b Correlations

		Overall Exploitation	*Mean Exploitation Spatial Side*	*Mean Exploitation Demand Side*	*Mean Exploitation Network Side*
Overall Exploration	Correlation	-,244	-,537**	-,503**	-,649**
	p-value	,089	,000	,000	,000
Mean Exploration Spatial Side	Correlation	-,374**	-,461**	-,457**	-,608**
	p-value	,010	,001	,001	,000
Mean Exploration Demand Side	Correlation	-,084	-,408**	-,411**	-,564**
	p-value	,562	,002	,002	,000
Mean Exploration Network Side	Correlation	-,183	-,517**	-,466**	-,623**
	p-value	,200	,000	,000	,000

To test for Hypothesis 1, Table 2-5 and Figure 2-2 represent the frequency distributions of the results, averaging the means of the results for each dimension. As showed by Table 2-5 and Figure 2-2, the overall exploration is higher than the overall exploitation. We calculated each as a mean of the results for the three dimensions respectively referred to exploration and to exploitation orientation.

Table 2-5 Frequency Distribution

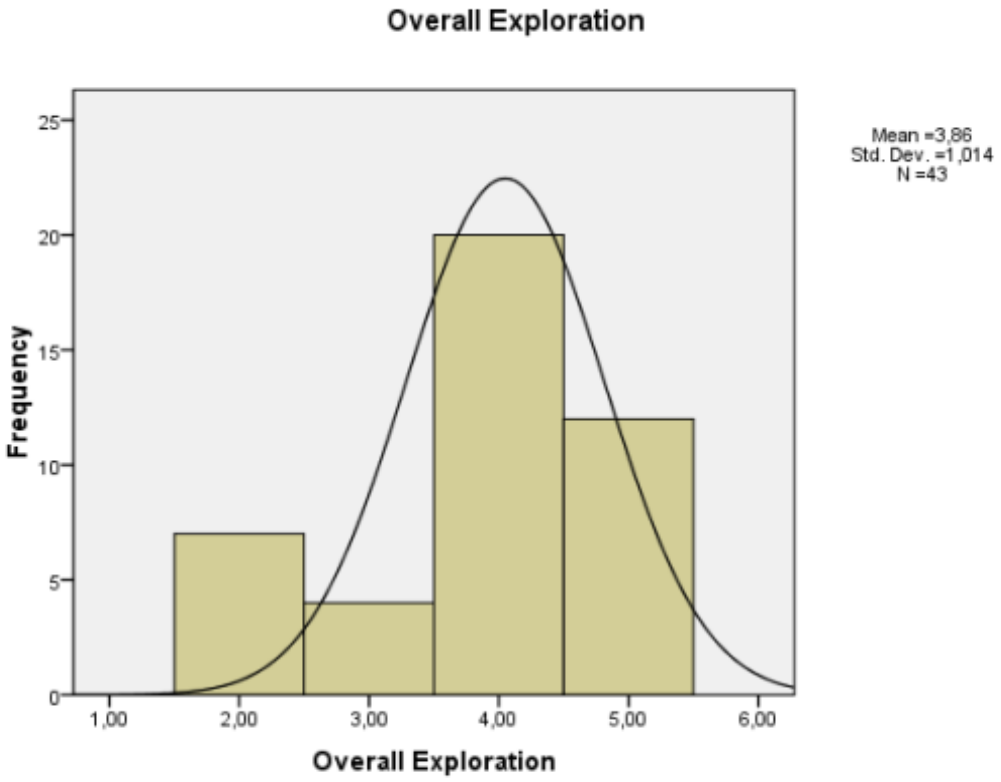
	Overall Exploration	*Overall Exploitation*	*Exploration Spatial Side*	*Exploration Demand Side*	*Exploration Network Side*	*Exploitation Spatial Side*	*Exploitation Demand Side*	*Exploitation Network Side*
1				4,7	4,7		18,6	18,6
2	16,3		18,6	9,3	11,6	16,3	44,2	46,5
3	9,3	90,7	14	7	9,3	44,2	11,6	11,6
4	46,5	9,3	55,8	23,3	34,9	18,6	11,6	18,6
5	27,9		11,6	55,8	39,5	20,9	14	4,7
Total	100	100	100	100	100	100	100	100

"*Overall Exploration*" reported a mean=3,86, while "*Overall Exploitation*" reported a mean=3,09. Also the Skeweness confirms the result. As evident from Figure 2-2, the distribution of the results concerning the "*Overall Exploration*" is left-skewed, showing a long tail on the left side due to the negative Skeweness (-,715). Conversely, the distribution of the results concerning the "*Overall Exploitation*" is right-skewed, showing a long tail on the right side, due to the positive Skeweness (2,905). We assumed that an average higher score on the items measuring exploration orientation compared to an average lower score on the items measuring exploitation

orientation would demonstrate a greater exploration orientation among the respondent VCs. Thus, results confirm Hypothesis 1.

To test which of the three dimensions (SSKA, DSKA, NSKA) impacted more one the overall average result, we compared the means of each of those. Due to space limitations, we do not show the figures representing the frequency distribution for each dimension referred to exploration orientation and to exploitation orientation. However, the relative results are reported in detail in Table 2-3 and Table 2-5. To simplify the interpretation of the results, we show in the following table (Table 2-6) only the descriptive statistics relative to the mean and standard deviation for the three dimensions.

Figure 2-2 Frequency Distribution



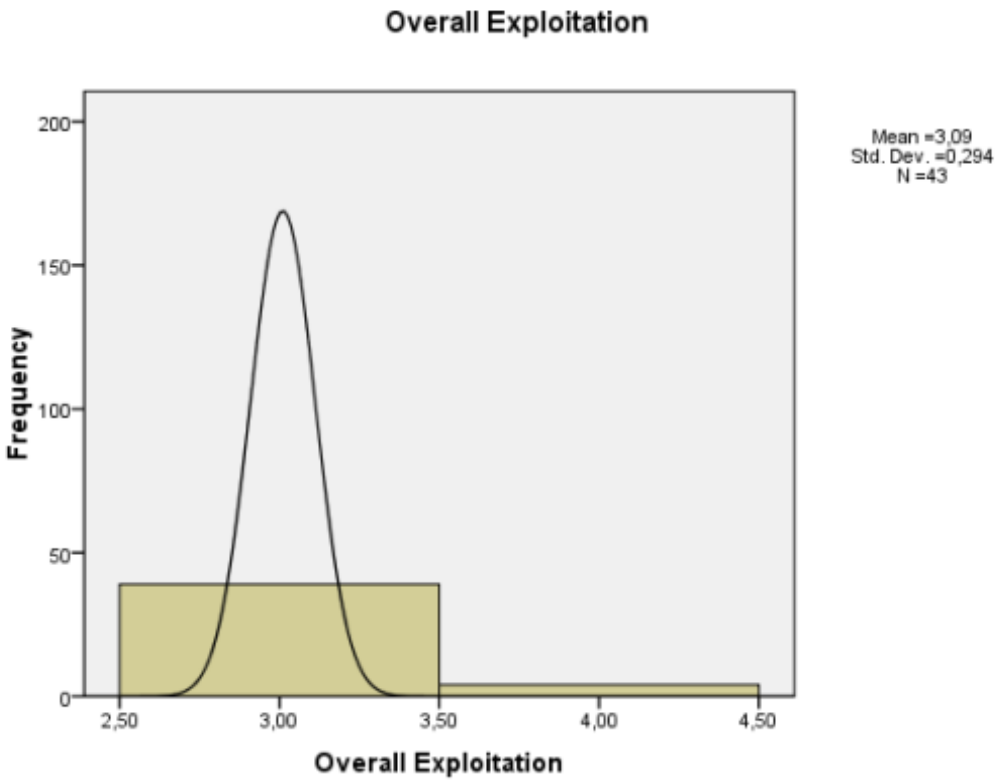


Table 2-6 Descriptive statistics: Mean and Standard Deviation SSKA, DSKA, NSKA

	Mean	*Std. Deviation*
Exploration Spatial Side	3,6047	,92940
Exploration Demand Side	4,1628	1,19384
Exploration Network Side	3,9302	1,18312
Exploitation Spatial Side	3,4419	1,00717
Exploitation Demand Side	2,5814	1,31353
Exploitation Network Side	2,4419	1,14022

Is evident the higher mean for the DSKA dimension as concern the exploration orientation and the higher mean for the SSKA dimension as concern the exploitation orientation. That is, the greater exploration orientation is affected by a greater demand side knowledge acquisition; VCs show a more explorative orientation by searching for new investment opportunities. On the other side, the greater exploitation orientation is affected by a greater spatial side knowledge acquisition; VCs show a more exploitative orientation by searching for opportunities into already known industry domains and local geographic contexts.

Additionally, to validate the result, we conducted a t-test to verify the existence of a significant correlation between each of the dimensions (SSKA, DSKA, NSKA) and their respective overall orientation (exploration or exploitation orientation), resulting into six pairs tests. Table 2-7 shows the results.

All the tests were satisfactory. Significant and positive correlation resulted for each pair (p-value>0.001).

Further, we ran a factor analysis to establish which dimensions explain most of the variance in our analysis. In detail, by running a principal components analysis we found that the overall analysis load on two components, and the 67% of the variance load on the first component (Table 2-8, Table 2-9). According to the analysis, only the overall exploitation can be removed from the analysis, due to the lower contribution (-,391) to the variance explanation (67,849%).

Table 2-7 Paired Samples Correlations and Tests

	Scale items	*Correlation*	*p-value*
Pair 1	*Exploration Spatial Side and Overall Exploration*	,850	,003
Pair 2	*Exploration Demand Side and Overall Exploration*	,786	,011
Pair 3	*Exploration Network Side and Overall Exploration*	,925	,323
Pair 4	*Exploitation Spatial Side and Overall Exploitation*	,340	,020
Pair 5	*Exploitation Demand Side and Overall Exploitation*	,412	,009
Pair 6	*Exploitation Network Side and Overall Exploitation*	,372	,014

Table 2-8 Principal Component Analysis: Total variance explained

Components	*Initial Eigenvalues*			*Extraction Sums of Squared Loadings*		
	Total	*% of Variance*	*Cumulative %*	*Total*	*% of Variance*	*Cumulative %*
1	5,428	67,849	67,849	5,428	67,849	67,849
2	1,021	12,766	80,615	1,021	12,766	80,615
3	,466	5,823	86,438			
4	,458	5,727	92,165			
5	,294	3,675	95,840			
6	,155	1,940	97,780			
7	,132	1,644	99,424			
8	,046	,576	100,000			

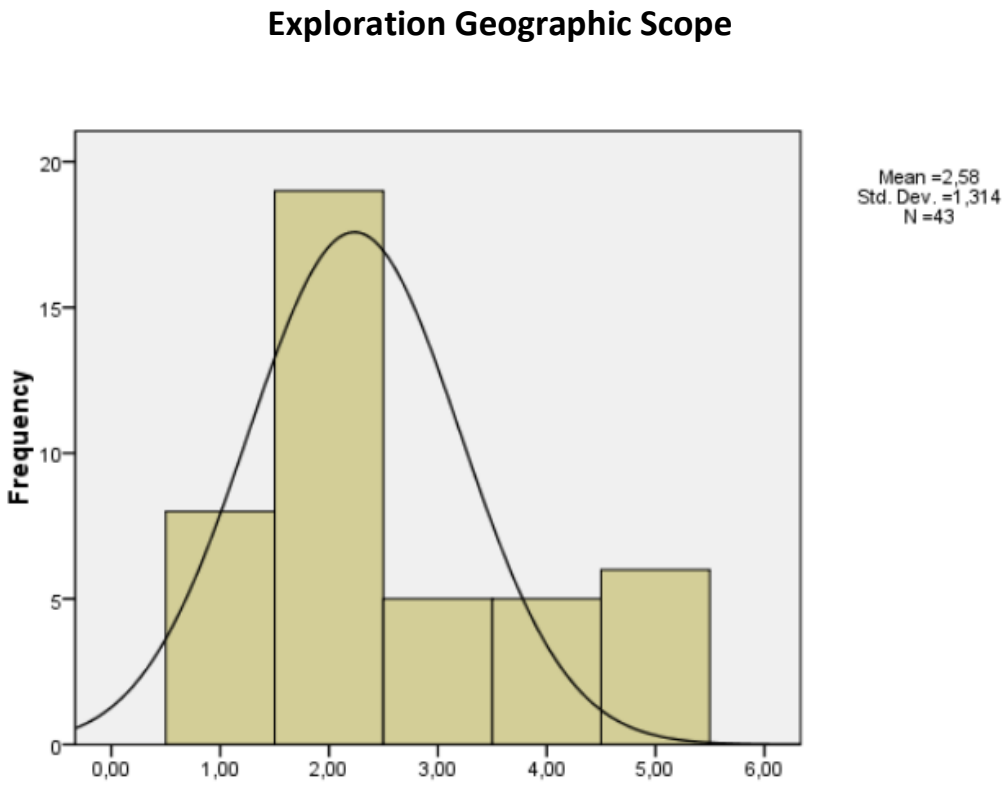
Table 2-9 Two Components Matrix

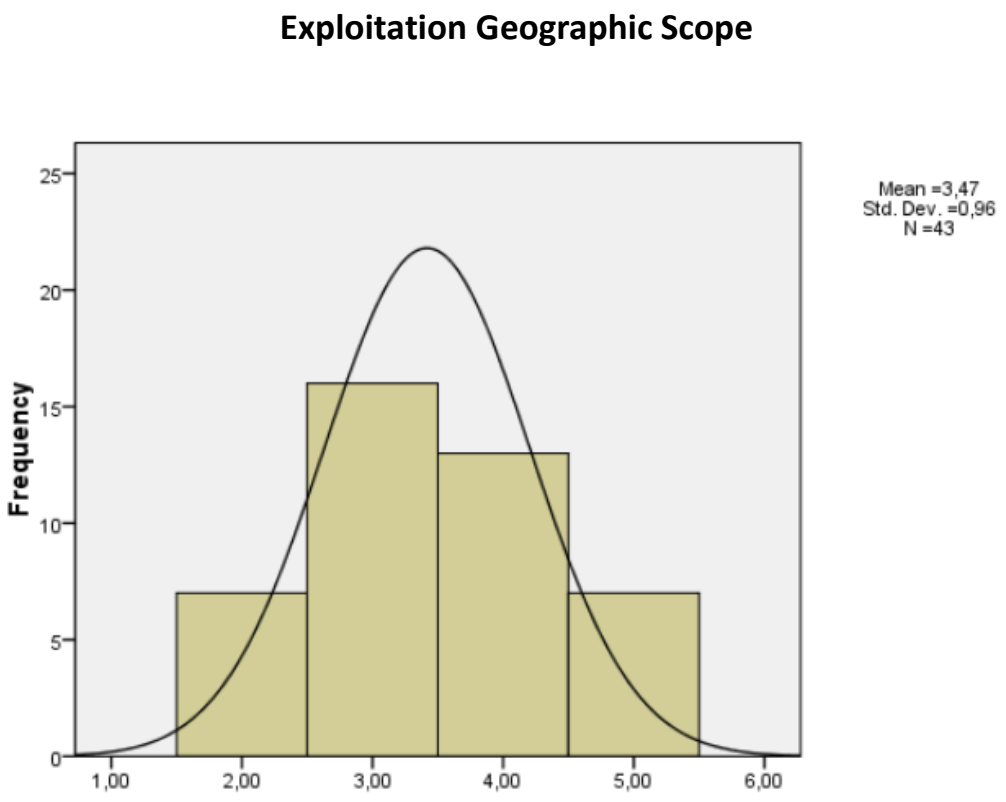
	Component	
	1	2
Overall Exploration	,940	,214
Overall Exploitation	-,391	,891
Mean Exploration Spatial Side	,856	-,064
Mean Exploration Demand Side	,809	,310
Mean Exploration Network Side	,915	,205
Mean Exploitation Spatial Side	-,789	,114
Mean Exploitation Demand Side	-,849	,160
Mean Exploitation Network Side	-,908	,012

To test for hypothesis 2, we compared the means of the results relative just to one of the SSKA items, the geographic proximity one (see the measurement instrument shown in Table 2-2).

Figure 2-3 shows frequency distribution, mean and standard deviation. The "*Exploration towards geographic scope*" reported a mean=2,58, while "*Exploitation towards geographic scope*" reported a mean=3,47. Also the Skeweness confirms the result. As evident from Figure 2-3, the distribution of the results concerning the "*Exploration towards geographic scope* " is right-skewed, showing a long tail on the right side due to the positive and high Skeweness (,707). Conversely, the distribution of the results concerning the "*Exploitation towards geographic scope*" even though right-skewed, with a long tail on the right side, reports a lower positive Skeweness (,104). Thus, the results show a higher score on the exploitation geographic scope item compared to the specular exploration-related one, due to results distributed on the higher points on the Likert-scale. We assumed that an average higher score on the geographic scope items measuring exploitation orientation compared to an average lower score on the specular items measuring exploration orientation would demonstrate a greater exploitation orientation among the respondent VCs. Thus, the results confirm Hypothesis 2.

Figure 2-3 Frequency Distribution Exploration and Exploitation Geographic Scope Item





2.5 Discussion

The co-evolutionary framework helped us to frame exploration versus exploitation orientation in a never explored research context: the VC industry.

