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Evaluating Innovation Output of Companies Backed by Corporate, Independent and Syndicated Venture Capital

Fatima Shuwaikh[1] | Sabrina Khemiri[2] | Souad Brinette[3] | Joakim Zebulon Börrén Dias[4]

[1]De Vinci Higher Education, De Vinci Research Center, Paris, France | [2]Université Paris-Saclay, Univ Evry, IMT-BS, LITEM, Evry-Courcouronnes, France | [3]EDC Paris Business School, OCRE-Lab, France | [4]Catolica Lisbon School of Business and Economics, Portugal

Correspondence: Fatima Shuwaikh (fatima.shuwaikh@devinci.fr)

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ABSTRACT

This paper examines how Corporate Venture Capital (CVC), Independent Venture Capital (IVC) and Venture Capital Syndicate (VCS) promote innovation among startups. Drawing on a dataset of 4406 venture-backed deals in North America, spanning 1998–2019, it explores how the configurations of investors and their contextual factors influence innovation output. The findings show that syndicated and CVC-backed ventures outperform IVC-backed ventures. Syndicates with a larger membership are positively associated with innovation outcomes based on resource pooling and knowledge sharing; contextual factors, such as location and technology fit, environmental munificence and absorptive capacity have a positive moderating effect on the relationship between VC type and innovation outcomes. This research adds to both academic knowledge and practical implications, offering entrepreneurs, investors and policymakers' actionable insights about how to facilitate innovation, improve venture funding and enhance innovation management to ultimately strengthen the innovation ecosystem.

JEL Classification: D26, G24, G32, L21, L26, M13

1 | Introduction

A strive for invention and innovation (Maynard 2019) drives the economy more than ever, and these values are deeply embedded in many entrepreneurial companies (Lebret 2015). Looking to the past couple of years, two companies have entirely transformed their industry: Uber and Airbnb. Uber has innovated in the way people travel and eat (Uber-eats). Due to its efficiency, Uber was able to snatch 70% US market share by December 2019 (Yeo 2020). A similar path was followed by Airbnb that revolutionised the way people travel and live. It is estimated that in 2019 they accounted for roughly 20% of the entire US rental business (Molla 2019). This simply shows that a fantastic innovative idea can upset outdated markets when supported financially and non-financially by the adequate Venture Capital (VC). A famous Nobel prize winner economist, Kenneth Arrow, once said in an interview to the Federal Reserve Bank of Minneapolis that: 'Venture capital has done much more, I think, to improve efficiency than anything'. This has been a topic of interest by several researchers, and most of them agree that VC-backed companies offer more growth opportunities than those that are not (Colombo and Grilli 2010; Puri and Zarutskie 2011).

VC splits into two major groups: Corporate Venture Capital (CVC) and Independent Venture Capital (IVC). The CVC is originated from a corporation, meaning investing in start-ups is not their primary business (Shuwaikh and Dubocage 2022). Some well-known companies like Google, create branches (Google Ventures) to invest in innovative and strategically oriented ventures that meet their goals (Dushnitsky 2012). IVC, on the other hand, is an independent entity (Chemmanur et al. 2014) with their core business being investing in start-ups[1]. Their focus is investing in ventures that will solely yield a financial outcome in the future. When investing, both of these investors can join forces and create a syndicate (Tian 2012). This Venture Capital Syndicate (VCS) usually offers higher resource pooling, however, the managing of an investment can be more challenging (Lockett and Wright 2001).

Given the growing importance of VC in supporting the development of innovative endeavours, this study attempts to understand what investor configuration (CVC, IVC or syndicates) provides the best support for innovation output and complements the study of Shuwaikh and Dias (2023). As an arm of existing corporations, CVC provides strategic assets and synergies such as access to complementary resources, sector-specific knowledge and strategic alignment with corporate priorities. In contrast, IVC, mainly profit-oriented, offers expert knowledge and conditions, short cycle and flexibility in decision-making process. In syndication, the benefits of various investors are combined to share resources, reduce risk and leverage collective knowledge (Shuwaikh et al. 2022).

The motivation for this study stems from the growing importance of innovation as a driver of economic progress and corporate growth, particularly in entrepreneurial ventures. The need to innovate is both a strategic advantage and an invincibility engine in the ever dynamic, competitive and evolving markets. But the road to nurturing innovation is long, and it needs a significant amount of financial, strategic and operational support. This is where VC comes in to bridge the gap, but not all VC provides equal value. Unlike IVC which focuses solely on financial returns, CVC pursues strategic goals going beyond those: this difference in objectives causes allocation of resources and operational expertise to differ, eventually impacting venture outcomes. While there have been few studies on the relative success of VC, there remains limited clarity on which type of investor aids innovation output most effectively. In addition, while the syndication between investors to combine and spread risk is an established practice and most people accept its role in enhancing innovation until now there exist a few studies on the matter. The current study aims to fill this gap by looking at the community role in innovation of two types of VC investors, acting solo and in syndication. It also investigates how the strategic context, including location fit, technological fit, absorptive capacity and environmental munificence can amplify the impact of such investments. This research seeks to elucidate such dynamics so as to derive actionable insights for entrepreneurs, investors and policymakers attempting to promote the innovation within entrepreneurial ecosystems.