The central idea of the co-evolution framework led scholars to follow an accurate approach anchored to the concept of "search". According to previous works, exploration vs exploitation are operationalized in terms of non-local versus local information- or knowledge-search behavior to discover new approaches towards technologies, products, and businesses; pursue new knowledge; experiment with new alternatives and business paths (e.g., Katila and Ahuja 2002, Rosenkopf and Nerkar 2001). We followed this approach and proposed a conceptualization of exploration versus exploitation orientation in terms of search for knowledge. We operationalized the constructs in terms of knowledge acquisition activities linked to two of the three dimensions of knowledge acquisition introduced by previous works in the organizational learning and evolutionary economics field of research: spatial-side knowledge acquisition (SSKA) and demand-side knowledge acquisition (DSKA) (Sidhu et al., 2004, 2007). We derived a third dimension adopting the social capital perspective to investigate on the network interactions and the relative knowledge resources a VC firm may search for. The resulting third dimension was the network-side knowledge acquisition (NSKA).

In light of the above premises, we stated that the greater the scope of external knowledge acquisition, the greater the exploration orientation showed by an organization; conversely, the narrower such scope, the greater the exploitation orientation.

In the context of VC, we identified the three dimensions into specific knowledge search domains within a VC conducts the main activity of seeking for investment opportunities.

VCs may build up their knowledge stocks focusing on a specific industry or a broad industry scope (SSKA); or focusing on a specific versus a non-local geographic area (SSKA); or on a restricted number of investments opportunities, engaging in follow-on investments, versus never explored investment opportunities (DSKA). Moreover, VCs may link their knowledge stocks to others, through more or less partners interactions in syndicated investments or, basically, an external (versus internal) advice-seeking, in so doing, accessing diverse information through their knowledge of others in the network they belong to (NSKA). If VCs show a greater orientation versus external or never explored domains, we stated that they are "exploration oriented" and adopt "explorative strategic rationales", conversely, VCs showing the opposite greater orientation towards a narrower search scope have been classified as "exploitation-oriented", hence showing high propensity to adopt "exploitative strategic rationales".

A first stage of the study was devoted to test the measurement instrument validity.

The results pertaining to the exploration-orientation measurement instrument are quite encouraging. Moving from the framework outlined above and our reconfiguration of the exploration orientation measurement instrument introduced by Sidhu et al. (2004, 2007), we conducted our empirical investigation in the VC industry. We were able to distil a parsimonious set of 12 items (6 pair items specular to each others). The measure covered all three identified dimension of the construct (SSKA, DSKA, NSKA). Importantly, the measure showed internal consistency, with satisfactory results in terms of reliability and unidimensionality (Cronbach's alpha>0.70; GFI<0.080; p-value<0.001). This fosters confidence in the adoption of the measure

in hypotheses-testing research. The study was devoted to propose a composite exploration-orientation construct in the VC field of analysis, and test for hypotheses pertaining the resulting higher or lower score for the three dimensions (SSKA, DSKA, NSKA) contributing to the overall score for the construct. A first result of the study was to increase the validity of the exploration measure suggested by previous scholars (Sidhu et al., 2004, 2007) and to establish initial validity of the exploration measurement in the specific context of VC.

While scholars in co-evolutionary economics and organizational learning devoted research to answer the inquiry: "Why do some organizations show more exploration orientation while, conversely, others show more exploitation orientation?" – the measurement instrument proposed by Sidhu et al. (2004,2007) was primarily devoted to find an answer to that inquiry - at this point of research we focused on a prior step, trying to deepen the understanding on whether an explorative versus an exploitative orientation prevails in our context of analysis, the VC industry. A further research will be aimed to cross over and investigate on the antecedents of a greater or narrower exploration versus exploitation orientation among VCs.

The investigation was conducted at an individual level of analysis. This is not detrimental to the reliability and representativeness of the findings because the rationales adopted at the manager-level are representative of the orientation of the overall VC firm. In fact, VC firms act through VC funds as investment responsible. Each fund is managed by a group of individuals (the VC managers) who make investment choices and manage the knowledge stocks adopting the shared view and policy of the firm and acting to achieve a common investment goal. This led us to be confident on the representativeness of VC managers orientations for a generalization of the findings at a VC firm level.

A first hypothesis was developed to answer the question: "Are VCs more explorative or more exploitative?". Moving from the evidence in the literature, we supposed a relatively greater exploration orientation. The results were satisfactory. In fact, hypothesis one was confirmed by our empirical investigation. VCs showed a relatively high explorative orientation, with average high scores (mean=3,86), compared to the resulted overall exploitation orientation (mean=3,09). Concerning the higher or lower scores for each of the three dimensions, DSKA contributed to the overall exploration result with the higher score (mean=4,16). On the specular side, SSKA contributed to the overall exploitation orientation with the average higher score (mean=3,44). Thus, results showed evidence of a more explorative orientation among VCs, especially as concern the search for new investment opportunities. That is, VCs are more likely to explore – search for non-local domains – by seeking new investment opportunities, while lower propensity was registered towards follow-on investments. On the specular side, notwithstanding VCs narrower exploitation orientation, the more exploitative search scope is the spatial-side one. That is, VCs are less likely to explore for distant geographic domains and new industries. In other words, spatial proximity matters in VCs investment decisions. The latter result is a partial confirmation for our second hypothesis. Precisely, moving from the literature on VC investments spatial distribution (e.g., Sorenson and Stuart, 2001; Lutz et al., 2012) we assumed VCs would show a lower explorative orientation in terms of geographic search. A further test was conducted to verify if items related to geographic scope scored lower if compared to the other items in the exploration and exploitation scales. Hypothesis 2 was confirmed by our empirical tests. In fact, results showed a higher score on the exploitation geographic scope item (mean=3,47) compared to the specular exploration-related one (mean=2,58). This result prove VCs relatively higher

propensity towards geographic proximity. That is, VCs prefer to invest in close or well-known geographic areas.

To explain the obtained result, the most accepted reason according to the literature on VC investments spatial distribution is the intent to preserve the effectiveness a more experience in an well-know geographic domain can assure to VCs activity (Tripsas, 2009); to reduce information asymmetries among firms and network partners located within different boundaries (Norton and Tenenbaum, 1993); and, consequently, to reduce the coordination costs deriving from a diversified geographic scope (Grant and Baden-Fuller, 2004; Matusik and Fitza, 2012).

2.6 Limitations and contributions

Some potential and actual limitations of this study can be discussed. First, empirical limitations are related to the operationalization of the variables, the sample and the use of a survey methodology. Although the study relied on validated scales and efforts were made to reduce bias, only the perspective of the randomly selected VC managers is being taken into consideration to measure exploration versus exploitation orientation variables.

With regard to the sampling, in the current research exploration and exploitation orientation among VCs are considered in a single country context, the Canadian country, with some industries more represented than others in terms of VC investments focus (clean-tech, software, biotech and digital). To allow for further generalizations beyond the investigated population, subsequent research can be directed to replicate the study to other contexts. Additionally, the small final sample size (43 VCs) constraints the reliability of the findings, inviting to replicate the study over a wider sample of VCs.

Although the scales were tested for reliability and validity, self-reported and web-administered data can reflect respondents' biases, misunderstanding of the questions, constrained memory or casuality. The subjectivity is a limit in the chosen instrument for conducting the empirical investigation. However, extreme care was taken in drawing the survey questionnaire to avoid bias. For instance, precise instructions were given to respondents to explain each question in advance. By any chance, caution must be exercised when considering the findings of this study. Future research is invited to adopt methodological triangulation in the form of multiple measurements of variables to enable the drawing of more reliable conclusions about the findings reported here.

As concern the measurement instrument, only knowledge-related items have been developed. Further operational items can be adopted in further studies, taking into consideration experimentation and risk-taking, both related to "exploration" and the VC industry.

A further methodological limitation concerns the absence of longitudinal objective data (excluding the subjective responses pertaining to the activities VCs have been engaged with in their VC experience), because of which a generalization of the findings to the overall VC experience cannot be assured.

From a theoretical point of view, a limitation can be noted in the use of the co-evolutionary economics perspective in addition to the knowledge-based view. Different findings could be

associated to a different framework, for example adopting the agency theory (focusing on the information asymmetries affecting VC investment activity when they diversify among different domains and invest outside the VC firm boundaries) and the related transaction costs theory.

Moreover, the study do not investigate on casuality. Antecedents and outcomes of a greater or lower exploration orientation among VCs need to be investigated. Further research can overcome this limitation.

Despite the limitations above stressed, we believe that this study has made progress towards filling important gaps in the literature. It advances a multidimensional operational measure in the VC industry anchored to the idea of spatial-side, demand-side and network-side knowledge acquisition. The scales for all the three items are reliable and unidimensional. In this context, the work finds preliminary evidence that exploration and exploitation can be operationalized in the VC context. The novelty of such investigation contributes to the literature on organizational learning and entrepreneurship, with a special focus on VC.

Through proposing and validating a measurement instrument to operationalize exploration orientation in the VC context, the study contributes to establish the foundations for a systematized empirical research into an explorative versus an exploitative behavior among VCs. The study traces a first step to a more advanced investigation towards exploration versus exploitation orientation among VCs. Future studies can investigate on the antecedents and outcomes associated to the trading-off rationales to examine why a VC can show more propensity towards one orientation or, alternatively, can show the co-existence of both rationales. Furthermore, future studies can link exploration versus exploitation orientation (i) to the decision making process adopted by VCs, and, in detail, VCs decision quality, and (ii) to VCs performance, to investigate on which orientation can be more beneficial for a higher VC investment performance. Next studies will go further on the outlined direction.

Chapter 3

EXPLORATION VS EXPLOITATION ORIENTATION AND DECISION-MAKING ACTIVITY IN THE VENTURE CAPITAL CONTEXT

3.1 Abstract

This study investigates VC decision making by adopting some novel conceptual lenses in the literature. Exploration and exploitation orientation in terms of knowledge search are linked to decision comprehensiveness by adopting the measurement instrument suggested in the first-stage study of the dissertation. Moving from our conceptual framework, we supposed a linear relationship between exploration and decision comprehensiveness and, conversely, a curvilinear relationship between exploitation and decision comprehensiveness.

We investigated among 43 Canadian VCs to test for hypotheses. Our findings reveal VCs more likely to explore make more accurate decisions, showing superior decision comprehensiveness. Conversely, VCs more likely to exploit make less accurate decisions, revealing a higher propensity towards intuitive decision processes and less decision comprehensiveness. Further findings deny a significant moderating effect played by VCs experience on the relationship investigated, contrary to what hypothesized.

Keywords: exploration orientation, exploitation orientation, decision-making, venture capital, overconfidence, decision comprehensiveness

3.2 Introduction

The decision-making process and the decision criteria adopted by VCs have been largely discussed in entrepreneurship and management literature in the last four decades.

The decision-making activity in VC firms occurs in an information-redundant and highly uncertain environment, with time constraints and the involvement of high levels of emotions. Under such conditions, VCs act as intuitive decision-makers (MacMillan et al., 1987; Zacharakis and Shepherd, 2001).

The intuition develops after making a large number of investments evaluated through a decision process which involves different criteria and logics depending on the step of the deal-flow process or the portfolio composition at the moment the decision is making.

It has to be noted that this topic has been investigated mostly adopting the conceptual lenses belonging to the finance and entrepreneurship literature (e.g. Bergemann and Hege, 1998; Shepherd and Zacharakis, 2002; Zacharakis and Meyer, 2000; Shepherd et al., 2003; Dimov et al., 2007).

A broader understanding of the decision-making process in VC firms will be provided by adopting a strategic management approach.

The aim of this study is to integrate extant studies on the topic adopting an unexploited conceptual lens in the literature on VC decision-making. Moving from the knowledge-based conceptualization of exploration and exploitation proposed in the first study, we link this perspective to the judgment/decision making literature to investigate the effect of exploration vs exploitation orientation on the intuitive decision-making typically adopted by VCs.

This study is a second-stage project following the previous study of the research that investigates on the dimensions to measure exploration and exploitation orientation in the VC industry.

Accordingly to our conceptualization of exploration and exploitation orientation as related to knowledge stocks acquisition - with regards to the industry scope, geographic scope, the investment opportunity, and the network interactions (not only with co-investing partners) - we assume that more exploitation oriented VCs will have more specialized knowledge stocks. More specialized knowledge means VCs rely on more specific information with regards to all the dimensions pertaining to the investment choice.

Conversely, more exploration oriented VCs will have more diversified knowledge stocks. More diversified knowledge means VCs rely on less specific information with regards to each dimension pertaining to the investment choice.

As well known in literature on VCs' decision-making, VCs suffer from "overconfidence", that is *the tendency to overestimate the likelihood that one's favored outcome will occur.* (Zacharakis and Shepherd, 2001, p.313). Overconfident VCs are less accurate in their evaluation process, more confident on their personal skills, less motivated to search for additional information or to interact with others to integrate knowledge resources and achieve higher performances.

Confidence increases as the amount of specific information increases (e.g., Zacharakis and Shepherd, 2001; Elstein and Bordage, 1988). Thus, more specific information increases

confidence and decreases decision accuracy; therefore, intuitive decision processes increase and, consequently, this will be detrimental to decision-making performance.

Moving from the above premises, we hypothesize that a more exploitation orientation will have a curvilinear relationship (inverted U-shaped) with decision-making performance, more specifically with regards to decision comprehensiveness (e.g., Miller, 2008; Forbes, 2007; Fredrickson, 1984; Fredrickson & Mitchell, 1984). Conversely, we hypothesize that a more exploration orientation will have a linear relationship (U-shaped) with decision-making performance (comprehensiveness).

Previous studies in the area of judgment/decision-making have demonstrated the effects of expertise on decision-making (e.g., Shepherd et al., 2003). Precisely, more experience not always leads to better decision processes (e.g., Shepherd et al., 2003; Camerer and Johnson, 1991; Einhorn, 1974).

VC firms experience will play a moderating role on the relationship mentioned above. We suppose that the moderating effect of increasing VC experience on the relationship we investigate on will enhance the curvilinear one and will make less pronounced the linear one.

To guide this second-stage research we asked a set of some related research questions:

1) To what extent do exploration vs exploitation orientation impact on the decision-making performance/comprehensiveness of VC companies?
2) Which will be the relationship between a more explorative-oriented VC or, conversely, a more exploitative-oriented VC and the decision-making performance/comprehensiveness achieved by the VC company?
3) How and to what extent does the VC experience moderate the relationship?

To address these questions we conducted our analysis at the individual level, more in detail at the VC manager level. A sample of Canadian VC firms is collected to search for empirical evidence.

VC firms act through VC funds as investment responsible. Each fund is managed by a group of individuals (the VC managers) who make investment choices and manage the knowledge stocks adopting the shared view and policy of the firm and acting to achieve a common investment goal. Decisions are made by VC managers. Thus, the decisions adopted at the manager-level are representative of the orientation of the VC firm. In light of this, the choice to set our investigation at the individual level will not be detrimental to the reliability and representativeness of the findings.

This study aims to contribute to the literature on exploration and exploitation, by investigating the impact of both rationales on the decision making activity, in particular in the VC context; and to the literature on VCs' decision-making, increasing the understanding on which factors positively affect the decision-making effectiveness.

Two practical contributions will be given to both VCs and entrepreneurs. Firstly, decision-making effectiveness increases VC performance. Faster decision processes and better decisions lead to superior performance outcomes. Thereby, an investigation on the factors affecting a more effective decision-making can increase the understanding of how VCs perform good. Secondly, for entrepreneurs asking for funding this deeper knowledge will represent a tool to choose the right VC investors looking at their exploration vs exploitation propensity. In fact, their

orientation will show to entrepreneurs how VCs decide and, consequently, the likelihood to achieve a high investment performance outcome.

The study proceeds as follows: First, the decision-making activity in VC firms is investigated. Second, the study looks at the overconfidence bias in decision-making and link this to the more or less specific knowledge stocks, adopting the conceptualization of exploration versus exploitation of knowledge stocks proposed in the previous study. This section discusses the effects of what previously argued on decision-making performance, in terms of decision comprehensiveness, and develops a set of testable hypotheses. Finally, the study discusses the findings of the empirical investigation, the implications of the research for both literature and practice, and the limitations of the study which invite for future research.

3.3 Literature review and hypotheses

The decision-making activity in VC

VCs invest, manage and return institutional investors' money by funding the entrepreneurial ventures (portfolio companies), contributing to their growth and expansion and, finally, as concern the most successful investments, exiting from the investment by selling the company to a public or corporate investor (De Clercq and Dimov, 2008).

The VC investment decision-making process is designed to reduce the risk of adverse selection. VCs provides the venture financed both equity (on a confidential basis) and non-financial resources, such as business advice. By reducing information and contracting costs, the VC can supply equity to entrepreneurial ventures too small to access the public equity market efficiently (Fried and Hisrich, 1994).

VCs select the investments to build up their portfolio to reduce company-specific risks and increase the returns from the investments.

Given that VCs are highly selective in their funding decisions, scholars have been always interested to deepen the understanding of VC decision-making (e.g. Hoban, 1976; Tyebjee and Bruno, 1984; MacMillan et al., 1985, 1987, 1989; Khan, 1987; Hall and Hofer, 1993; Fried and Hisrich, 1994***;*** Muzyka et al., 1996; Shepherd, 1999; Zacharakis and Meyer, 2000; Zacharakis and Shepherd, 2001, 2005; Franke et al., 2006, 2008; Dimov et al., 2007; Petty and Gruber, 2011).

VCs attempt to assess the likelihood of success or failure by evaluating information surrounding the particular venture. To receive funding, new ventures must past an initial screening, by reviewing the business plan, followed by a long due diligence.

Previous studies offer insights on the evaluation criteria adopted in the screening process by VCs. A review of this literature suggests that the more employed selection criteria are (i) the firm's management team; (ii) the industry; (iii) the product or services, considered as the "value proposition"; (iiii) the financial potential (e.g., Tyebjee and Bruno, 1984; MacMillan et al., 1985; Muzyka et al., 1996; Franke et al., 2008).

Table 3-1 Prior research on VC decision-making

Study	Research Focus	Collection Method	Sample
Hoban (1976)	Predictors of venture success	Archival Analysis, Questionnaire	3 US-based VC firms
Tybejee and Bruno (1984°)	Evaluation process and VC investment criteria	Survey method, questionnaire	46+41 US-based VC firms
MacMillan et al. (1987)	Screening criteria and successful vs unsuccessful performance	Questionnaire	67 US-based VC firms
Kahn (1987)	Investment characteristics and related successful outcome	Questionnaire	36 US-based VC firms
Hisrich and Jankowicz (1990)	VC intuition and decision making	Interviews	5 VCs (context unknown)
Hall and Hofer (1993)	Investments decision criteria	Interviews	4 US-based VC firms
Fried and Hisrich (1994)	A model of VC investment decision-making process	Interviews, Case-study	18 US-based VC firms
Muzyka et al. (1996)	Factors adopted in the investment evaluation	Interviews, Questionnaire	73 Europe-based VC firms
Shepherd (1999)	VC evaluation of new venture survival	Conjoint Exp.	66 Australia-based VCs
Zacharakis and Meyer (2000)	Decision aids in VC decision making	Conjoint Exp.	53 US-based VC firms
Zacharakis and Shepherd (2001)	VC overconfidence in investment decisions	Conjoint Exp.	53 US-based VC firms
Shepherd et al. (2003)	VC experience and the influence on decision-making	Questionnaire	66 Australia-based VCs
Franke et al. (2008)	VC evaluation of new venture proposals	Conjoint Exp.	51 Europe-based VCs
Dimov et al. (2007)	VC characteristics and investment selection	VentureXpert database	108 US-based and 51 Europe-based VCs
Petty and Gruber (2011)	Decision-making criteria and investment evaluation process	Archival data analysis	1 Europe-based VC firm

The majority of these studies underestimated the cognitive differences in how VCs make decisions, although is well known how cognitive differences are potentially impactful on the exploitation of an opportunity and the investment performance (Venkatraman, 1997; Zacharakis and Shepherd, 2001).

Investment decisions rarely come out from a rationale and structured procedure. While the information used by the VC firm is highly quantified (comprising balance sheets, formal agreements, market information, asset evaluations), subjective qualitative evaluations about the information lie at the heart of the decision to be made. VC investment decisions can be

distinguished by the value of the assets involved and by the extent to which information, institutional constraints, company policies, and personal beliefs are combined into a final judgment by a subjective process on the part of the venture capitalist (Hisrich and Jankowics, 1990).

It is well recognized in the decision-making literature that decision makers are not perfectly rational. By serving not merely as an information-producing agent, but as a decision-making agent, VCs make investment decisions in an information-redundant and highly uncertain environment, with time constraints and the involvement of high levels of emotions. Under such conditions, VCs act as intuitive decision-makers (MacMillan et al., 1987; Zacharakis and Shepherd, 2001).

In light of this, contributions raised by scholars on judgment/decision making, to investigate on how much the automatic information processing, biases and heuristics inhibit optimal decisions (Zacharakis and Meyer, 2000; Zacharakis and Shepherd, 2001) .

Overconfidence, exploration vs exploitation of knowledge, and decision comprehensiveness

Decisions made in a highly uncertain environment involve time constraints, high levels of emotions and automatic information processing, leading to cognitive errors (Baron, 1998). This type of environment is familiar to the one VCs experiment when making their investment evaluations (Zacharakis and Meyer, 2000). Much of the information which surrounds VCs is uncertain, non-familiar and ambiguous, leading VCs to be affected by cognitive biases.

Many biases and heuristics are investigated in the cognitive literature and the judgment/decision-making literature. Biases affect how decision-makers obtain and use information in order to make a judgment. Moving from previous works, we focus on the most common and pervasive: the overconfidence bias (Griffin et al., 2001; Zacharakis and Shepherd, 2001).

Is well known in literature on VCs' decision-making that VCs suffer from "overconfidence", that is "*the tendency to overestimate the likelihood that one's favoured outcome will occur, and the validity of one's personal judgment even when there is no personally favoured hypothesis or outcome*" (Griffin et al., 2001, Zacharakis and Shepherd, 2001, p.313). Overconfident VCs are less accurate in their evaluation process, more comfortable with their personal skills, less motivated to search for additional information or to interact with others to integrate knowledge resources and achieve higher performances. If VC decision-makers are overconfident they may limit their information search (e.g., Cooper et al., 1995), and reduce their knowledge stocks. VCs affected by overconfidence bias carry out their decision process by relying on existing knowledge instead of seeking additional information. This propensity towards overconfidence may be detrimental to investment opportunity selection and evaluation, because VCs may be too optimistic on their decision ability to select the proper investment, reducing the right perception of potential opportunities and pitfalls (Zacharakis and Meyer, 2001). In fact, scholars generally argue that overconfidence has a negative impact on decision quality and the decision-making overall performance as a result.

Confidence increases as the amount of specific knowledge increases (e.g., Zacharakis and Shepherd, 2001; Elstein and Bordage, 1988). Due to the availability of more information to evaluate, VCs focus on the more salient knowledge factors and underestimate other factors that are more pertinent to the decision. Thus, more specific knowledge increases confidence and decreases decision accuracy; therefore, intuitive decision processes increase and, consequently, this will be detrimental to decision quality and the overall decision-making performance.
Decision-making performance is typically intended in terms of accuracy, decision consensus, decision reliability, systematic processing, and related to bootstrapping models (e.g., Shepherd et al., 2003; Logan, 1990).
We adopt *decision comprehensiveness* (e.g., Miller, 2008; Forbes, 2007; Fredrickson, 1984; Fredrickson & Mitchell, 1984) as a representative construct of the decision-making performance, diametrically in contrast with the automatic processing or the intuitive processing which are detrimental to decision-making performance. Thus, we conceptualize decision quality in terms of decision comprehensiveness. This is defined as "*the extent to which an organization attempts to be exhaustive or inclusive in making and integrating strategic decisions"* (Fredrickson and Mitchell, 1984, p. 447). The inquiry about to what extent strategic decisions are comprehensive has been at the center of studies on strategy formulation (Eisenhardt and Zbaracki, 1992), which state that the analysis and integration of a greater information stock in decision-making is beneficial to companies by increasing the strategic understanding of the context they work in. For example, decision comprehensiveness can improve firm performance in highly uncertain environments as companies need information about the trade-off between the market opportunities and threats (Forbes, 2007; Goll and Rasheed, 2005; Miller, 2008). VCs act in a highly uncertain environment and make strategic investment decisions. In light of this, we considered the VC context under investigation ideal to evaluate decision quality in terms of decision comprehensiveness.
In our first-stage research project we interpreted the knowledge stock at the center of the interplay between an exploration versus an exploitation orientation among VCs.

Drawing on the previous study and the proposed conceptualization of exploration and exploitation orientation as related to greater or narrower knowledge search in non-local domains - with regards to search dimensions like the industry scope, geographic scope, investment opportunity, and network interactions (not only with co-investing partners) - we assume that more exploitation oriented VCs will have more specialized knowledge stocks. It means VCs rely on more specific information with regards to all the dimensions pertaining to the investment choice.

Conversely, more exploration oriented VCs will have more diversified knowledge stocks. It means VCs rely on less specific information with regards to each dimension of the investment process.

We distinguished three knowledge search domains and studied the exploration versus the exploitation VCs may show as referred to each of these dimensions. VCs may build up their knowledge stocks focusing on a specific industry or a broad industry scope (SSKA); or focusing on a specific versus a non-local geographic area (SSKA); or on a restricted number of investments opportunities, engaging in follow-on investments, versus never explored investment opportunities (DSKA). Moreover, VCs may link their knowledge stocks to others, through more or less partners interactions in syndicated investments or, basically, an external (versus internal)

advice-seeking, in so doing, accessing diverse information through their knowledge of others in the network they belong to (NSKA).

Drawing on the above premises, with reference to each knowledge search domain identified, we develop the following hypotheses:

Hypothesis 1: *The greater the exploitation orientation, with regards to each knowledge search dimension, the lower the decision comprehensiveness*.

Conversely,

Hypothesis 2: *The greater the exploration orientation, with regards to each knowledge search dimension, the decision comprehensiveness.*

The moderating role of experience

Decision-making processes employed by VCs vary in experience. "*Does more experience at the venture capital task result in better decisions?*". Scholars addressed this important question because findings from previous studies are controversial. In fact, some studies provide evidence that experienced decision-makers in a given task may adopt superior decision processes compared to those with less experience (Anderson, 1983; Dreyfus and Dreyfus, 1986; Nosofsky, 1984, 1986, 1987). Conversely, other studies in the area of judgment/decision-making suggest that increasing experience does not always lead to better decisions (e.g., Camerer and Johnson, 1991). For instance, experienced decision-makers rely on various heuristics and biases as those who suffer few experience, both incurring into equally relevant mistakes (Roose and Doherty, 1976; Ullman and Doherty, 1984). Furthermore, experienced decision-makers appear to suffer from overconfidence (Zacharakis and Shepherd, 2001), being less likely to engage in counterfactual thinking , thus failing to attain important insights into how and to what extent performance may be improved in different scenarios (e.g., Roese, 1997). Hence, experienced decision-makers may fail to develop better decisions, with negative effects on firm performance. By extrapolation, on the one hand, VCs may become more accurate in choosing the ''right'' companies as their experience increases; on the other hand, VCs may be affected by a curvilinear relationship between experience in the industry and decision quality, resulting in underestimation of valuable investment opportunities and, conversely, overestimation of investments less likely to experiment successful performance.

Due to the turbulent nature of the VCs' environment, their information processing capacity is less structured and high levels of emotion and extreme time constraints affect how they make their decisions. Moving from the work of Shepherd et al. (2003), such conditions have been considered the premise to consider highly experienced VC decision-makers more intuitive rather than conscious while performing the decision process. VCs incur into an automatic processing, devoting less effort to systematically evaluating each information factor to make a judgment (Zacharakis and Shepherd, 2001).

Automatic processing requires less cognitive efforts. As a result of this process, VCs come to rely on their ‘‘efficient’’ information processing strategy and tend to invest less cognitive effort. Less cognitive effort can lead to a greater susceptibility to the various biases and heuristics previously mentioned. Therefore, the benefits of experience in reducing the cognitive effort required to make a judgment may be exceeded by the potential costs of reduced investment of cognitive effort in the decision-making task, with detrimental effects on ultimate decision quality and comprehensiveness (Shepherd, 2003).

Sometimes in VC investment decisions the effect of experience can be underestimated, but the relationship between growing experience and decision processes may as well be curvilinear in nature. In other words, initially, growing experience enhances VCs' decision making capabilities. Lately, however, more experience may be detrimental to decision quality and comprehensiveness.

Along the proposition of an existing curvilinear relationship between experience and decision comprehensiveness, we offer the following hypotheses:

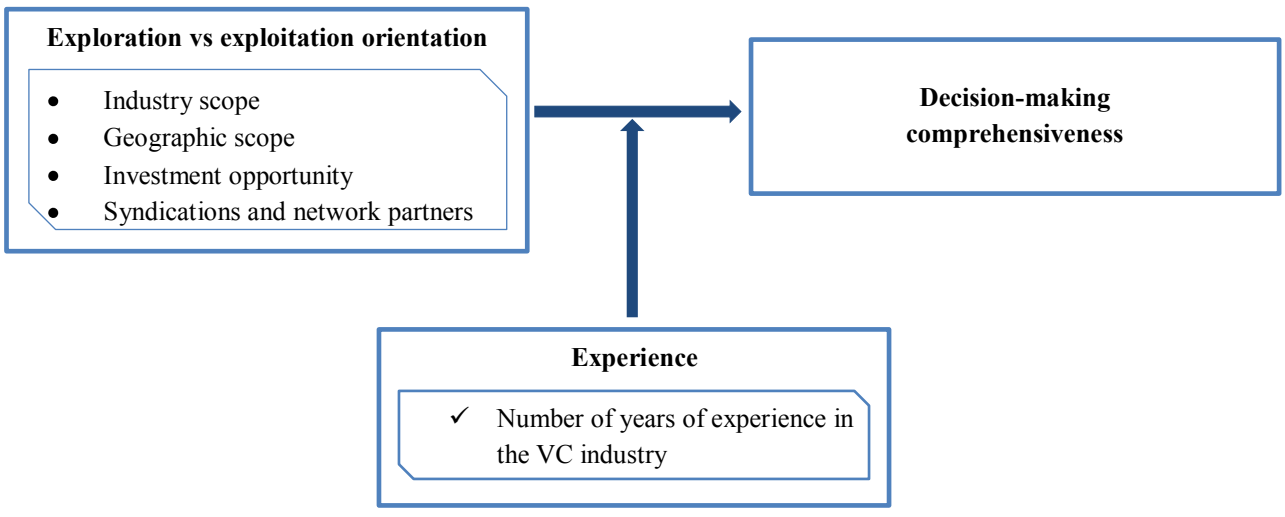
Hypothesis 3a: *The curvilinear relationship (inverted U-shaped) between exploitation orientation, with regards to all the dimensions, and the decision comprehensiveness will be moderated by the experience of the VC; more experience in the VC industry will make the relationship more pronounced.*

Conversely,

Hypothesis 3b: *The linear relationship (U-shaped) between exploration orientation, with regards to all the dimensions, and the decision-making comprehensiveness will be negatively moderated by the experience of the VC; more experience in the VC industry will make the relationship less pronounced.*

We draw our conceptual framework as follows (Fig.3-1).

Figure 3-1 Conceptual Framework



3.4 Research method and data collection

Sample and data collection

To test the hypotheses we conducted an empirical investigation among the VC members of the CVCA (Canadian Private Equity and Venture Capital Association).

The Canadian country context has been adopted by scholars researching on VC industry (Cumming, 2006; Cumming and Johan, 2008, 2010) due to the novelty in terms of area of investigation (compared to the US context) and the recent development of the Canadian VC industry, justifying a growing research interest. Moreover, Canada and U.S. both derive from the legal "family" of the Common Law system, thus it is interesting to investigate on possible differences between the well known U.S venture capital industry and the less explored Canadian one moving from the same corporate governance system.

Since the CVCA represents both private equity and venture capital investors, we included in our initial sample only the VCs.

We collected data on VCs from the CVCA VC members list available on Thomson One Banker electronic database. The initial sample consisted of 90 VC firms. A first screening procedure reduced the population to 80 firms due to the lack of available contacts for the VCs excluded by the sample. We directly accessed to the mailing list with address and management team information of the VCs associated and, consequently, derived a "n" population matching with the "N" one because no stratification was necessary.

A survey electronically submitted by a web form has been adopted to collect data. It is well known the low propensity of VCs to give access to sensitive data. To overcome this possible limitation and, consequently, increase the likelihood to survey only knowledgeable respondents, we sent the survey only to board members. VCs were randomly selected, choosing the third contact from every company contact list in the database. A cover letter accompanied the questionnaire to clearly explain the purpose of the research.[3]

We conducted the study at an individual level (VC manager) rather than at a firm level for a double reason: (i) the low propensity of VCs to take part to research investigations, hence, the difficulty an investigation at a firm level would represent; (ii) the rationales adopted at the manager-level are representative of the orientation of the VC firm (as well explained in the introduction).

Three reminders over a period of one month and a half have been sent to increase the likelihood to get a satisfactory response rate.

After the initial mailing, if we did not get any response, we sent a reminder note and we recurred to direct email contacts (after 10 days). We sent a final reminder note after the three-week period.

To test for non-response bias, we examined differences between respondents and non-respondents. A t-test showed no significant differences ($p > .05$) between the two groups based

[3] An individual feedback-report will be sent to each respondent. Additionally, we will draw up a general report for the CVCA with our findings and the individual performance feedbacks of each member participating in the survey

on the management team size, VC firm age, and firm size (in terms of funding capital). The result indicated that differences between respondents were not related to nonresponse bias.

To overcome possible limitations related to the single-informant data, we tried to survey a second member of each VC respondent company and, then, calculate an agreement score for item-study variable. Actually, we realized the difficulty of such a purpose, due to the low propensity of VCs to participate to any kind of investigation.

Finally, we received 50 filled questionnaires, with a response rate of 62%. This response rate was distributed among the three reminders as follows: a 18% response rate after the first reminder; a 40% response rate after the second reminder; a 62% response rate after the final reminder.

After a clean-up of records with missing data a final sample of 43 respondents (VC managers) was reached.

The sample consisted of both male (90%) and female (10%) VC managers. The average respondents age was 46 year old, ranging between 30 to 64 year old. The 50% of the respondents got an MBA; the 31% had an educational background in the management field area, the 26% had an engineering educational background, a 12% had a law educational and an economics educational background, while the remaining percentage was distributed between healthcare, physical sciences and physiology educational background. The 73% of the VCs had a previous professional experience as an entrepreneur.