Current literature argues on what type of VCs offer the most value for these companies in terms of achieving an innovative high output. Some studies conclude that CVC offers an increased worth to their venture (Chemmanur et al. 2014; Alvarez-Garrido and Dushnitsky 2016), while others state that CVCs just do not offer additional benefit compared to IVC (Bertoni et al. 2013). Additionally, there are times when VCs are motivated to create a syndicate to achieve better future deal flow or diversification (Manigart et al. 2006). With the help of Venture Capitalists (VCs), start-ups can upscale their work and achieve astonishing results. When a VC firm enters a business, it usually has the capability to transform it using its industry experience, knowledge and other resources (Gompers and Lerner 2000; Alvarez-Garrido and Dushnitsky 2016). It is estimated that when a VC firm invests, the entrepreneurial firms will consider ~100 potential opportunities (Gompers et al. 2020). For example, the Silicon Valley Bank made research findings that, from 2009 until 2018, 42% of FDA-approved drugs within the United States had some type of VC fundraising (SVB 2019) which demonstrates both the strength and opportunity VC firms offer alongside the capacity to achieve results.

This research is based on a dataset of 4406 venture-backed deals in North America from 1998 to 2019. These startups cover a wide range of industries, from tech to biotech to software, which are all highly innovation-intensive sectors. This analysis spans pre-IPO and post-IPO periods, allowing for examination over time to understand how investor configurations influence innovation. The study, using patents and citations as proxies for innovation output, investigates the effects of different contextual framework. Technological fit (industry knowledge alignment), location fit (geographic proximity between investors and ventures) environmental munificence (abundance of resources and opportunities) and absorptive capacity (venture's ability to recognise, assimilate and apply external knowledge) on the innovation outcomes of the venture. The data have been thoroughly gathered from various sources: USPTO, Compustat and Thomson One Private Equity databases, resulting in a thorough and expansive dataset. Our empirical investigations are based on OLS for the baseline regressions, and on Generalised Method of Moments (GMM) along with 2SLS to control for endogeneity problems arising from reverse causality and endogeneity.

The results show that CVC-backed ventures generate more innovation output than their IVC-backed counterparts. This is because CVC investors offer access to strategic assets and knowledge sharing capabilities, including internal research and development resources, laboratories and sector-specific expertise. Syndication is identified as a substantial source of innovation, with larger syndicates leading to higher positive effects on innovation output due to pooling resources and sharing diverse expertise. The analysis also reveals that contextual factors including technological fit, location fit, environmental munificence and absorptive capacity increase innovation output in ventures. The technological fit ensures the alignment of industry peers' experience and outputs for impactful incremental innovations, location fit promotes synergistic operations, environmental munificence creates environments rich in resources, supportive of creativity and experimentation and absorptive capacity allows ventures to build processes for translating external knowledge into groundbreaking ideas.

This research makes distinct contributions. This primarily contributes to the literature on investor effects by enhancing theoretical understanding of how VC configurations and contextual factors impact innovation, thereby addressing a central gap in existing research. Second, it provides actionable implications for entrepreneurs and investors alike by describing a framework to help uncover which types of investors are best suited to promoting innovation. These insights can also be harnessed by policymakers in creating supportive ecosystems that match the needs of ventures with the types and conditions of investors best suited to support sustained innovation and economic growth (Yang et al. 2023).

This paper will be structured in the following manner. First, in Section 2, there will be a literature review regarding past findings followed by the methodology in Section 3, which explains the data collection and treatment process as well as the method used. Section 4 then expresses the results from this analysis, which will, later on, be interpreted in the discussion section. Lastly, there will be a conclusion of the research made and an insightful perspective on how to develop this idea further.

2 | Theoretical Background and Hypothesis Development

The resource-based view (Penrose 1959) suggests that CVC activities operate as means to secure, exploit and protect competitive advantages through environmental changes. Inter-organisational collaboration is an important driver for CVC investments in resource-constrained environments, facilitating the acquisition of strategic resources through partnerships. The resource-based view (RBV) of the firm has been regularly used since its beginning to explain inter-organisational relationships. Collaborations and alliances are seen as effective means of acquiring or sharing resources to achieve strategic goals. For instance, Keil et al. (2008) highlight that firms can integrate diverse knowledge bases by leveraging the resources of their partners, providing a vital pathway for learning and innovation within inter-organisational collaborations.