The firms had on average 17 full-time staff members, with firm size ranging between 3 to 55 employees. Firm age was on average 18 years, ranging from 2 to 60 years. The respondents were General Partner (53%), Associate (19%), Fund Manager (11%), Principal (10%), CEO (7%). The average total capital commitment was around 455 million dollars. The 50% of the VCs were engaged in the clean-tech, software, biotech and digital industry. Finally, the 50% of VC firms were specialized in all investment stages, from seed capital to expansion capital, the 20% in all stages excluding the seed capital; the 20% in all stages excluding the expansion capital; the remaining 10% were specialized only in early stage investments.

Measurement of constructs

To measure our constructs we adopted scales from the first-stage of the research, concerning exploration and exploitation, and from previous literature, concerning the dependent variable. Each scale has been verified through various reliability analyses.

Decision comprehensiveness. It is an holistic measure comprising several qualitative dimensions. We measured this dependent variable by an eight-item Likert scale, modeled on the one adopted by Alexiev (2010) and developed by Miller et al. (1998). We used a 5-point Likert scale anchored at “weakly involved” and “strongly involved”. VC respondents were asked to rank the decision making activity on the degree to which they: (1) developed multiple scenarios to solve a problem; (2) evaluated different options to manage the investment X; (3) considered many different criteria for eliminating courses of actions; (4) conducted various analysis on suggested courses of action; (5) searched for consensus to make a pre-deal decision or post deal decision; (6) examined multiple explanation for the problem; (7) conducted a more in-depth

analysis to evaluate the opportunity in the investment selection process; (8) based their decisions on factual information (α=,85).

Exploration versus exploitation orientation. We described the concepts in our first-stage study in terms of greater or narrower knowledge search in non-local domains. We developed a scale for exploration and exploitation moving from previous works (Sidhu et al., 2004; Mom et al., 2007; Sidhu et al., 2007). We originally developed a 10-item scale for exploration and exploitation according to the three identified dimensions of exploration (SSKA, DSKA, NSKA). We reduced the first set of items to 6 items for exploration and exploitation, with two items for the SSKA dimension, one item for the DSKA dimension and three items for the NSKA dimension. The items were developed as statements regarding knowledge-gathering propensity in relatively local versus non-local domains. More in detail, the exploration scale measured the extent to which a VC manager showed an exploration orientation during his experience in the VC company he currently works in. Conversely, the exploitation scale measured the extent to which a VC manager showed an exploitation orientation under the conditions previously mentioned.

The items have been measured on a 5-point Likert scale anchored at "weakly involved/oriented" and "strongly involved/oriented".

For a detailed description of the items edition procedure we suggest to view the first-stage study (Section 4, "*Exploration and Exploitation Orientation Measures*").

Experience. We measured our moderator as scholars previously did (Shepherd et al., 2003). In fact, experience was measured by the number of years that a decision-maker had worked as a VC (mean of 9,7 years; standard deviation of 5,91). While most studies operationalize experience in terms of the number of years performing a task, the quality of that experience is also likely to impact the decision process. Results should not be generalized beyond the years of experience in the VC task. Experience resulted correlated with VCs' age (R^2=0.62).

Control variables. We controlled for various factors identified in previous literature as determinants to decision comprehensiveness (Miller et al., 1998; Simons et al., 1999; Goll and Rasheed, 2005), and commonly adopted in literature on VC (e.g., De Clercq and Dimov, 2008). We accounted for *consistency of the team*, by measuring the number of team members who are responsible for investment decisions, from investment selection to evaluation. We measured also *firm age*, by the number of years since founding, to capture the effect of formalization of organizational practices. Thirdly, we measured also *firm size* by the total capital commitment, as "larger" companies have more financial resources which can allow them to invest in a comprehensive strategic decision making process.

Items validation

To validate the items edition procedure, we tested the reliability of the scales for the overall decision comprehensiveness items, the overall exploration and exploitation items, and each of the dimensions measured by a multi-item scale (SSKA and NSKA). No validation test has been

applied to the DSKA dimension due to the single-item measure not allowing to apply any reliability test.

A confirmatory factor analysis (CFA) has been applied to purify the scale and led to the final measurement instrument, as shown in Table 3-3.

All the reliability coefficients are satisfactory. The reliability of the summated scales as represented by Cronbach's alpha[4] is 0.85 for the decision comprehensiveness scale; 0.70 for the overall exploration scale, and 0.78 for the overall exploitation scale. Is well known that the coefficient is satisfactory when the resulting values are higher than 0.70, identifying an acceptable coefficient. As concern the single dimensions (SSKA and NSKA), the Table 3-3 illustrates the results. In detail, as concern the exploration-related items, the Cronbach's alpha for the SSKA dimension is 0.71 and for the NSKA dimension is 0.70 (DSKA not applicable); as concern the exploitation-related items, the coefficient for the SSKA dimension is 0.77 and for the NSKA is 0.79 (DSKA not applicable).

The overall results of the confirmatory factor analysis are represented in Table 3-2. The chi-square index and the goodness-of-fit index (GFI) were (1) exploration orientation: χ^2_{df}=139.88, $\chi 2$ /d^2=2.26 (p=0.000), GFI=0.000; (2) exploitation orientation: χ^2_{df}=155.027, $\chi 2$/d^2=2.09 (p=0.000), GFI=0.000; (3) decision comprehensiveness: : χ^2_{df}=70.047, $\chi 2$/d^2=1.70 (p=0.003), GFI=0.003. Fixed factors models estimated to assess component unidimensionality are satisfactory (GFI<0.080; p-value<0.05). We did not calculate the incremental-fit index (IFI).

The exploration and exploitation dimensions had acceptable fits, while the decision comprehensiveness scale had good level fits, indicating the subscales to be unidimensional. The model thus implies dimensional independence, with each search dimension being distinct but correlated to the others, proving that our conceptualization of exploration versus exploitation orientation, as well as the decision comprehensiveness scale adopted, have a basis into empirical reality.

Table 3-2 Reliability and CFA-model Fit Results

		Cronbach's Alpha	Chi-Square	p-value	Chi-Square /df	GFI
Exploration Orientation	6	*,70 Acceptable*	139.88	0.000	2.26	0.000
Exploitation Orientation	6	*,78 Acceptable*	155.027	0.000	2.09	0.000
Decision Comprehensiveness	8	*,85 Good*	70.047	0.003	1.70	0.003

[4] Cronbach's alpha as a coefficient of internal consistency is calculated as α=mw(Σsλ1/2s−1)/Σsλ1/2s(mw−1), with λs the something diagonal element of Λ as computed in the orthonormalization step during the last iteration. For values higher than 0.70 the reliability of the coefficients tested is satisfactory.

Table 3-3 Results of the Reliability Test and Final Measurement Instrument

Variabile	Scale Items	Cronbach's alpha
	Exploration	
Spatial Side	**1.** Searching of investment opportunities in new industries/markets never explored/invested in **2.** Investment activities located far from your local geographic context	0.71
Demand Side	**1.** Searching of new investment opportunities	Not applicable
Network side	**1.** Investment activities requiring new network interactions (manager, other VCs from the same network, academics, industry experts) **2.** Investment activities requiring external advice seeking (from other organizations) **3.** Investment activities syndicated with new partners (so requiring new partners interactions)	0.70
	Exploitation	
Spatial Side	**1.** Searching for opportunities in the industry and business invested before **2.** Investment activities located considering the geographic proximity with the VC company	0.77
Demand Side	**1.** Reinvestment in firms already invested before	Not applicable
Network Side	**1.** Investment activities requiring existing network interactions (interactions with existing contacts, such as manager, academics, VCs of from the same network, consultants) **2.** Investment activities requiring internal advice seeking (within your own company) **3.** Investment activities syndicated always with the same partners (so not requiring new partners interactions)	0.79
	Decision Comprehensiveness	
	1. Developed multiple scenarios to solve a problem **2.** Evaluated different options to manage the investment X **3.** Considered many different criteria for eliminating courses of actions **4.** Conducted various analysis on suggested courses of action **5.** Searched for consensus to make a pre-deal decision or post deal decision **6.** Examined multiple explanation for the problem **7.** Conducted a more in-depth analysis to evaluate the opportunity in the investment selection process **8.** Based their decisions on factual information	0.85

Analysis and results

Table 3-4 contains the descriptive statistics. The correlations among the reported variables indicate that the exploration and exploitation measures are not strongly correlated with one another. Table 3-5 shows the Kendall's tau-b correlations among the specular dimensions referred to exploration and exploitation orientation, and decision comprehensiveness. All the specular variables are negatively and significantly correlated (p-value<0.05). The only less significant correlation is the one between "*Overall exploration*" and "*Overall exploitation*" (p-value=0.089). Positive and significant correlations result between "exploration" (overall and each of the search dimensions) and "*Decision comprehensiveness*" (values are reported in black in Table 3-5; p-value<0.05), while negative and significant correlations result between exploitation and "*Decision comprehensiveness*" (values are reported in red in Table 3-5; p-value<0.05).

The relation between exploration versus exploitation orientation, with regards to each of the search dimensions (SSKA, DSKA, NSKA), and decision comprehensiveness have been investigated first by the use of Chi-Square Tests. Table 3-6 shows the results expressed by Spearman correlation. Results show the linear relations (U-shaped) between "*Overall exploration*" and each of the dimensions of the exploration scale, and decision comprehensiveness. In fact, Spearman's coefficients are positive and the correlations are significant (p-value<0.01, two-tailed).

The stronger positive correlation is between the exploration with regards to NSKA dimension and decision comprehensiveness (,764). On the specular side, results show the curvilinear relationship (inverted U-shaped) between "*Overall exploitation*" and each of the dimensions of the exploitation scale, and decision comprehensiveness. In fact, Spearman's coefficients are negative and the correlations are significant (p-value<0.01, two-tailed). The stronger negative correlation is between the exploitation with regards to NSKA dimension and decision comprehensiveness (,731).

In light of the results obtained, Hypotheses 1 and 2 are confirmed.

Table 3-4 Descriptive statistics

	Overall Exploration	*Overall Exploitation*	*Exploration Spatial Side*	*Exploration Demand Side*	*Exploration Network Side*	*Exploitation Spatial Side*	*Exploitation Demand Side*	*Exploitation Network Side*	*Decision Comprehens.*
Valid	43	43	43	43	43	43	43	43	43
Missing	0	0	0	0	0	0	0	0	0
Mean	3,9	3,1	3,6	4,2	3,9	3,4	2,6	2,4	3,9
Median	4,0	3,0	4,0	5,0	4,0	3,0	2,0	2,0	4,0
Mode	4,0	3,0	4,0	5,0	5,0	3,0	2,0	2,0	4,0
Skewness	-,715	2,905	-,601	-1,386	-1,036	,313	,707	,655	-,716
Std. Error of Skewness	,361	,361	,361	,361	,361	,361	,361	,361	,361
Kurtosis	-,462	6,748	-,525	,897	,167	-,963	-,662	-,487	-,625
Std. Error of Kurtosis	,709	,709	,709	,709	,709	,709	,709	,709	,709
Minimum	2,00	3,00	2,00	1,00	1,00	2,00	1,00	1,00	2,00
Maximum	5,00	4,00	5,00	5,00	5,00	5,00	5,00	5,00	5,00

Table 3-5 Kendall's tau-b Correlations

		Overall Exploitation	*Mean Exploitation Spatial Side*	*Mean Exploitation Demand Side*	*Mean Exploitation Network Side*	*Mean Decision Comprehensiveness*
Overall Exploration	Correlation	-,244	-,537**	-,503**	-,649**	**,666****
	p-value	,089	,000	,000	,000	**,000**
Mean Exploration Spatial Side	Correlation	-,374**	-,461**	-,457**	-,608**	**,625****
	p-value	,010	,001	,001	,000	**,000**
Mean Exploration Demand Side	Correlation	-,084	-,408**	-,411**	-,564**	**,449****
	p-value	,562	,002	,002	,000	**,001**
Mean Exploration Network Side	Correlation	-,183	-,517**	-,466**	-,623**	**,697****
	p-value	,200	,000	,000	,000	**,000**
Mean Decision Quality	Correlation	**-,308***	**-,482****	**-,513****	**-,662****	1,000
	p-value	**,032**	**,000**	**,000**	**,000**	.

Table 3-6 Chi-Squared Tests

		Decision Comprehensiveness
Overall Exploration	Spearman's	,728
	p-value	0.000
Exploration Spatial-Side	Spearman's	,699
	p-value	0.000
Exploration Demand-Side	Spearman's	,517
	p-value	0.000
Exploration Network-Side	Spearman's	**,764**
	p-value	0.000
Overall Exploitation	Spearman's	-,330
	p-value	0.031
Exploitation Spatial-Side	Spearman's	-,574
	p-value	0.000
Exploitation Demand-Side	Spearman's	-,608
	p-value	0.000
Exploitation Network-Side	Spearman's	**-,731**
	p-value	0.000

We ran a partial correlation analysis to test for Hypotheses 3a and 3b, introducing experience as control variable (Table 3-7). The correlation between "*Overall exploitation*" and "*Decision comprehensiveness*" is confirmed as negative (-,308) and significant (p-value=0,047). The moderating effect of experience negatively impacted on the linear relationship among the variables. In fact, the negative correlation was confirmed, but the relation is less pronounced (-,308<-,313). This results is contrary to our hypothesis 3a, in which we argued for a more pronounced negative relationship due to the moderating effect determined by experience. As concern Hypothesis 3b, the correlation between "*Overall exploration*" and "*Decision comprehensiveness*" is confirmed as positive (,817) and significant (p-value=0,000). The moderating effect of experience positively impacted on the linear relationship among the variables, confirming the positive correlation and making the relation more pronounced (,817>,728). This results is contrary to our hypothesis 3b, in which we argued for a less pronounced positive relationship among the variables due to experience as moderator.

Table 3-7 Correlation Coefficients under experience moderating effect

		Decision Comprehensiveness Controlled by experience	*Decision Comprehensiveness No experience*
Overall Exploration	Spearman's	,817	,780
	p-value	,000	,000
Overall Exploitation	Spearman's	-,308	-,330
	p-value	,047	,031

To control for the relationship between our constructs, we constructed regression models (GLM Models[5]). Model 1 include experience as moderator, Model 2 ignore experience variable. The Model 1 showed an R^2=,839 (Adjusted R^2=,799). Model 2 showed R^2=,790 (Adjusted R^2=,738). Of the control variables none showed significant association with decision comprehensiveness. In fact, *firm age* reported a p-value=,969; *consistency of the team* reported a p-value=,334; *firm size* reported a p-value=,642 (all control variables had a p-value>0.05). Model 1 resulted in the following equation:

$$Y_{DC}=293.084*X_{expl.\ e}+18.247*X_{expt.e}+11.810*\ X_{expl.\ e}\ X_{expt.e}$$

That means: DC (Decision comprehensiveness) is positively and significantly correlated with the following predictors, with the presence of the moderating variable: $X_{expl.\ e}$ *(p-value=,000),* $X_{expt.e}$ *(p-value=,011), covariate variables* $X_{expl.e}\ X_{expt.e}$ *(p-value=,037).*

Model 2 resulted in the following equation:

$$Y_{DC}=28.936*X_{expl.e}+1.343*X_{expt.e}$$

That means: DC (Decision Comprehensiveness) is positively and significantly correlated with the following predictors, with the lack of the moderating variable: $X_{expl.e}$ *(p-value=,000),* $X_{expt.e}$ *(p-value=,045).*

Tables 3-8 and 3-9 show the results of the regression analysis.

[5] The generalized linear model (GLM) expands the general linear model. The dependent variable is linearly related to the factors and covariates through a specified link function. It covers widely used statistical models, such as linear regression for normally distributed responses, logistic models for binary data, log-linear models for count data, complementary log-log models for interval-censored survival data, plus many other statistical models through its very general model formulation.

Table 3-8 Results of Generalized Linear Regression Analysis[b]

Dependent Variable:Mean Decision Comprehensiveness

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
Corrected Model	416,998[a]	8	52,125	20,886	,000
Intercept	687,398	1	687,398	275,433	,000
Firm age	,004	1	,004	,002	,969
Consistency of the team	2,402	1	2,402	,963	,334
Firm size	,551	1	,551	,221	,642
Overall_Exploration	**293,084**	3	97,695	39,145	,000
Overall_Exploitation	**18,247**	1	18,247	7,311	,011
Overall_Exploration * Overall_Exploitation	**11,810**	1	11,810	4,732	,037
Error	79,862	32	2,496		
Total	6300,000	41			
Corrected Total	496,860	40			

a. R Squared = ,839 (Adjusted R Squared = ,799)

b. Weighted Least Squares Regression - Weighted by Experience

Table 3-9 Results of Generalized Linear Regression Analysis

Dependent Variable:Mean Decision Comprehensiveness

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
Corrected Model	37,243[a]	8	4,655	15,081	,000
Intercept	72,197	1	72,197	233,871	,000
Firm age	,005	1	,005	,016	,901
Consistency of the team	,025	1	,025	,081	,778
Firm size	,001	1	,001	,004	,948
Overall_Exploration	**28,936**	3	9,645	31,245	,000
Overall_Exploitation	**1,343**	1	1,343	4,350	,045
Overall_Exploration * Overall_Exploitation	**,725**	1	,725	2,348	,135
Error	9,879	32	,309		
Total	656,000	41			
Corrected Total	47,122	40			

a. R-Squared= ,790 (Adjusted R Squared = ,738)

3.5 Discussion

The study aimed to integrate extant studies on VC firms' decision making. Moving from the knowledge-based conceptualization of exploration and exploitation proposed in the first-stage study, we linked this perspective to the judgment/decision making literature to investigate the effect of exploration vs exploitation orientation on the intuitive decision making typically adopted by VCs.

Accordingly to our conceptualization of exploration and exploitation orientation as related to a greater or narrower knowledge search into non-local domains - with regards to the industry scope, geographic scope, investment opportunity, and network interactions (not only with co-investing partners) - we assumed that the greater the exploitation orientation VCs have, the greater the specialization of their knowledge stocks. More specialized knowledge means VCs rely on more specific information with regards to all the dimensions pertaining to the investment choice.

Conversely, the greater the exploration orientation VCs have, the greater the diversification of knowledge stocks. More diversified knowledge means VCs rely on less specific information with regards to each dimension pertaining to the investment choice.

Evidence from literature on VCs decision-making show their susceptibility to a specific cognitive bias, "overconfidence", that leads investors to be less accurate in their evaluation processes, significantly confident on their personal skills, less motivated to search for additional information or to interact with others to integrate knowledge resources and achieve higher performances.

It is well known from literature the existing linear relationship between confidence and the amount of specific information, that is the greater the latter, the greater the former (e.g., Zacharakis and Shepherd, 2001; Elstein and Bordage, 1988). Thus, more specific information increases confidence and decreases decision accuracy. In other words, we built our framework on the basis of the mentioned relationship: more specific information may be detrimental to decision-making performance by determining a higher propensity towards intuitive decision processes.

We adopted decision comprehensiveness (e.g., Miller, 2008; Forbes, 2007; Fredrickson, 1984; Fredrickson & Mitchell, 1984) as a representative construct of the decision-making performance, diametrically in contrast with the automatic processing or the intuitive processing which are detrimental to decision-making performance. The construct chosen may be evaluated as a synonym of "decision quality" and "decision effectiveness", thus corresponding to what we aimed to test. Moreover, as decision comprehensiveness can improve firm performance in highly uncertain environments with regards to companies need of information about the trade-off between the market opportunities and threats (Forbes, 2007; Goll and Rasheed, 2005; Miller, 2008), since VCs act in a highly uncertain environment and make strategic investment decisions, we considered the VC context under investigation ideal to evaluate decision quality in terms of decision comprehensiveness.

Additionally, we tested for experience as a moderator of the main relationship under analysis. Due to the evidence on the effects of experience on decision making (Shepherd et al., 2003), we

supposed that the experience would exercise a moderating effect on the investigated relationship, by enhancing the curvilinear one and making less pronounced the linear one.

In sum, we tried to give an answer to three related research questions: (1) To what extent does exploration vs exploitation orientation impact on the decision-making performance/comprehensiveness of VC companies?; (2) Which will be the relationship between a more explorative-oriented VC or, conversely, a more exploitative-oriented VC and the decision-making performance/comprehensiveness achieved by the VC company?; (3) How and to what extent does the VC experience moderate the relationship?

The study empirically applied the exploration versus exploitation orientation measurement instrument proposed in the first-stage study to shade light on the relationship between a more explorative versus a more exploitative orientation and decision-making performance. Thus, what theoretically experimented in the previous study found practical use as an operational measure.

Moving from the framework outlined above and our reconfiguration of the exploration orientation measurement instrument introduced by Sidhu et al. (2004, 2007), we conducted our empirical investigation at an individual level, by surveying 43 VC managers from Canadian VC firms. We measured exploration and exploitation orientation by the set of 12 items (6 pair items specular to each others) developed in the first-stage study, covering all three identified knowledge search dimensions of exploration and exploitation (SSKA, DSKA, NSKA). We measured decision comprehensiveness by a set of 8 items replaced by previous research (Alexiev, 2010), and by the original operationalization of the construct proposed by Miller et al. (1998). Importantly, all three scales showed internal consistency, with satisfactory results in terms of reliability and unidimensionality (Cronbach's alpha>0.70; GFI<0.080; p-value<0.001).

We summarize the major findings of our research in the following three bullet points, and will comment later on their implications for both literature and practice.

- There is a linear relationship between exploration orientation and decision comprehensiveness. As VCs are more likely to explore – search for non-local domains – by seeking new investment opportunities, investing in distant geographic areas and industries never invested before, and syndicating or interacting with new partners belonging to an external network, they adopt more accurate decisions, the decision process is less intuitive, and, consequently, they show superior decision comprehensiveness.
- There is a curvilinear relationship between exploitation orientation and decision comprehensiveness. As VCs are more likely to exploit - search for local domains - by incurring into follow-on investments, investing into close geographic areas and industries already in portfolio, and syndicating and interacting with existing partners, they produce less accurate decisions, the decision process is more intuitive and automatic, and, consequently, they show lower decision comprehensiveness.
- Experience does not play an effective moderating role, contrary to what we hypothesized. In fact, the linear versus curvilinear relationships mentioned above are not significantly affected by VCs expertise in the industry.

3.6 Limitations and contributions

Some potential and actual limitations of this study can be addressed. First, empirical limitations are related to the operationalization of the variables to measure exploration and exploitation, the sample and the use of a survey methodology. Although the study relied on validated scales and efforts were made to reduce bias, only the perspective of the randomly selected VC managers is being taken into consideration to measure exploration versus exploitation orientation variables.

With regard to the sampling, investigation is based on a single country context, the Canadian country, with some industries more represented than others in terms of VC investments focus (cleantech, software, biotech and digital). To allow for further generalizations beyond the investigated population, subsequent research can be directed to replicate the study to other contexts, for instance Europe and US. Additionally, the small final sample size (43 VCs) constraints the reliability of the findings, inviting to replicate the study over a wider sample of VCs. Notwithstanding the small consistency of the sample, previous research on VC decision making relied on similar consistent samples, even smaller. Thus, we are confident on the representativeness of our investigation.

Although the scales were tested for reliability and validity, self-reported and web-administered data can reflect respondents' biases, misunderstanding of the questions, constrained memory or casuality. The subjectivity is a limit in the chosen instrument for conducting the empirical investigation. However, extreme care was taken in drawing the survey questionnaire to avoid bias. For instance, precise instructions were given to respondents to explain each question in advance. By any chance, caution must be exercised when considering the findings of this study. Future research is invited to adopt methodological triangulation in the form of multiple measurements of variables to enable the drawing of more reliable conclusions about the findings reported here.

As concern the measurement instrument, only knowledge-related items have been developed to measure exploration and exploitation. Further operational items can be adopted in further studies, taking into consideration experimentation and risk-taking, both related to "exploration" and the VC industry.

A further methodological limitation relates to the absence of longitudinal objective data (excluding the subjective responses pertaining to the activities VCs have been engaged with in their VC experience), because of which a generalization of the findings to the overall VC experience cannot be assured.

From a theoretical point of view, notwithstanding overconfidence bias is the most pervasive and common (Griffin et al., 2001; Zacharakis and Shepherd, 2001), other cognitive biases from judgment/decision making literature may be considered to draw the conceptual framework we adopted to develop our hypotheses.

The study contributes to literature on VC decision making by adopting some novel conceptual lenses.

A first practical implication for VCs may be detected. Recognition of which orientation, more explorative versus more exploitative, represents an opportunity for VCs to improve decision accuracy may contribute to achieve superior investment performance goals. Selection and evaluation procedures in the deal-flow process may be optimized by a greater or narrower focus

on specific versus diversified knowledge or, in other words, on existing versus never explored knowledge. By the identification of the positive relationship between a more explorative orientation and decision comprehensiveness, VCs may derive practical implications from our study. Searching for non-local domains, may lead VCs to more accurate decisions, higher consensus, less time-consuming decision processes, an overall decision making higher performance. Conversely, VCs find evidence from our findings that the opposite orientation towards knowledge search lead to lower decision quality, potentially resulting in underestimation of good investment opportunities, errors in the portfolio composition, low investment performances.

A second practical implications may be suitable for entrepreneurs. Clearly, for entrepreneurs asking for funding knowledge arising from our findings represents a tool to choose the right VC investors looking at their exploration vs exploitation propensity. In fact, their orientation will show to entrepreneurs how VCs decide and, consequently, the likelihood to achieve a high investment performance outcome.

Future research can expand the investigation into other country-contexts. Different methodology can be adopted, for instance a longitudinal investigation. Moreover, inverted hypotheses may be studied following scholars proposition of the utility of optimistic overconfidence for entrepreneurship (Busenitz and Barney, 1997).

Chapter 4

LINKING EXPLORATION ORIENTATION TO PERFORMANCE IN VENTURE CAPITAL COMPANIES

4.1 Abstract(*)

We examine the performance effects of exploration orientation in the context of venture capital companies. More specifically, drawing on the knowledge and organizational learning literature, we conceptualize exploration orientation (vs exploitation) in the VC context in terms of greater (vs narrower) non-local acquisition of knowledge resources via a spatial-side, a demand-side, and a network-side search. Moving from our framework, we hypothesize that VC firms benefit from higher exploration because of efficiencies in evaluating and managing investments due to the breadth of knowledge. Additionally, we hypothesize a more pronounced effect on the U-shaped relationship estimated between exploration and performance when uncertainty related to early stage investing is higher. An econometric method is used to run the investigation among a sample of 335 US- and Europe-based VC firms collected from Thomson One Banker database. Limitations of the study, contributions for both management and entrepreneurship literature and practitioners, and implications for future research are outlined.

Keywords: exploration orientation, knowledge resources, venture capital, performance, uncertainty

(*) The study was conceived during the author's visiting period at the Rotterdam School of Management of the Erasmus Universiteit (The Netherlands), thanks to the productive research advices from Prof.dr. H.W. Volberda and the colleagues. In detail, the investigation is conducted in cooperation with the Strategic Management and Entrepreneurship Department at the RSM (Erasmus Universiteit). Dr. L. Berchicci is working in co-authorship at the empirical investigation of the study since data are collected from Thomson One Banker database from Erasmus Universiteit.

4.2 Introduction

Extant studies have demonstrated a strong interest in the role of knowledge in creating and sustaining competitive advantage, and creating economic value. According to the knowledge-based perspective, a firm is a nexus of knowledge stocks, which are fundamental to the firm performance (Nelson and Winter, 1982; Spender, 1996). On the one side, organizational learning leads to internal accumulation of knowledge, which allows firms to create value by sophisticating the selection and evaluation capability towards new opportunities and exploiting these opportunities to carry out the business (Penrose, 1959; Spender and Grant, 1996). On the other side, external network relationships and knowledge arising from external search play an important role in enriching the firm's knowledge stock (Lane and Lubatkin, 1998; Grant and Baden-Fuller, 2004).

This has placed exploration firmly at the center of researchers' agenda, because the extent to which an organization engages in exploration - or its opposite orientation, exploitation - is thought to influence learning, knowledge generation, innovation and performance (Sidhu et al., 2004). To grasp the essence of exploration several contributions from the literature on organizational learning refer to exploration as "the pursuit of new knowledge and boundary-spanning search for discovery of new approaches to technologies, businesses, processes or products (Sidhu et al., 2004, p.916; Levinthal and March, 1993; McGrath, 2001). Moreover, scholars frame exploration as "accessing to external knowledge through inter-firm alliances" (De Clercq and Dimov, 2008); as a "diversification of knowledge assets"(Matusik and Fitza, 2012); as a "knowledge generation", including all the activities which increase an organization's stock of knowledge (Lorenzoni and Baden-Fuller, 1995). Thus, the centrality of knowledge acquisition to exploration is evident in various theoretical perspectives.

Notwithstanding extant studies on this research area, there is little understanding about how and to what extent differences in exploration (vs exploitation) orientation, with regards to knowledge resources, relate to performance.

Drawing on the knowledge-based perspective and organizational learning literature (e.g., Zollo and Winter, 2002; Ahuja and Katila, 2001; Rosenkopf and Nerkar, 2001; Zahra et al, 1999; Levinthal and March, 1993; March, 1991), we investigate the relationship between exploration orientation and performance in the venture capital industry (hereafter, VC): a novel context for an empirical investigation of organizational learning issues.

The VC industry is a valid context to conduct this research also to foster aggregation and comparison of findings on exploration (vs exploitation) orientation in different research contexts.

Moving from Matusik and Fitza (2012), we stress further key considerations validating the choice to study the relationship between exploration orientation and performance in VC: (i) the relative novelty of the research (to our knowledge can be detected only two prior similar studies, however no one with clear reference to exploration and/or exploitation (De Clercq and Dimov, 2008; Matusik and Fitza, 2012); (ii) the high-level of uncertainty typical to the VC context, linked to the return on the investments made, but even related to the more general perceptions of VC actors engaged in high-risk deals (e.g., McMullen and Shepherd, 2006); (iii) VCs primarily rely on applying knowledge resources - content and network knowledge resources - and the experience gained it is a key resource determining their investment choices and the related

successful outcomes (e.g., Dimov and Shepherd, 2005); (iiii) the organizational structure of all VC firms is almost the same; these investors have generally a basic structure with a single unit and a single location to base their main activity. Also the incentives are shared among VC firms (e.g., De Clercq et al., 2006). These aspects reduce the contingency effects that could negatively interfere with the relationship we investigate on.

The co-existence of these attributes allows to determine the effect of exploration orientation (towards knowledge search) on performance, without any combined effect coming from different organizational structures and incentives, for instance.

Previous studies investigated the effect of diversification versus specialization of knowledge on performance under uncertainty in the same industry context (Matusik and Fitza, 2012). However, extant works restricted the investigation of this relationship to a specific type of knowledge asset: the industry or investment market VCs invest in.

Moving on the work of Matusik and Fitza (2012), we want to take a step forward their study adopting the multidimensional measure of exploration (vs exploitation) orientation we developed in the first-stage of the research project. Accordingly, we will investigate on three more knowledge assets: the geographic scope, the investment opportunity, and syndications.

Since we want to stress the moderating effect of uncertainty on the relationship between exploration orientation showed by VCs and performance, we measure the uncertainty considering the investment stage (from seed to later stage) of the portfolio companies. Previous works related this factor to levels of uncertainty (e.g., Matusik and Fitza, 2012).

To guide our research, we asked a set of three interrelated research questions that will permit several novel insights on VC strategic orientation towards investments and performance outcomes:

1) To what extent does exploration orientation impact on the performance of VC companies?
2) Which will be the relationship between a more explorative activity and the performance achieved by a VC company?
3) How and to what extent does the relationship change under higher uncertainty conditions?
   (3.1) What will be the moderating effect of investment stage?

To address these questions we developed a set of testable hypotheses. We collected and analyzed data on US-based and Europe-based VC firms from Thomson One Banker database. Data were analyzed by using an econometric method.

The study aims to contribute to both management and VC finance literature, on the one hand, and practice, on the other hand. More specifically, it aims to foster comparison of findings on the relationship between exploration (vs exploitation) and performance in different research contexts. Furthermore, it aims to increase the understanding on how VCs invest and which investments trajectories can allow these investors to obtain higher performance outcomes.

Practical implications for entrepreneurs are outlined. In detail, a deeper knowledge of how VCs invest, through their propensity towards exploration (vs exploitation) of knowledge resources, would help entrepreneurs to choose those type of VC investors they should likely ask for funding because their higher performance.

In addition, findings will point to several interesting questions for future research.

In the following sections, we develop arguments about the main effect of VC knowledge exploration on performance. We then examine the moderating effect played by uncertainty with regards to the investment stage VCs invest in. Finally, we present our model, anticipate the expected results, limitations and contributions of the study.

4.3 Literature review and propositions

VCs invest, manage and return institutional investors' money by funding the entrepreneurial ventures (portfolio companies), contributing to their growth and expansion and, finally, as concern the most successful investments, exiting from the investment by selling the company to a public or corporate investor (De Clercq and Dimov, 2008).

VCs select the investments to build up their portfolio in the vein to reduce company-specific risks and increase the returns from the investments. The successful performance of the investment activity of VC companies depends on how much they learn from prior investments – syndicated or independent - in terms of good exits and failures (Gupta and Sapienza, 1992; Wright and Lockett, 2003; De Clercq and Dimov, 2008).

In the context of VC companies, VCs acquire knowledge from prior investments and show a learning capability - before mentioned as "absorptive capacity" – in the deal-flow process, from the evaluation and selection, to the management of the investment opportunities.

Previous research argued on the differences VCs show in the extent of their investments – that can be greater or lower – and in their propensity towards a broader or narrower scope of their knowledge domains (e.g., Gupta and Sapienza, 1992; Dimov and Shepherd, 2005; De Clercq and Dimov, 2008, Matusik and Fitza, 2012).

Knowledge is central to VCs investment activity. In fact, VCs apply knowledge resources in their investment activity and the decision-making behind their investment choices (e.g., Dimov and Shepherd, 2005; Sapienza, 1992). They provide knowledge to the portfolio companies they invest in, and get back knowledge from their investment experience, each investment contributes to broaden.

VCs use content knowledge (technical, financial, managerial, governance knowledge) to select and to manage the portfolio companies they are engaged with. VCs even link this knowledge stock to other actors of the industry interacting with them as partners in syndications or, basically, as advice-providers, in so doing, they broaden and integrate their knowledge (e.g., Matusik and Fitza, 2012).