Based on the RBV, knowledge-based view of the firm highlights that knowledge is a valuable strategic asset for firms (Grant 1991). Advocates of this viewpoint, for example, DeCarolis and Deeds (1999), suggest that differences in firms' knowledge principles and capabilities are the main determinants of superior performance and sustained competitive advantage. Spender (1996) views firms as collections of competencies and knowledge, stating that the diversity of knowledge among firms is the primary source of sustainable competitive advantage and corporate superiority. Additionally, firms are required to systematically upgrade their knowledge base through converting knowledge flows into knowledge stocks and engaging in learning to adapt to changes of the environment. Spender (1996) also underlines the fact that organisational learning is a powerful tool for achieving and maintaining competitive advantage. Likewise, Grant (1991) emphasises that organisational learning enhances performance by increasing the effectiveness of knowledge generation, transfer and application processes (Zhao and Liu 2021).

Based on the guiding ideas of the knowledge-based view, Polanyi (1967) even claims that tacit knowledge is especially valuable to firms as it is complex golden eggs which cannot be transferred easily thus will earn them a competitive edge over their rivals. Explicit knowledge is difficult to put into words and bound to people. As Polanyi (1967) puts it, this type of knowledge is ‘knowing more than we can tell’, which implies its inexpressible features; it cannot be fully communicated through language or explicit accounts. As DeCarolis and Deeds (1999) and Kogut and Zander (1992) have argued, tacit knowledge feeds sustainable competitive advantage due to the immobile nature of this type of knowledge along with its high inimitability.

2.1 | Impact of Investor Type on Ventures Outcome

Both types of investors' goals and objectives do not match entirely and their added value to the entrepreneurial firms does neither. With this paper, the path that nurtures most innovation and value creation will be apparent, whether in CVC, IVC or VCS.

2.1.1 | Corporate Venture Capital (CVC)

CVC can be described as a structured subsidiary that aims to invest in entrepreneurial firms in an attempt to achieve both strategic benefits and financial returns (Gompers and Lerner 2000). The funding is supplied by the parent corporations. The duration of the investments with the CVC does not usually have a predefined timeframe, as some investments might be held for the long run (Guo et al. 2015). The CVCs are associated with high innovation output and value creation (Dushnitsky and Lenox 2006; Alvarez-Garrido and Dushnitsky 2016), yet it achieves its utmost potential when it is within the appropriate temporal and sectorial factors (Dushnitsky and Lenox 2006; Hill and Birkinshaw 2014). There is evidence that suggests that this mechanism allows the corporations to be less reliant on R&D (Winters and Murfin 1988), hence pursuing these types of venturing for financial reasons but also strategic ones. Additional studies suggest that strategically focused CVCs offer higher innovation outputs for entrepreneurial firms compared to the ones that are financially focused (Dushnitsky and Lenox 2006).

In 2019, some of the most active CVCs globally were Google Ventures, Intel Capital and Salesforce Ventures. As expected, these CVCs offer an extensive set of complementary assets and in-depth knowledge to their portfolio investments (Gompers and Lerner 2000; Maula et al. 2005; Dushnitsky 2012). The complementary assets can be diverse, but some have a unique location fit benefit (Alvarez-Garrido and Dushnitsky 2016; Shuwaikh et al. 2022b). This is especially true for the technological CVCs mentioned above but also to biotech/biopharma CVCs like Novartis Venture Fund, where they can offer both facilities and scientists to their ventures (Zucker et al. 1994). Lastly, just like in R&D, innovation from entrepreneurial firms can come at substantial risk. Therefore, to promote an optimal environment, CVCs are usually much more tolerant to failure (Chemmanur et al. 2014; Tian and Wang 2014). These enormous relative advantages come at a cost, however. Managers are not as motivated as an IVC manager would be. CVC managers are softly incentivised as corporations usually have policies regarding pay uniformity (Block and Ornati 1987; H. Chesbrough 2000). These big corporations might also face more significant internal conflicts (Sykes 1986; Chesbrough and Tucci 2012) and information asymmetries (Gans and Stern 2003).

2.1.2 | Independent Venture Capital (IVC)

IVC funds can usually be described as limited partnerships that raise funding from a third party to invest in entrepreneurial ventures to seek a purely financial return compared to the CVCs

(Alvarez-Garrido and Dushnitsky 2016). This type of investor usually makes investments aiming at a timeframe of around 10 years (Gompers and Lerner 1996), after which they exit the investment with the most common way being through an IPO, an acquisition, or a write-off (Guo et al. 2015). The objective is to dissolve the fund and capitalise on the gains. Besides the financial aspect, IVCs also add value with strategy formulation, personnel recruitment and networking (Sapienza 1992; Maula et al. 2005). Through its network, IVCs are usually more capable of obtaining additional alternative sources of financing as well as monitoring financial and operational performance (Gorman and Sahlman 1989; Macmillan et al. 1988).