Moving from the premises above, in our first-stage research we traced a conceptualization of the rationale adopted by VCs in their search of knowledge in terms of exploration or, conversely, exploitation. Clearly, we conceptualize exploration (and the specular exploitation) in the VC context in terms of knowledge acquisition activities. In this view, we state that the greater the scope of external knowledge acquisition, the greater the exploration orientation showed by VCs; conversely, the narrower such scope, the greater the exploitation orientation. In the search of knowledge resources, VCs show three types of knowledge search - spatial-side, demand-side,

and network-side knowledge acquisition - we identified in a first-stage study and represent here to build up our framework and develop our hypotheses.

Exploration of knowledge resources and VC performance

When facing new opportunities, VCs adopt their knowledge to understand and evaluate them. In the search of knowledge to enrich the repository of knowledge stocks, VCs may look beyond their boundaries and local domains and benefit from access to others' knowledge or never explored domains. Exploring for knowledge resources may be beneficial for the VC company by providing additional resources to improve problem solving capabilities (March, 1991; Ahuja and Katila, 2001; Matusik and Fitza, 2012) and novel solutions to issues related to the deal-flow, for instance. VCs may benefit from knowledge deriving from never explored domains in terms of greater adaptability and flexibility to novel challenges and problems coming from turbulent environments and high-velocity markets where VCs normally place their investments. Knowledge from non-local search provides a higher number of inputs and, consequently, a greater number of knowledge combination is available (Nelson and Winter, 1982; Fleming and Sorenson, 2001). The VC company may broaden the spectrum of competences by developing intuitions deriving from new inputs, improving decision-making and, consequently or independently, firm performance (Gavetti et al., 2005; Matusik and Fitza, 2012).

As concern a *spatial-side knowledge acquisition* (SSKA), exploration can encompass entry into a market (Helfat and Liebeman, 2002) or industry (Cattani, 2005) that is new to the VC firm. The decision by VCs to invest in companies acting in industries they never invested before represents entries into never explored investment markets. VCs may consider investing in an unfamiliar industry as a purposeful opportunity seeking, enabling a different set of investment rules compared to those developed to manage previously faced investment situations. Moreover, different industries have different economics and market trends, thereby VCs which diversify their portfolio and the risk associated to the investments managed may benefit from compensation mechanisms between different risk-sensitive industries (Gupta and Sapienza, 1992; Dimov and Martin de Holan, 2010; Matusik and Fitza, 2012). This point explains the propensity towards industry exploration VCs may show.

This propensity can be explained by the fact that the unfamiliar industry context is a source of knowledge and may be perceived as a challenge to develop new skills to deal with a never explored industry and a nascent technology looming on the horizons. That is, even though the difficulties related to an uncertain industry domain, VCs explore new industries to broaden their spectrum of knowledge and, consequently, to develop the competences required to manage nascent technology-based investments.

Such type of decision carries high uncertainty and each VC can evaluate it differently. Has to be noted that VC firms which get knowledge from non-local domains and external networks increase their expertise or network connections to proper sources of knowledge to coach a wider basket of portfolio companies. If a company is specialized in a single industry and exploit knowledge only from a narrow scope, every opportunity rising from different domains or an already selected opportunity which evolves over time and requires distinct industry-specific

competences get missed or under-performed. Thus, the exploration of knowledge resources from non-local domains and beyond VCs own boundaries increases the capability to manage and carry on to success a portfolio company.

Search into never explored domains can be related, as well as to industry domains, to geographical markets. Different country contexts are source of value-adding knowledge for VCs, due to different human capital, different laws, different market trends, different cultures, and a different institutional context as a whole. The search for knowledge at a spatial side, thus, pertains both to the industry scope and the geographic scope of VCs investments.

As concern a *demand-side knowledge acquisition* (DSKA), VCs activity is strictly focused on seeking investment opportunities to invest the money raised from various investors with the purpose of achieving superior returns. The investment opportunity is represented by the entrepreneurial venture VCs select and evaluate to build up their portfolio. While some VC firms invest in companies that are in the process of exploring nascent ideas, not supported by any commercial technology or tested market (i.e. early stage companies), others prefer those companies with clear market dynamics and advanced and tested products (i.e. late-stage companies), to expand their already existing business (Podolny, 2001; Dimov et al., 2006). A new opportunity is a source of knowledge, relative to the market, the industry, the human capital, the technological domain and the network associated to the entrepreneurial venture. Investing on a new opportunity can enrich the VC firms knowledge stocks, therefore increasing the breadth of knowledge allowing to manage a company down a variety of trajectories, increasing flexibility and adaptiveness.

Finally, as concern the third knowledge search type, *the network-side knowledge acquisition*, (NSKA), instead of investing in new ventures alone, VC firms form syndicates in which multiple investors provide financing for a venture. Due to the nature of VCs as financial intermediaries, the multiple nature of financing contracts provide help to solve the otherwise prohibitive information problems stemming from moral hazards and asymmetric information related to the financing of new ventures (Amit et al., 1998; Chan, 1983; Diamond, 1984; Gompers, 1995; Kaplan and Stromberg 2003, 2004; Leland and Pyle, 1977; Ueda, 2004; Jääskeläinen, 2012). In fact, *ex ante* screening activities and *ex post* monitoring activities are managed by VCs to reduce agency information-related risks. In this vein, a joint effort in the selection of investment enhances the screening procedure (Brander et al., 2002; Casamatta and Haritchabalet, 2007; Cestone et al., 2007; Cumming et al., 2010; De Clercq et al., 2010; Dimov and Milanov, 2010) and improves the monitoring of the entrepreneurial ventures (Sorenson and Stuart, 2001; Fritsch and Schilder, 2008; Meuleman et al., 2009). In other words, syndications help to increase the amount of information, skills and resources available for the decision-making, monitoring and management of investment opportunities. This enhances the value of the investment by reducing the costs of asymmetric information and agency, and increasing the likelihood of superior performance outcomes (Clarysse et al, 2013).

Exploring via network interactions do not rely just on syndications, that means, in other words, co-investing partners. Network interactions imply also external advice-seeking, not necessarily coming from an active cooperation into an investment. The number of partners with whom the VC collaborates and the familiarity with these partners influence its performance due to the broader accessible scope of knowledge which can be exploited for commercial ends (Grant and Baden-Fuller, 2004).

Uncertainty in a turbulent entrepreneurial context, in never faced industry contexts, geographic areas, network of partner relations and syndications, can be better controlled by knowledge stocks deriving from non-local search (exploration).

To summarize, the relationship between exploration and performance in VC companies is function of the benefits associated to a broader knowledge stock and breadth of experience, increasing problem solving capabilities, flexibility, adaptability and portfolio companies guiding competences. Despite potentially higher coordination costs and reduced depth of experience can be associated to investments when an explorative orientation prevails among VCs, the detrimental effect on VC performance is compensated by the beneficial effects of those exploration-related advantages outlined before. In fact, at high levels of exploration, the effect of flexibility and adaptability are greater than the detrimental effects of coordination costs and lack of in-depth experience. At high levels of exploration it is more likely a firm has the breadth of knowledge relevant to increase problem solving capabilities and to manage portfolio companies down a variety of business and technology paths, and market dynamics. Higher exploration provides greater access to knowledge stocks which enhance a VC capability to properly drive the investment opportunity and manage the deal-flow, even though under uncertainty. Most VC firms, however, are relatively small, thus high levels of exploration are difficult to detect in a wide range.

Overall, we expect the relationship between exploration and performance to be a U-shaped one. VC performance may benefit from high levels of exploration, compensating the existing detrimental effects associated to a broad rather than deep knowledge stock. Accordingly, with reference to each knowledge search dimension described above, we developed the following propositions:

Hypothesis 1a: *There will be a U-shaped relationship between exploration, with regards to the industry VCs invest in, and performance*.

Hypothesis 1b: *There will be a U-shaped relationship between exploration, with regards to the geographic area VCs invest in, and performance*.

Hypothesis 1c: *There will be a U-shaped relationship between exploration, with regards to the investment opportunity VCs include in their portfolio, and performance.*

Hypothesis 1d: *There will be a U-shaped relationship between exploration, with regards to the co-investing partners (syndications), and performance*

The moderating effect of uncertainty

The environment where VCs act and invest in is characterized by high levels of uncertainty. Uncertainty is related to the entrepreneurial context, being defined as a "Knightian" uncertainty (e.g., Knight, 1921), that is "*the inability to classify the environment and predict future events*" (Matusik and Fitza, 2012, p. 408). Alternatively, uncertainty can be strictly related to the

decision-making activity VCs run and the consequences on the investment performance outcome. In light of this second interpretation, it is possible to consider two dimensions of uncertainty (Thompson & Tuden, 1956). First is uncertainty as to the preferred outcomes, which is "*ends uncertainty*". Second is uncertainty concerning the solutions used to achieve the desired ends, which is called "*means-uncertainty*". Brunsson (1985) discusses the nature of 'estimation uncertainty', that is common in economic decision-making processes. According to Brunsson (1985), uncertainty could be defined as "*lack of confidence in existing information*" (Brunsson, 1985; Larsson, 2000). A VC may be uncertain about the correct estimation of a given descriptive element in his or her cognitive structure. For example, an investor may be certain that the product market is a key driver for investment evaluation, and there may be no difficulty in weighing the market aspect against investment cost. But uncertainty can still exist about whether to invest or not, if the investor is not certain about market future trajectories and consequential effects on investment performance. In this study we adopt the "Knightian" definition of uncertainty. Moving from that definition, VCs react to uncertainty in a double manner: (i) they invest by exploiting familiar domains, accumulating knowledge resources relevant to portfolio companies invested; (ii) they invest in non-local domains to broaden the knowledge stock to accumulate as much inputs as possible to manage also unpredictable situations in the investment activity. The former approach shows a higher propensity towards deep knowledge and an exploitative orientation, allowing to endogenize uncertainty; the latter approach shows a higher propensity towards the breadth of knowledge and an explorative orientation, allowing to cover more unpredictable situations and catch valuable investment opportunities out of uncertainty. While VC firms adopting the first approach encourage learning processes, prefer to develop routines to be exposed to a less competitive pressure and investment risk (experiential learning), VCs adopting the latter approach prefer to learn outside their boundaries rather than from internal accumulated experience (vicarious learning), focusing on a wide range of knowledge stocks.

The investment stage. One key aspect in VCs investing activity which is closely related to high levels of uncertainty is the investment stage, that is the stage the entrepreneurial venture is at the moment the VC invests in it. Early stage investments are related to higher levels of uncertainty due to multiple reasons: (i) the market of the entrepreneurial venture, together with the technology at the basis of the business are not completely tested and are susceptible to dynamism; (ii) the management team has not sophisticated skills to carry out the business (De Clercq et al., 2006); (iii) the VC company incurs into very costly effective monitoring of entrepreneurs (e.g., Sahlman, 1990; Lerner, 1995; Kaplan and Stromberg, 2003, 2004; Bottazzi, Da Rin, and Hellmann, 2008), as advisor to improve the efficiency of the entrepreneurial firm, by spending time on helping the business to develop and grow up. More deep knowledge and experience would be useful in such staging, to increase VCs' monitoring activity and optimize their judgments, helping to manage unpredictable contingences the early stage portfolio company may encounter. However, at the same time, early stage investments require higher problem solving capabilities due to new problems that previous portfolio companies have not faced. Thus, different and non-local knowledge stocks, in other words the breadth of knowledge, may enhance the likelihood to be able to manage all the unpredictable situations encountered by early stage investments, by adopting as much different inputs and knowledge as possible. The

difficulty to predict the trajectory an early stage company may take make an explorative orientation, with the broad knowledge spectrum associated, useful in early stage investing, thus allowing us to expect the value of exploration to be higher in such case.

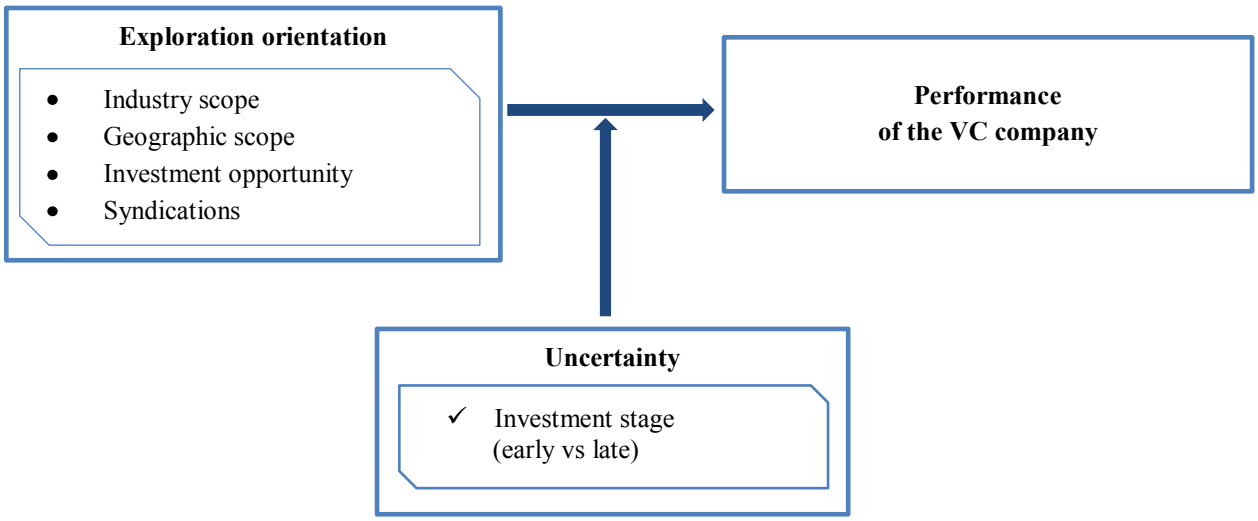
On the opposite side, late stage investments are associated with lower levels of uncertainty for several reasons: (i) the technology at the base of the product has been already proven; (ii) market conditions are well-known; (iii) performance milestones have been already reached by the portfolio company; (iiii) the management team has already developed specific competences and performed to reach defined outcomes. Hence, in the case of late stage investing deep knowledge and experience have a less relevant value, since generalized expertise coming from broad rather than deep knowledge spectrum allows to efficiently evaluate the companies under investment. Also required problem solving capabilities are less sophisticated in such staging. The trajectories of the portfolio companies are established and unexpected situations are difficult to be experimented. The value of exploration orientation, and the breadth of knowledge stock associated, is less relevant as the level of uncertainty declines. Thus, the value of exploration orientation is less relevant in late stage investments.

In light of this, with higher levels of uncertainty, associated to early stage investing more than late stage investing, the value of exploration orientation towards knowledge resources we expect to be higher. Higher levels of exploration orientation will have a positive impact on VC performance under higher uncertainty associated to early stage investments. We therefore state:

Hypothesis 2: *The U-shaped relationship will be moderated by the investment stage; early stage investments will make the relationship more pronounced than in the cases of late stage investments*.

We draw our conceptual framework as follows (Fig.4-1).

Figure 4-1 Conceptual Framework



4.4 Research method and data collection

Sample and data collection

To test our hypothesis, we collected data from Thompson One Banker database, which stores information on Private Equity and Venture Capital firms. Such dataset has detailed information on VC firm operations such as location, portfolio, funds, estimated investments. Furthermore, it also has information on the companies that received a VC investment, their location, industry, number of employees, and current status (active versus failed). We retrieved information on VC firms that were established in the period between 2001 and 2004 both in Europe and in the U.S. We decided to take new VC firms to capture their full portfolio during the seven-year window after their establishment. In this way, we are able to list all their VC investments from 2001 (for VCs established in 2001) to 2012 (for all the VCs in our database that were still active in 2012). Overall, we were able to collect complete data on 579 VC firms with an average of 3 investments per year. To analyze our data, we followed prior works by Matusik and Fitza (2012), and built up our dataset to adopt as unit of analysis the VC firm/year. VC firms invest by VC funds, and each VC firm may have multiple funds which shares expertise and knowledge and participate to the VC final goal that is to increase the likelihood of a successful performance outcome associated to the portfolio companies invested. Due to the fact that VC funds share knowledge resources of the entire VC firms, we adopted the VC firm level to run our analysis as representative of the relationship between exploration of knowledge and VC performance. Furthermore, prior works (Matusik and Fitza, 2012) received similar results from the same investigation conducted both at a firm and a fund level, thus further validating our choice.

As we explain later, our dependent variable is calculated at VC firm level/year, while our independent, moderating, and control variables are averaged over the time window chosen to run the investigation. Precisely, we chose a time window of 7 years to be able to have 6 time-windows. In fact, each company stays in a VC firm portfolio up to about eight years until the VC exits the investment. To adopt such a time window can assure representativeness to the sample analyzed if compared to the VC industry as a whole. Has been demonstrated that using seven- and nine-year windows results in similar findings, thus allowing to validate one-year more or one-year less rolling windows (Matusik and Fitza, 2012). In detail, the first time window encompasses 2001 until 2007, the second one goes from 2002 to 2008, and so on. For example, the percentage of successfully ultimate investments made in 2001 were regressed on variables averaged over the seven-year window from 2001 to 2007, and so on. Since our time-windows are 7 years long, we excluded observations with a short time window. This is consistent with prior studies (Sorensen, 2008; Fitza et al., 2009; Matusik and Fitza, 2012), which exclude VCs with lower activity, considered not representative of the overall VC firms. For example, although we had data relative to our dependent variable for the year 2010, we had to exclude those since we did not have the relative 7-year time window. Furthermore, in our final analysis we included only VC firms that were active at least 4 years to ensure that a portfolio had been built. Thus, after the stratification procedure, the final sample resulted in 335 VC firms with an average of 3.6 investments per year, for 1,451 observations.