According to a BCG report (How the Best Corporate Venturers Keep Getting Better 2020), IVC has always represented a more significant amount of the VC investment worldwide by representing 74% in 2017 yet fading yearly compared to CVC (IVC representing 80% in 2012). However, this value is purely on a percentage basis as global VC investments reached $147 billion in 2017 (being $109 billion for IVC) against $50 billion in 2012 (being $40 billion for IVC). A reason for such efficiency and outperformance within IVC could be that managers also have a performance-based compensation (Block and Ornati 1987), alongside the other benefits mentioned above.

Due to the heterogeneity of the type of investors, one can wonder how it will impact ventures with their different skill sets. This diversity is originated all from the complementary assets and know-how (Gompers and Lerner 2000; Maula et al. 2005; Dushnitsky 2012) to the managers' compensation (Block and Ornati 1987; Gompers and Lerner 2000) and strategy formulation (Sapienza 1992; Maula et al. 2005; Luukkonen et al. 2013). Also essential to remember that whoever the entrepreneurial firms choose as their funding, it will affect the board of the firm itself as VC principals and representative take charge (Rosenstein et al. 1993).

Previous studies have shown some outperformance from the CVC compared to the IVC (Maula 2001; Chemmanur et al. 2014; Guo et al. 2015), raising a question of why they coexist and why the IVCs take up most of the market. However, when controlling for selection, CVCs do not offer superior outcome (Bertoni et al. 2013). Alkhanbouli et al. (2020) summarise how a business creates and captures value. They illustrate that an innovative business model refers to the innovation of one or more parts of the business (investor-venture). Bertoni et al. (2013) argue that IVCs offer an increased growth compared to CVCs but only on a short-term post-investment period. Brinette et al. (2020) cover CVC operations initiated by French firms over the period 2000–2018. They analysed the role played by the specific resources and the shareholding profile in carrying out CVC operations. They highlighted the importance of using these vehicles for financing innovation in the French economy. Therefore, considering the above literature, it is expected that, for the new time frame, CVC-backed ventures register higher innovation outputs (Mazza and Shuwaikh 2022).

2.1.3 | Venture Capital Syndicate (VCS)

As investors do not have to work by themselves with their skillset as a limitation, a business association between CVCs and IVCs can be created—Venture Capital Syndicate (VCS). This is a type of alliance (Wright and Lockett 2003) where they will take a joint-equity stake in a venture and work together in an attempt to maximise their potential to try to create additional value/innovation for the venture as well as post-IPO operating performance (Tian 2012). It allows the syndicate members to not only pool their resources (Ferrary 2010) but also to diversify risk (De Clercq and Dimov 2004).

According to Ferrary (2010), the motivation for creating a syndicate is twofold. First, it is to diversify the risk during the seed stage, which is quite uncertain. Secondly, it is to create a heterogeneous community within that investment (Chen and Xu 2020). On the other side, however, the VCS may reveal some issues like the lack of dynamic stability or a dominant party within the decision-making (Wright and Lockett 2003). When the syndicate is created, there is a lead investor that oversees the majority of the investment, with the rest of the investors being more passive (De Clercq and Dimov 2004; Manigart et al. 2006). The lead investor is usually the investor that creates the original investment and invites others to join (Ferrary 2010). Once the leader is established, to achieve the benefits mentioned above, they look for partners to create the syndicate (Shuwaikh and Dias 2023). The RBV shines another logical perspective into syndication (Lockett and Wright 2001), which benefits the alliances by understanding each member's strategic resources and pooling them together to achieve a competitive advantage. As expected, syndicates offer more capital availability and increased future investment opportunities (Hochberg et al. 2007; Ferrary 2010) due to the expansion of their networks. Some claim that the cooperation through syndicates and resource pooling of VCs can help find good investment targets and increase the value-added (Lockett and Wright 2001; Brander et al. 2002). Nonetheless, engaging in a syndicate, in the point of view of the lead investor, is not entirely straight-forward. Before considering creating a syndicate and its potential partners, VCs decision is dependent on their developed investment strategy and the intrinsic characteristics of the VC itself (De Clercq and Dimov 2004).

Taking into consideration that syndications are supposed to boost the resources while reducing risk, it is hypothesised that syndicates and CVC investors improve the innovation output of the funded companies (Wang and Li 2022; Smith and Brown 2023). Accordingly, compared to IVCs, CVC and VCS-backed ventures experience higher innovation outputs.

Hypothesis 1. *The CVC- and VCS-backed ventures display higher levels of innovation output compared to IVC-backed ventures.*

2.2 | The Role of Contextual Factors in Enhancing Innovation Outputs

2.2.1 | Location Fit

The location fit between IVCs and CVCs and their ventures enables more interaction between the parties involved creating a more personal relationship, allowing a smoother due diligence process, operational assistance and relationship nurturing (Sorenson and Stuart 2001; Alvarez-Garrido and Dushnitsky 2016; Shuwaikh and Dubocage 2022). This location fit has particular importance when it comes to the CVCs complementary assets. These complementary assets are any non-financial benefit a corporation can share with their investments. Using the example of Alvarez-Garrido and Dushnitsky (2016) while studying this effect on biotech ventures, both laboratories and scientists (Zucker et al. 1994) are complementary assets of paramount importance for these ventures. The need for R&D and other necessary facilities for the ventures are both expensive and scarce, giving a competitive advantage to the CVCs. The emphasis on the impact that complementary assets have on the output for innovation (Maula 2001; Chemmanur et al. 2014) highlights the importance of fit. Complementing the previous statement, the probability of a breakthrough for researchers is higher once the parties are neighbouring each other (Catalini 2018). The opposite is also true, however, where distant ventures access minimal resources, making the CVCs lose their main competitive advantage (Chemmanur et al. 2014). Therefore, taking into consideration the potential boost of the CVCs, it is expected that location fit will contribute to a higher innovation output for the CVCs (Shuwaikh 2018).

VCS consists of more than on VC and the involved VCs can be of both investor type—IVC or CVC. Therefore, following the related literature (Maula 2001; Chemmanur et al. 2014), location fit will still be analysed. However, it is exclusive to the syndicate leader (Sorenson and Stuart 2001; Ferrary 2010). Meaning, while still measuring the syndicate's impact, the group leader will represent the location closeness to the venture (Shuwaikh et al. 2022a). The leader within a syndicate is most likely the initial investor, which early on nurtures the relationships with the ventures. As the leader invites potential partners and establishes relationships with them, once the syndicate is closed, they get piquantly involved in the venture's management (Sapienza 1992; Hellmann and Puri 2002), attributing the location fit to the leader. Therefore, it is expected that the location closeness will show an increased innovation output for VCS' leader.

Hypothesis 2. *The location fit between the VC and the venture enhances the innovation output for CVC- and VCS-backed ventures more than for IVC-backed ventures.*

2.2.2 | Technological Fit

The technological compatibility between the VC investors and the ventures can impact the innovation output as they have specialised expertise (Gompers et al. 2009; Shuwaikh and Dubocage 2022) like market knowledge and sector connections. Sometimes, parent corporations try to outsource their internal projects to increase the speed of innovation and competitive advantage (Fulghieri and Sevilir 2009). Consequently, to accomplish this, they outsource through ventures with the same sector-specific goals. Compared with IVCs, they are sometimes focused on a specific sector to capture this beneficial innovation and compatibility. There is opposing literature regarding who takes the most benefit from the technological fit. Due to the resources of the corporate parent, CVCs have access to a competitive advantage, which is sector-specific expertise (H. W. Chesbrough 2002). In contrast, the efficient resource allocation, compensation schemes and venturing experience with IVCs make them better at nurturing innovation (Gompers et al. 2009). Therefore, despite opposing perspectives, it is expected that the CVC expertise will outperform the IVC in terms of innovation output for the ventures. This final hypothesis follows the rationale of Hypothesis 2 in terms of syndicate leaders. As the syndicate leader is either an IVC or CVC, the proposition basis in Hypothesis 3 still is applicable. Therefore, the aim is to see the impact sector-specific VCs can have on the innovation output (Shuwaikh and Dias 2023). Moreover, as the syndicate is composed of a leader, that will be the benchmark point for this hypothesis. Consequently, it is expected that the syndicate leader sector-specific expertise will be superior to the IVCs in terms of innovation output for the ventures.

Hypothesis 3. *The technological fit between the venture capitalists and the venture enhances the innovation output for CVC- and VCS-backed ventures more than for IVC-backed ventures.*

2.2.3 | Absorptive Capacity

According to Cohen and Levinthal (1990), absorptive capacity is defined as the 'ability to recognize the value of new external information, assimilate it, and apply it to commercial ends'. They discuss that inter-organisational learning is most efficient when there is an adequate similarity in the fundamental knowledge of the partners that enables efficient interaction, but concurrently, sufficient heterogeneity in the unique knowledge that is non-redundant provides useful knowledge. Cohen and Levinthal (1990) proposed the concept of absorptive capacity in a three-stage model of absorption: identification, assimilation and exploitation. Building on the earlier concepts, Zahra and George (2002) further elaborated this framework, characterising absorptive capacity as a 'dynamic capability pertaining to knowledge creation and application'. Their updated framework includes four dimensions: acquisition, assimilation, transformation and exploitation. Zahra and George (2002) also suggested that absorptive capacity consists of two basic categories. The first, potential absorptive capacity, captures acquisition and assimilation, which centres around the firm's ability to identify and make sense of new knowledge. The second, realised absorptive capacity, subsumes transformation and exploitation, which concern the degree to which the firm can apply and exploit the acquired knowledge.