Measures

We anticipated above that to measure our constructs we chose the VC firm level of analysis. We described the procedure followed to stratify data according to the decision to measure our independent, moderating and control variables over a seven-year window (see the explanation in the section before). Below we provide a detailed description of each measure adopted.

Dependent variable. One of the most difficult information to get from VCs is relative on their performance outcomes. Even though VCs are asked to report performance information, no direct measure of performance for a large number of VCs is available by accessing to official databases. It implies a bias in a VC sample collected due to the restriction of performance data only to those VCs who publicly reported their outcomes. We encompassed this limitation by following previous works (Hochberg et al., 2007; Matusik and Fitza, 2012), which based the performance measure on the percentage of investments in a given year that were successfully exited. Previous works adopted as successful outcome only the case when the portfolio company is exited by an IPO, that is the company goes public by a liquidity event which assures to the VC the highest return on the investment (De Clercq et al., 2006). Additionally to such successful outcome interpretation, we followed De Clercq and Dimov (2008) and adopted as successful performance measures two status: (i) the investee goes public (undergo an IPO); (ii) the company is acquired by another company. Both exit strategies indicate a successful performance outcome (Sahlman, 1990), where the former is the best outcome, and the latter the second-best one. To simplify our analysis, we coded both exit results as alternative but equivalent specification of successful investment performance.

Independent variables. We measured exploration according to the three dimensions of knowledge acquisition described in the theoretical section, SSKA, DSKA, and NSKA. In detail, we framed exploration as greater non-local search for knowledge, operationalizing it with regards to the industry VCs invest in, the geographic scope of VCs investments, the investment opportunity (new vs follow-on investment), and the number of syndicate partners and non-familiarity with those.

To measure the *1st independent variable* - the industry scope - we followed Matusik and Fitza (2012), by adopting an entropy measure. In Thomson One Banker the industry is represented by two-digit SIC codes and VEIC codes. We chose to adopt the former, allowing to know the numerical distance between industry codes and, consequently, the relatedness of industries. We calculated industry exploration (vs exploitation) as follows:

$$Industry\ Exploration_{i} = \sum_{j=1}^{N} pI_j \ ln \ l \ pI_j$$

where pI_j is the percentage of VC i investments made in industry j in the 7-year window, and ln (l/pI_j) is the weight of each industry segment.

To measure the *2nd independent variable* - geographic scope - we measured the average distance between each VC firm and each investment made in the seven-year window. To calculate the distance we followed Cumming and Dai (2010). We collected the zip codes of investors and investee from Thomson One Banker, then we obtained the latitude and longitude

data for the center of each zip code from an electronic converter and estimated the distance between centers of two zip codes using the following equation:

$$d_{ij} = 3963 \times \text{ar cos}[\sin(\text{lat}_i)\sin(\text{lat}_j) + \cos(\text{lat}_i)\cos(\text{lat}_j)\cos(|\text{long}_i - \text{long}_j|)]$$

where latitude (lat) and longitude (long) are measured in radians and 3963 is a constant representing the Earth's radius in statute miles[6].
In sum, the more distant the investments made, the more explorative the orientation.

To measure the *3rd independent variable* - investment opportunity – we adapted the measurement approach adopted by De Clercq and Dimov (2008) to count the number of prior interactions with an investment opportunity (a firm to invest in) to discover if each investment in the window under analysis represents a new investment (explorative), versus a follow-on investment (exploitative).
Therefore, we counted the number of times each VC firm in the sample had previously invested in a firm and summed these counts to derive a score.
In sum, the lower the number of prior interactions of an investment opportunity, the greater the exploration orientation.

To measure the 4th *independent variable* - syndicate partners (co-investors) – we followed De Clercq and Dimov (2008) and their measure for the number of syndicate partners and the non-familiarity with those, in terms of no prior interactions with the syndicate partners. For each investment, we used the reported number of participating investors to measure the number of syndicate partners. To measure the number of prior interactions with syndicate partners for each investment, we counted the number of times the VC firm had previously co-invested with each syndicate partner and summed these counts to derive a score for the entire syndicate. We used the sum rather than the average of the number of prior interactions to exclude from the final score all the cases where no partner interaction was reported in the database. To ensure validity to our measure, we verified the lack of significant correlation among the total number of prior interactions with the number of partners/investors whose data were reported in the database, to demonstrate that the missing cases were not detrimental to the validity of the final result.

In sum, the greater the number of non-familiar syndicate partners, the greater the exploration orientation.

Moderating variable. For each investment made by a VC firm, the VC reports the relative stage, early stage versus late stage. VC firms classify each investment in the Thomson One Banker database as: seed, early, expansion, later stage. We treated these values as an ordinal scale and calculated an average.

Control variables. We controlled for various factors commonly adopted in literature on VC performance (e.g., De Clercq and Dimov, 2008; Matusik and Fitza, 2012) to reduce bias effects of omitted variables, eliminate alternative explanations of investment performance, and account

[6] Sorenson and Stuart (2001) use "3437" as the constant representing the radius of the Earth in nautical miles; Coval and Moskowitz (1999, 2001)) use "6379" as the constant representing the radius of the Earth in kilometers. Adopting these different units (such as nautical or kilometer) does not change our measure of local bias (Cumming and Dai, 2010).

for alternative rationales for syndications. We controlled for *VC firm characteristics*, in detail we controlled for the VC's *age*, *total number of investments to date* (logged), as more experienced VCs may achieve more successful exits. We controlled for *location in U.S. or Europe* (adopting a dummy variable), to distinguish findings relative to different country contexts, may be affected by different institutional contexts and contingency factors. We also controlled for VC *firm size* by the total capital commitment, as "larger" companies have more financial resources which make less likely the need to syndicate (Manigart et al., 2006). To control for *year differences in IPO rates*, we included a set of dummies for each investment year. To account for *the growth and decline of the IPO market*, we included the total (logged) number of IPOs achieved by investees in a given year across the total population of investments in the Thomson One Banker database. We also controlled for the *average stage of the investments a VC made in every focal year* to control for the bias related to the greater likelihood a late stage investment has to result in an IPO.

Analysis and initial results

We built up the dataset at the fund level first, then at the firm level. Due to the multiple events we observed for most of the VC firms in our study, we adopted a fixed effects regression analysis (Matusik and Fitza, 2012). One of the benefits of this approach is that we can control for unobservable variables that do not change across time. Our models consists of 1,451 observations per 335 VC firms. We estimated the model below:

$$Performance_i = \alpha + \beta_1\, Industry\ Exploration + \beta_2\, Geographic\ Exploration + \beta_3\, Investment\ Exploration + \beta_4\, Network\ Exploration + \beta_5\, Stage_i + \beta_6 CV + \varepsilon_i$$

The coefficient β_1, β_2, β_3, β_4, represent respectively the effects of industry exploration, geographic exploration, investment opportunity exploration and network exploration (as referred to the number and non-familiarity of syndicate partners) on performance. *CV* represents a vector of control variables as well as the fixed effects for each VC firm. To test our hypotheses, we were interested to verify whether the coefficient estimates are not equal to zero. If some or all the coefficients are equal to zero, this means one or all the hypotheses are null, that means exploration has no relationship with VC performance, and/or investment stage (as representative of uncertainty) does not moderate the relationship investigated.

We expected all the hypotheses would be confirmed and a linear relationship between exploration orientation and VC performance would be empirically tested.

However, the first analysis we ran was not satisfactory. By running the analysis with 1,451 observations, we obtained that only the relationship supposed in Hypothesis 1d was confirmed (mean syndication =-89.52 with $p<0.10$). Notwithstanding we found significant correlations between the dependent variable and the variables representing the industry diversification (-36.57 with $p<0.05$) and investment firm (0.0778 with $p<0.05$), the relationship hypothesized was not confirmed.

We conducted a robustness test including those firms that invested only for a period longer than five years, so active investors across time. By running the analysis with 979 observations no significant difference has been detected. Only Hypothesis 1d was confirmed.

To overcome the empirical limitation we decided to run a second analysis adopting a survival methodology.

4.5 Discussion

Drawing from the knowledge-based view and organizational learning literature, we are examining the performance effects of exploration orientation, framed as a greater propensity towards non-local search for knowledge resources showed by VC firms, which represent our unit of analysis. The conceptualization of exploration orientation as related to knowledge search and acquisition derives from our first-stage study in which we proposed a proper conceptualization of exploration (vs exploitation) orientation and a measurement instrument to operationalize the constructs in the VC context. Evidence from the context of venture capital investment performance will reinforce some aspects of our conceptual framework and lead to a more nuanced understanding of other points. Due to the fact we could not run the analysis yet, we can just anticipate what we expect to find out.

Looking at exploration orientation in the context of analysis chosen allows us to better understand how investment decisions related to knowledge resources acquisition can affect performance, more in detail under uncertain environmental conditions. In VC firms which primarily rely on knowledge assets we expected to test a U-shaped relationship between a more explorative orientation and performance. We tried to demonstrate under what conditions the positive effects of exploration can be shown. We explained the expected U-shaped relationship as at high levels of exploration the benefits to superior problem solving capabilities and higher competences in managing portfolio companies down a variety of trajectories are important to VC performance, increasing the likelihood to reach successful performance outcomes. Critical in our model was the moderating effect we expected to prove for uncertainty, expressed in terms of investment stage (early stage versus late stage). In the case of early stage investments, associated with higher levels of uncertainty, we expected to prove that an explorative orientation towards the dimensions of knowledge search we adopted helps to manage that uncertainty. As explanation, we stressed the importance of knowledge stocks as much various as possible to increase the efficiency in responding to the dynamic nature of an early stage company, which operates in a dynamic market and whose business relies on a not sufficiently proven technology. Conversely, we expected to find a lower effect played by late stage investments on the relationship investigated, due to the less broad knowledge stocks VC firms require to manage companies managed by a more experienced management team, working in a proven market and managing a tested product, thus, in general, not significantly requiring the breadth of knowledge in the area of the late stage portfolio company's business.

In sum, we expected to find that the scope of VC firms' knowledge stocks has important and beneficial investment performance implications, especially in a context of higher uncertainty.

At the current stage of the empirical analysis, results do not confirm our hypotheses, except for Hypothesis 1d. Furthermore, there is no evidence of a moderating effect played by uncertainty, expressed in terms of early stage investments.

To validate our theoretical framework and test for our hypotheses we are going to run a second analysis adopting a survival methodology.

4.6 Limitations and contributions

Several limitation to our study can be noted and suggest avenues for future research. First, empirical limitations are related to the variables chosen to measure exploration orientation and performance, and the collected sample.

With regards to the VC syndicates chosen to measure exploration through a network-side dimension, our data lack sufficient detail to examine the nature and outcomes of prior interactions between syndicate partners. Further research can distinguish positive interactions versus negative interactions, that is the case where positive investment outcomes are associated to specific syndicate partners versus the specular cases. Additionally, further research can make a comparison between lead and non-lead investors with regards to the benefits received in terms of knowledge stocks. As network-side dimension to measure exploration, further studies can adopt other sources of external knowledge, for instance external advice-seeking coming from consultants, academics, entrepreneurs, research institutes, and so on.

With regards to the investment performance measure adopted, even though IPOs and acquisitions are commonly adopted by researchers as signals of successful performance outcomes, an alternative measure can be the number of employees of the portfolio company invested, as a measure of the company's growth via the VC funding and monitoring activity.

Future research can repeat the study by distinguishing short-term from long-term performance and, consequently, testing if different findings may be derived.

Furthermore, future research can adopt syndications as moderator rather than independent variable (Matusik and Fitza, 2012). In so doing, uncertainty can be disentangled by an additional investigation dimension, may be resulting in different findings.

An additional operational limitation pertains to the generalizability of our findings to country contexts different from U.S. and Europe and to contexts other than venture capital companies (independent VCs). In fact, as concern the latter aspect, the same investigation can be repeated among corporate venture capital investors (CVCs), business angels, hedge funds and private equity investors which represent other players in the funding capital industry.

As concern the sampling, we are limited to data available at the Thomson One Banker database; further attention must be devoted to verify the representativeness of such data source of the VC industry context.

Our research, especially after receiving the expected findings, has important implications to both literature and practice. As concern literature on entrepreneurship, the study deepens the understanding on how VCs invest and which investment characteristics (related to knowledge assets) have a positive impact on performance. As concern the strategic management literature, the study broadens the understanding on exploration (vs exploitation), providing insights into the relationship with performance in a novel context of investigation, as the VC industry.

A first practical implication for VCs may be detected. Recognition of the opportunity behind a more explorative orientation to reach superior performance outcomes may contribute to improve the business and, consequently, also the reputation of the VC investor. Selection and evaluation procedures in the deal-flow process may be optimized by a greater or narrower focus on specific versus diversified knowledge or, in other words, on existing versus never explored knowledge. By the identification of the positive relationship between a more explorative orientation and performance, VCs may derive practical implications from our study.

A second practical implications may be indicated for entrepreneurs. Clearly, for entrepreneurs asking for funding knowledge arising from our findings represents a tool to choose the right VC investors looking at their exploration (vs exploitation) propensity. In fact, their orientation will show to entrepreneurs how VCs invest and, consequently, the likelihood to achieve a high investment performance outcome.

Future research can develop specular hypotheses concerning more specifically exploitation orientation (vs exploration), to investigate on the relationship between a greater depth of knowledge, related to a local search for knowledge stocks, and VC performance.

Chapter 5

CONCLUSIONS AND IMPLICATIONS

5.1 Introduction

The nature of exploration is usually associated to concepts such as search, variation, flexibility, experimentation, innovation, and risk-taking (March, 1991; Lewin et al., 1999).

A pivotal concept in the framing of exploration is the idea of greater or lesser scope of external knowledge acquisition. Evidently, greater or lesser search efforts increase or reduce the knowledge stocks from the external environment which are included within the boundaries of the organization.

Our interest on investigating exploration (versus exploitation) as closely related to the concept of knowledge search and acquisition was expressed into an empirical investigation in the VC context, due to the central role played by knowledge in VC investing, upon all the deal-flow process, from the *ex ante* selection and evaluation activities, to the *ex post* funding, monitoring and exiting activities which VCs perform.

To this end, approaching exploration from the evolutionary economics perspective and drawing on previous works (Sidhu et al.,2004, Sidhu et al., 2007), we extended prior literature by focusing on scope search on three integral different dimensions. Two knowledge search dimensions were redrawn by following the conceptualization suggested by researchers in evolutionary economics: *spatial-side knowledge acquisition* (SSKA) and *demand-side knowledge acquisition* (DSKA).

The third dimension – *network-side knowledge acquisition* (NSKA) - was framed as related to a firm's interactions with external partners, by adopting the lens from social capital theory.

These elements were used to develop a framework that combined insights from knowledge-based and social capital theories into a measurement instrument which was consequently functional to test the relationship between exploration and exploitation orientation and, respectively, VC decision-making performance (expressed in terms of decision comprehensiveness) and VC performance. Moderators were introduced in the model to test a hypothesized moderating effect exercised by experience on the former relationship, and by uncertainty on the latter one (Figure 1-2).

For this dissertation, three empirical studies were developed to treat different aspects of the framework. In detail, each study represents a step forward in the research project which follows a unique incremental stream of reasoning (Table 5-1). The studies by no means attempt to be exhaustive, but rather aim at making specific contributions to the literatures of organizational learning and venture capital, in detail, but more in general to the strategic management and entrepreneurship literatures. The dissertation overall focused on the concepts of "search" and acquisition of knowledge resources as focal aspects for a conceptualization of exploration and exploitation orientation in the context under investigation, the VC industry.

Clearly, the conceptualization we provided of the specular orientations, which is closely rooted into the overall dissertation framework, frames exploration and exploitation in the VC context in terms of knowledge acquisition activities. In this view, we stated that the greater the scope of external knowledge acquisition, the greater the exploration orientation showed by VCs; conversely, the narrower such scope, the greater the exploitation orientation. In other words, exploration orientation was expressed in terms of non-local search for acquisition of knowledge stocks, while, conversely, exploitation orientation was framed as local search, or search into close domains, for acquisition of knowledge stocks. In the search for knowledge three dimensions of scope search were identified in VC as related to (i) industry scope and geographic scope (spatial-side knowledge acquisition, SSKA); (i) investment opportunity (demand-side knowledge acquisition, DSKA); (iii) syndications and network interactions (network-side knowledge acquisition, NSKA). After validating the measurement instrument proposed, these dimensions were used as measures for the constructs to test, thus, for the effects of exploration and exploitation orientation on VC decision-making performance, expressed in terms of decision accuracy or, better to say, decision comprehensiveness, and on VC performance. Further, we accounted for the effects of an organizational moderator (experience) on the first relationship, and an environmental moderator (uncertainty) on the second one.