While these factors are not functionally interchangeable, they are mutually dependent and together improve firm performance (Zahra and George 2002). Indeed, several scholars highlight absorptive capacity as a dynamic capability (Cohen and Levinthal 1990; Flatten et al. 2011; Zahra and George 2002), and a vast array of studies points to its pivotal role as a precursor of CVC investments (Dushnitsky and Lenox 2006). More absorptive capacity makes corporate investors more willing to make CVC (Dushnitsky and Lenox 2006) because they are better able to discover and make use of what they learn from CVC experience. Similarly, Sahaym et al. (2010) found that R&D investment enables firms to better recognise and pursue opportunities, making CVC investments more attractive. Moreover, sectors with larger absorptive capabilities usually based on past spending in R&D—also play a more prominent role in external innovation through their CVC accords. Therefore, absorptive capacity constitutes an important facilitator of the investment of other firms in emerging technologies and ventures to generate growth, which highlights an interplay between R&D and CVC (Gompers and Lerner 2000). Moreover, firms from industries that have traditionally engaged in high R&D efforts have a better ability to assess the potential of new technologies by leveraging their superior knowledge about the industry and absorptive capacity (Cohen and Levinthal 1990), which would promote subsequent CVC investment activities.

Through an analysis of the knowledge-based view and organisational learning literature, absorptive capacity has been identified as a core construct for learning, knowledge creation and innovation (Cohen and Levinthal 1990; Zahra and George 2002).

Hypothesis 4. *Higher levels of absorptive capacity will lead to higher levels of innovation output for CVC- and VCS-backed ventures compared to IVC-backed ventures.*

2.2.4 | Environmental Munificence

The performance-learning linkage is mediated substantially by the concept of environmental munificence which have gained its importance in recent years. This piece of contextual info links to the concept of environmental munificence, which is described as 'the degree to which an environment can sustain the growth of firms' (Starbuck 1976), and to the 'availability or scarcity of essential resources needed by firms operating in that environment' (Castrogiovanni 1991). In essence, a firm's growth and survival is primarily determined by the resources made available to it by a particular environment. Studies show that companies tend to pursue growth in resource abundance. Moreover, when resources are scarce and environmental munificence is low, competition for these resource escalades, making growth more difficult (Castrogiovanni 1991). Thus, at low level of environmental munificence, it means resource scarcity whereas at a high level of environmental munificence, it means resource abundance.

In more munificent environments that are resource-rich, firms enjoy ample resources, resulting in low levels of competition and independence from external suppliers (Boyd 1990). This surplus gives firms the slack resources required to strategically orient business units to acquire new knowledge through their external investment strategy. Additionally, organisations are more poised to leverage insights learned from organisational learning in those contexts (Li et al. 2013). Although in resource-rich settings, the presence of various opportunities encourages firms to explore aggressively; conversely, given the prevailing resource constraints, resource-poor contexts exert strong pressures on the firms to explore and exploit simultaneously to maximise the utilisation of scarce resources. Limited resources make firms less willing to engage in exploratory action since such behaviour requires a significant investment in innovation and growth, and resource scarcity limits this investment (Sahaym et al. 2010). In such tightly constrained environments, where increasing rivalry for diminishing resources endangers the survival of organisations, growth is frequently a low priority, resulting in stagnation of sales growth (Castrogiovanni 1991). In challenging environments, however, companies focus on cost-cutting, consolidation and threat avoidance for survival rather than investing in growth initiatives (Sahaym et al. 2010).

On the other hand, for industries with higher environmental munificence there is an abundance of resources that allow additional strategic initiatives like CVC investments and actively scanning the market for potential emergent technology and trends. Resource-abundant contexts allow firms to explore the extensions of existing capabilities and application of emerging technologies, initially often in adjacent industries where a firm has existing core competences (Sahaym et al. 2010). Additionally, the resource overflow induces competitive behaviours in the industry, specifically the innovation arms race, pushing companies to pursue unique pursuits such as CVC investments (Gompers et al. 2005; Sahaym et al. 2010). Not only does this context encourage experimentation and risk-taking, but it also increases firm value by strategies involving innovation. This leads to the following hypothesis:

Hypothesis 5. *Higher levels of environmental munificence will lead to higher levels of innovation output for CVC- and VCS-backed ventures compared to IVC-backed ventures.*

3 | Methodology

The main dataset collected features 4406 venture deals within North America between 1998 and 2019. The year 1998 is the initial year because it corresponds to the increase in CVC investment among firms and companies (Shuwaikh 2018). All the selected venture deals are of ventures that have gone public, been acquired, or been written off within the timeframe. From this entire dataset, 1562 ventures have CVCs as their majority investor, while 2844 have IVCs. All the investment information about the ventures is collected from Thomson One private equity database (Shuwaikh, Hughes, et al. 2023). The data collection for this dataset was done through USPTO for the patents and citations collections, and to obtain important financial and accounting information, we use Standard and Poor's Compustat database. A secondary dataset was created for companies that went public exclusively so that it would be possible to analyse their pre- and post-IPO performance. The data collection for this database suffered a more rigorous process due to the inexistence of many of the private companies prior to IPO (Shuwaikh et al. 2023).