Table 5-1 summarizes the research questions of each of the studies, the theoretical perspectives used to hypothesize the relationships and the level of analysis. It can be noted that exploration orientation (and the specular one) can be studied at multiple levels. The three studies in this dissertation focused on individual level (Study 1 and 2) and firm level (Study 3). Across these levels, positive effects were found between exploration orientation and decision comprehensiveness (as expression of decision-making performance) and positively effects are expected on VC performance as well. As concern the investigation on decision comprehensiveness, specific contingent factors in the decision-making power distribution among

VC board members provide a sense of possible boundaries to these positive effects, thus suggesting to identify such boundary conditions as a fruitful area for future research.

Table 5-1 Overview of the empirical studies

Study	Main research question	Leading Causal Mechanisms	Level of Analysis	Empirical Context
Study 1	Conceptualization of exploration and exploitation orientation in the VC industry	Knowledge-based view, social capital theory, evolutionary economics	Individual level (VC manager)	43 Canadian VC managers from CVCA
Study 2	Impact of exploration vs exploitation orientation on decision-making performance / comprehensiveness in VC companies	Knowledge-based view, organizational learning, judgment/decision-making	Individual level (VC manager)	43 Canadian VC managers from CVCA
Study 3	Impact of exploration orientation on VC performance under uncertainty	Knowledge-based view, organizational learning, uncertainty	Firm level (VC firm)	335 US- and Europe-based VC firms from Thomson One Banker database

5.2 Summary of the findings of the studies

Table 5-2 through 5-4 sum up the hypotheses and the extent to which these were supported by the empirical findings of the studies. It has to be noted that for the third study[7] we could not run the analysis yet because the dataset is still at a fund level, while our investigation has to be ran at a firm level. In light of this, hypotheses concerning the relationship between exploration orientation and performance are expected to be supported, but the relative results will be presented later. In the following, the hypotheses and the results are reflected upon.

[7] As concern the third study, the empirical investigation is in co-authorship with Dr. L. Berchicci, from the Strategic Management and Entrepreneurship Department at the Rotterdam School of Management of the Erasmus Universiteit (The Netherlands). Data were collected from Thomson One Banker Database (by access permission of the Erasmus Universiteit) and the final dataset is going to be set up from Dr. L. Berchicci, in order to run the analysis at the firm level we chose for our investigation.

Study 1 - Investigating exploration and exploitation orientation in the venture capital industry

Study 1 (Table 5-2) found encouraging results. The co-evolutionary framework helped us to frame exploration versus exploitation orientation in a never explored research context: the VC industry. First, we stated five double propositions (specular to each other) to propose our conceptualization of exploration and exploitation orientation, that was the greater the scope of external knowledge acquisition, the greater the exploration orientation showed by a VC; conversely, the narrower such scope, the greater the exploitation orientation.

Each pair of propositions referred to the three identified dimensions into specific knowledge search domains within a VC conducts the main activity of seeking for investment opportunities: (i) spatial-side, via the industry scope and geographic scope; (ii) demand-side, via the investment opportunity; (iii) network-side, via the syndications and network interactions.

Then, we tested the measurement instrument validity. We found strong support for the operational measures proposed from the reliability tests conducted. Moving from our framework, we adopted the composite exploration-orientation construct in the VC field of analysis, and tested for hypotheses pertaining the resulting higher or lower score for the three dimensions (SSKA, DSKA, NSKA) contributing to the overall score for the construct. Moving from the evidence in the literature, we supposed a relatively greater exploration orientation. The results were satisfactory, in fact VCs showed a relatively high explorative orientation compared to the resulted overall exploitation orientation. While the DSKA dimension was found to significantly contribute to the overall exploration orientation, on the side of exploitation orientation, the search dimension which resulted more impactful on the overall result was the SSKA one. That means VCs resulted more explorative as concern the selection of the investment opportunity, while more exploitative as concern the spatial distribution of their investments. Finally, moving from the literature on VC investments spatial distribution (e.g., Sorenson and Stuart, 2001; Lutz et al., 2009) we assumed VCs would show a lower explorative orientation in terms of geographic search. The relative hypothesis was confirmed by our empirical investigation, thus proving VCs relatively higher propensity towards geographic proximity. That is, VCs prefer to invest in close or well-known geographic areas.

Table 5-2 Results of Study 1 - *Investigating exploration and exploitation orientation in the venture capital industry*

Hypotheses	Result
HP1: *VCs are relatively more likely to explore than to exploit in terms of spatial side, demand side and network side knowledge acquisition.*	Supported
HP2*: VCs are more likely to explore than to exploit as concern all the knowledge acquisition dimensions (SSKA, DSKA, NSKA), except for the geographical side knowledge acquisition.*	Supported

Study 2 - Exploration vs exploitation orientation and decision-making activity in the venture capital context

In Study 2 (Table 5-3) we moved from the knowledge-based conceptualization of exploration and exploitation proposed in Study 1 to link this perspective to the judgment/decision making literature in the vein to investigate the effect of exploration vs exploitation orientation on the decision-making performance reached by VCs, by framing this in terms of decision comprehensiveness. By measuring exploration and exploitation orientation through the measurement instrument proposed in the previous study, and by measuring decision comprehensiveness by a scale redrawn with respect to what previous scholars proposed in their works (Miller, 1998; Alexiev, 2010), we tested for our hypotheses which resulted in satisfactory findings. In fact, both hypotheses 1 and 2 found strong support, proving the existence of a linear relationship between exploration orientation and decision comprehensiveness and, conversely, a curvilinear relationship between exploitation orientation and decision comprehensiveness. Clearly, as VCs are more likely to explore – search for non-local domains – by seeking new investment opportunities, investing in distant geographic areas and industries never invested before, and syndicating or interacting with new partners belonging to an external network, they adopt more accurate decisions, the decision process is less intuitive, and, consequently, they show superior decision comprehensiveness. In contrast to this finding, as VCs are more likely to exploit - search for local domains - by incurring into follow-on investments, investing into close geographic areas and industries already in portfolio, and syndicating and interacting with existing partners, they produce less accurate decisions, the decision process is more intuitive and automatic, and, consequently, they show lower decision comprehensiveness.

Additionally, we tested for experience as a moderator of the main relationship under analysis. Unexpectedly, experience does not significantly moderate the relationship between exploration and exploitation orientation and decision comprehensiveness. A moderating effect was verified, but opposite to what we hypothesized, that is experience makes the linear relationship between exploration and decision comprehensiveness relatively more pronounced, while, conversely, results in a less pronounced curvilinear relationship among exploitation and decision comprehensiveness. This is in contrast with respect to what we assumed.

Table 5-3 Results of Study 2 - *Exploration vs exploitation orientation and decision-making activity in the venture capital context*

Hypotheses	Result
HP1: *The greater the exploitation orientation, with regards to each knowledge search dimension, the lower the decision comprehensiveness*	Supported
HP2: *The greater the exploration orientation, with regards to each knowledge search dimension, the decision comprehensiveness.*	Supported
HP3a: *The curvilinear relationship (inverted U-shaped) between exploitation orientation, with regards to all the dimensions, and the decision comprehensiveness will be moderated by the experience of the VC; more experience in the VC industry will make the relationship more pronounced.*	Partially supported
HP3b: *The linear relationship (U-shaped) between exploration orientation, with regards to all the dimensions, and the decision comprehensiveness will be negatively moderated by the experience of the VC; more experience in the VC industry will make the relationship less pronounced.*	Partially supported

Study 3 - Linking exploration orientation to performance in venture capital companies

Study 3 (Table 5-4) is the only one reporting partial results instead of certain findings (see the note in section 5.2). Looking at exploration orientation in the VC context of analysis allows us to better understand how investment decisions related to knowledge resources acquisition can affect performance, more in detail under uncertain environmental conditions. In VC firms which primarily rely on knowledge assets we expect to test a U-shaped relationship between a more explorative orientation and performance.

Critical in our model is the moderating effect we expect to prove for uncertainty, expressed in terms of investment stage (early stage versus late stage). In the case of early stage investments, associated with higher levels of uncertainty, we expect to prove that an explorative orientation towards the dimensions of knowledge search we adopted helps to manage that uncertainty.

In sum, we expected to find that the scope of VC firms' knowledge stocks has important and beneficial investment performance implications, especially in a context of higher uncertainty. At the current stage of the empirical investigation only the relationship supposed between the number of co-investors and performance has been confirmed. We will run a further analysis by adopting a different methodology to overcome the empirical limitation.

Table 5-4 Expected Results of Study 3 - *Linking exploration orientation to performance in venture capital companies*

Propositions	Result
HP1a: *There will be a U-shaped relationship between exploration, with regards to the industry VCs invest in, and performance*	Not supported
HP1b: *There will be a U-shaped relationship between exploration, with regards to the geographic area VCs invest in, and performance*	Not supported
HP1c: *There will be a U-shaped relationship between exploration, with regards to the investment opportunity VCs include in their portfolio, and performance*	Not supported
HP1d: *There will be a U-shaped relationship between exploration, with regards to the co-investing partners (syndications), and performance*	Supported
HP2: *The U-shaped relationship will be moderated by the investment stage; early stage investments will make the relationship more pronounced than in the cases of late stage investments*.	Not supported

6.3 Implications

The findings of the studies suggest several contributions to both theory and practice.

✓ *Implications for theory*

The novelty of our investigation contributes to the literature on organizational learning and entrepreneurship, with a special focus on VC.
We advanced a multidimensional operational measure for exploration and exploitation orientation in the VC industry anchored to the idea of spatial-side, demand-side and network-side knowledge acquisition, as the evolutionary economics perspective and knowledge-based and social capital theories suggested. The scales for all the three items were reliable and unidimensional. In this context, the dissertation work found preliminary evidence that exploration and exploitation can be operationalized in the VC context.
Additionally, the research contributes to literature on VC decision-making by adopting the lenses pertaining to exploration and exploitation, which represent a novel conceptual stream of research in VC.
With respect to performance and the upcoming findings from the third study, we contribute to the entrepreneurship literature by deepening the understanding on how VCs invest and which investment characteristics (related to knowledge assets) have a positive impact on

performance. As concern the strategic management literature, the study broaden the understanding on exploration (vs exploitation), providing insights into the relationship with performance in a novel context of investigation, as the VC industry.

✓ *Implications for practice*

Our dissertation work contributes to deepen the understanding on how VCs select their investments, which is the predominant orientation among exploration and exploitation which they show while deciding to invest and build up their portfolio, and, finally, which orientation can lead to superior decisions and, consequently, performance outcomes. In light of this, a first practical implication for VCs may be detected. Recognition of which orientation, more explorative versus more exploitative, represents an opportunity for VCs to improve decision accuracy may contribute to achieve superior investment performance goals. Selection and evaluation procedures in the deal-flow process may be optimized by a greater or narrower focus on specific versus diversified knowledge or, in other words, on existing versus never explored knowledge. By the identification of the positive relationship between a more explorative orientation and decision comprehensiveness, VCs may derive practical implications from our study. Searching for non-local domains, may lead VCs to more accurate decisions, higher consensus, less time-consuming decision processes, an overall decision making higher performance. Conversely, VCs find evidence from our findings that the opposite orientation towards knowledge search lead to lower decision quality, potentially resulting in underestimation of good investment opportunities, errors in the portfolio composition, low investment performances.

A second practical implications may be indicated for entrepreneurs. Clearly, for entrepreneurs asking for funding knowledge arising from our findings represents a tool to approach VCs in a proper way. Moving from the knowledge of the VC firm propensity towards a greater or lower scope of its investments – thus, a diversified versus specific focus of its investments – entrepreneurs may identify which VC firm better fits with their investment goals, thus increasing the likelihood to obtain funding and the performance of the deal. In fact, VC firms orientation will show to entrepreneurs how VCs decide and, consequently, the likelihood to achieve a high investment performance outcome.

6.4 Limitations and future research directions

The studies in this dissertation were conducted within the constraints of numerous limitations. Addressing these shortcomings provides opportunities for future research. New theoretical challenges emerge as well. Some of the most pertinent ones include clarifying the link between knowledge-based view and social capital and exploration (vs exploitation) orientation, extending the framework, exploring the antecedents of exploration and exploitation orientations in the VC context and deepening the understanding on the strategic decision-making process behind the

exploration orientation in VC companies; further investigating on the effects of exploration and exploitation on performance, distinguishing between short-term and long-term performance; adopting the perspective which treats with vicarious learning versus experiential learning to propose a similar as well as diverse investigation in the VC context. Clearly, the first further step remains to complete the third investigation to obtain the expected findings outlined in the current research work.

A more detailed examination of the theoretical, together with methodological, limitations of the dissertation and future research which is suggested to answer to the open inquires is reported upon below.

✓ *Theoretical limitations and future research*

As concern *Study 1*, a first limitation pertains to the perspectives adopted, which can lead to findings potentially different from those derived from an empirical application of a different theoretical framework. For instance, adopting the agency theory (focusing on the information asymmetries affecting VC investment activity when they diversify among different domains and invest outside the VC firm boundaries) and the related transaction costs theory can lead to different insights. Moreover, the study does not investigate on casuality. Antecedents and outcomes of a greater or lower exploration orientation among VCs need to be investigated. Further research can overcome this limitation.

As concern *Study 2*, the most evident theoretical limitation is the fact that the framework relies on a specific cognitive bias in VC decision-making - overconfidence - while lots of different bias from judgment/decision-making literature can exercise different effects and lead to develop hypotheses diverse from those proposed in the current research. Future research can adopt a conceptual framework taking those into consideration. Moreover, inverted hypotheses may be studied following scholars proposition of the utility of optimistic overconfidence for entrepreneurship (Busenitz and Barney, 1997).

Concerning *Study 3*, as we deal with exploration orientation, while no attention is devoted to empirically test exploitation, future research can develop specular hypotheses concerning more specifically exploitation orientation (vs exploration), to investigate on the relationship between a greater depth of knowledge, related to a local search for knowledge stocks, and VC performance.

✓ *Methodological limitations and future research*

In *Study 1* and *Study 2* we adopted the same methodology, thus methodological limitations are commonly addressed. Among these we note empirical limitations related to the operationalization of the variables, the sample, the use of a survey methodology, and the adoption of an unique perspective, the one of the randomly selected VC managers which were considered to measure exploration versus exploitation orientation variables. With regard to the sampling, in the current research exploration and exploitation orientation among VCs were considered in a single country context, the Canadian country, with some industries more represented than others in terms of VC investments focus (cleantech, software, biotech and

digital). To allow for further generalizations beyond the investigated population, subsequent research can be directed to replicate the study to other contexts. Further, in order to increase the reliability of the findings, a larger sample of VCs would be needed. An additional limitation concerns the form chosen to conduct the survey. The self-administered questionnaire represents a limit in our empirical investigation, which may suffers from subjectivity. In light of this, future research can choose a quantitative methodology to derive the results by a more sophisticated and objective collecting instrument.

As concern the measurement instrument to operationalize exploration and exploitation, only knowledge-related items have been developed. Further operational items can be adopted in further studies, taking into consideration experimentation and risk-taking, both related to "exploration" and the VC industry.

Finally, a further methodological limitation concerns to the absence of longitudinal objective data (excluding the subjective responses pertaining to the activities VCs have been engaged with in their VC experience), because of which a generalization of the findings to the overall VC experience cannot be assured.

Then, in *Study 3* empirical limitations are related to the variables chosen to measure exploration orientation and performance, and the collected sample.

Moving from the latter, an operational limitation pertains to the generalizability of our findings to country contexts different from U.S. and Europe and to contexts other than venture capital companies (independent VCs). In fact, the same investigation can be repeated among corporate venture capital investors (CVCs), business angels, hedge funds and private equity investors which represent other players in the funding capital industry.

As concern the sampling, we are limited to data available at the Thomson One Banker database; further attention must be devoted to verify the representativeness of such data source of the VC industry context.

Variable-related limitations can be referred to the measures proposed for our dependent variable and syndications. As concern the former, the investment performance measure adopted, even though IPOs and acquisitions are commonly adopted by researchers as signals of successful performance outcomes, can be replaced in future studies by the number of employees of the portfolio company invested, as a measure of the company's growth via the VC funding and monitoring activity. As concern the latter, data on syndicates lack sufficient detail to examine the nature and outcomes of prior interactions between syndicate partners. Further research can distinguish positive interactions versus negative interactions, that is the case where positive investment outcomes are associated to specific syndicate partners versus the specular cases. Additionally, further research can make a comparison between lead and non-lead investors with regards to the benefits received in terms of knowledge stocks. As network-side dimension to measure exploration, further studies can adopt other sources of external knowledge, for instance external advice-seeking coming from consultants, academics, entrepreneurs, research institutes, and so on. Finally, syndications can be adopted as moderators in future investigation on the topic, as Matusik and Fitza (2012) did.

6.5 Conclusion

The aim of this dissertation was to investigate exploration and exploitation orientation in a novel context: the VC industry. To this end, we adopted knowledge-based and social capital theoretical lenses, together with the main assumptions from evolutionary economics and organizational learning literatures, to draw the theoretical framework which allowed us to conduct the study at multiple levels of analysis, and derive interesting findings from our empirical investigation. Important insights derived from our dissertation work which can inspire future research works to deepen the understanding on how exploration and exploitation orientation work in the VC context. This dissertation, taking part to an open debate on the scope of knowledge stocks in the VC context and the relative effects on decisions quality and performance, showed that a different conceptualization of the propensity showed by VCs towards local versus non-local knowledge resources is possible, and investigate on exploration and exploitation among investors makes sense, despite the previous skepticism showed by some scholars about the topic.

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