To attain each investor's SIC code, a two-phase process was used. First, it was necessary to employ a web-scraping mechanism through some databases and SIC webpages to try to obtain the required codes. Second, as many firms did not have this code present, the Securities and Exchange Commission (SEC) was used to check the company fillings (e.g., 8-K, Acquisition Statements) through the EDGAR Company Fillings system. These official fillings usually have within them the SIC codes and operating sector. Lastly, would a firm's code not be found, it would be manually checked. When regressing with these codes, the CVC investors within the 6000-6799 (codes related to Finance, Insurance and Real Estate) were excluded to avoid biased results. Finally comparing matching data between 1-year prior IPO and 1-year post-IPO, and to make sure the analysis has matching firms for comparison, we reached a final value of 4406 deals. Once all the values for each deal done within this timeframe were reached, three databases were created for analysis:

Base Database—Consists of all 4406 deals collected for the timeframe and utilises the most recent values available for each venture. Since this database uses patents and citations, it is more comprehensive. It is used for the main regressions as well as some of the robustness checks.

Pre-IPO Database—Consists of 2675 deals collected for the timeframe and utilises the financials of the venture 1 year before it went for IPO. The database is derived from the Last Value database.

Post-IPO Database—Consists of 2675 deals collected for the timeframe and utilises the venture's financials 1 year after it went for IPO. The database is derived from the Last Value database.

3.1 | Dependent Variables

The innovation output: to capture the quantity of a company's innovation output, we use the natural logarithm of the patent count for company (i) at year (t), $\ln\left(Patents_{i,t}\right)$. Particularly, the variable $\ln\left(Patents_{i,t}\right)$ includes the number of patent applications filed in the granting year (Zhang et al. 2019). We use a second proxy, $\ln\left(Citations_{i,t}\right)$ which indicates the patent quality by including the number of citations collected by each patent (Chemmanur et al. 2014). Following the literature, we create patent variables based on the year of patent application because it is nearer to the event of the exact innovation (Griliches 1990).

3.2 | Independent Variables

For the baseline regression, there were different independent variables: *Type of Investor, Syndicate*.

3.3 | Type of Investor

The variable *Type of Investor* is a dummy variable taking the value of one when the first investor in a venture is a CVC and zero otherwise (i.e., if the first investor in a venture is an IVC).

3.4 | VC Syndicate

The VC syndicate is assessed through a dummy variables, which consists of four two sub-variables: *VCS[Q1–Q2], VCS[Q3–Q4]*. The first (second) range of syndicates was based on the first (third) and second (fourth) quartile of the VC syndicate. These variables are dummy, being one when the number of investors in the venture equals the range of the dummy, and zero otherwise. They allow to better capture the effect of syndicate size on the innovation output. It is also relevant to keep in mind that when all the sub-dummies are zero, the venture only has a single investor.

3.5 | Moderating Variables

3.5.1 | Location Fit

The location fit is proxied by is a dummy variable that takes one when the venture's location matches the first investor's location and zero otherwise. Since some states are vast in the US, it was decided that this dummy would be developed using both parties' metropolitan locations. This way, the investor and the venture had to have their headquarters in the same city. This is most notable when looking to California, where several firms are based in San Jose or San Francisco. However, despite being in relative fit, it would be considered as a different location.

3.5.2 | Technological Fit

This variable was built based on the SIC codes of both parties. The SIC code is a 4-digit number that indicates the sector and business activity in which the company operates. The first two digits represent the major group the company works in while the first three digits represent the sector group, and the whole four digits combined represent their division. For the regressions, the three and the four digits SIC code are considered. Because of insufficient relevant matches on the 4-digit code due to its specificity, the 3-digit SIC code was used instead as it took into account a broader number of firms and still translates that both parties work in the same sector in the same manner. Hence, the technological fit is assessed through a dummy variable that equals 1 if the 3-digit SIC is the same for both parties, and 0 otherwise.

3.5.3 | Absorptive Capacity

Multiple criteria have been used to measure absorptive capacity. For example, Geroski (2005) based this on R&D expenditures, Cohen and Levinthal (1990) based their measure on R&D intensity and Mowery et al. (1996) focused on firm size. Zahra and George (2002) further clarified absorptive capacity by incorporating two components—potential and realised absorptive capacity—into the existing four-dimensional framework. The patent stock is a good representative of the company's strength to absorb different information for knowledge capital. According to Cohen and Levinthal (1990), the patent stock of a company is employed as an index of the company's absorptive capacity. It is measured by estimating the depreciated sum of all patents for which a company has applied at time (t) at a depreciating rate λ of 30% (Dushnitsky and Lenox 2006).

$$\text{Patent Stock}_{it} = \ln\left(patents\right)_{it} + (1 - \lambda)\textit{Patent Stock}_{it} \quad (2)$$

3.5.4 | Environmental Munificence

To measure environmental munificence, many researchers use continuous variables such as total employment, price–cost margin, industry growth rate, or industry sales (Park and Mezias 2005). In this study, we use the growth of sales to operationalise the presence of munificence in industry environments. Following the methodology of Keats and Hitt (1988), we acquire industry sales from Compustat. We use the 5-year average growth in net sales during the relevant time period for each industry. Afterwards, we use the natural logarithm of the annual figures across all firms in each relevant industry in a time-series regression, with time being the independent variable. To capture the growth rate of industry sales to demonstrate the presence of munificence in each industry environment, the antilogs of the resulting regression slope coefficient were used (Keats and Hitt 1988; Sahaym et al. 2010).

$$y_t = \alpha_0 + \alpha_1 * \mathrm{t} + \varepsilon_t \mathrm{x} \quad (3)$$

3.6 | Control Variables

Following previous studies (Chemmanur et al. 2014; Dushnitsky and Lenox 2006; McKinsey 2018; Guo et al. 2015), we include several control variables that have been shown to have an impact on innovation outputs. We consider four major groups of controls: (1) Financial controls regroup *Revenues* (Revenues/Assets), *Leverage* (Ln(Leverage)), *Profitability* measured by ROA and Gross Margin, *Capital expenditures* (Capex/Assets). (2) Funding controls are the *amount of investment* (Average Funding Per Firm), *Successful IPO Exit* proxied by a dummy variable that equals 1 when the successful exit is an IPO and 0 otherwise, *Number of rounds* that each venture has been through already, *Majority of CVC in a syndicate* measured by the percentage of CVC in the syndicate, and a dummy variable representing 1 when CVCs represent more than 50% of a syndicate, 0 otherwise. This gives a deeper insight to the stage at which the company finds itself, therefore determining if it is a new venture or a more mature one. This can translate to the firm's ability to be more innovative during certain stages of the investments processes. (3) Age/experience controls consist of the *venture's age* (the natural logarithm of the age of the venture at IPO), *Investor experience* (the number of funds the investor has created). (4) Industry controls which controls for all the companies that have a SIC code starting with 73 (SIC correspondence to 'Business Services').

4 | Results and Discussion

Table 1 describes the summary statistics of the Base database. This is the baseline database, which incorporates all the values that are within both the regressions and the robustness tests. On panel A, 1562 (35.5%) ventures had CVC as their majority investor. From the 4406 ventures, only 970 of them had a match of at least three-digit SIC codes with their investor, meaning they operate in the same sector group. Regarding location fit, 1321 ventures were located in the same metropolitan area as their first investor.

Regarding the Patents and Citations, measuring the innovation output, ventures register on average 378 patents and 3698 citations. These values are significantly higher than the median of 38 and 415, respectively, suggesting the presence of extreme values in the higher quartiles. Separating the results per investor type, it is notable that CVC-backed ventures present higher innovation outputs, on average, compared to IVC-backed venture (1342 patents and 12,824 citations on average for CVCs vs. 452 patents and 3524 citations on average for IVCs), which goes on par with Chemmanur et al. (2014). Taking into consideration the correlation matrix, it is clear that the significance of the Patents and Citations with other variables follow a similar path. Both have a significant positive correlation with Technological fit and with the type of investor being a CVC, suggesting it could impact the output innovation (Alvarez-Garrido and Dushnitsky 2016). There is also a noticeable positive correlation between both with Successful IPO exit due to the fact that having well known patents and citations pave a more likely path to success for these companies.

Table 2 reveals the important relationship between syndication size and CVC presence with the primary attributes of innovation output. Panel A confirms findings that CVC involvement has a significantly positive and stable effect (in Model 2) at baseline. When syndication size is analysed using quartiles (Models 2.A.3 through 2.A.4), it is also clear that being associated with larger syndicates—particularly in quartiles 3 and 4—correlates with increased innovation output. These larger syndicates do provide synergistic benefits, facilitating pooling of a greater range of expertise and resources that can foster better innovation outcomes.

Further, Models 2.A.5 to 2.A.8 highlight the importance of contextual aspects including location fit, technological fit, absorptive capacity and environmental munificence. We find four factors which are consistent, positive and significant at 1% level, which play a significant role in determination of innovation. Specifically, deepened collaboration and operational efficiency between ventures and investors enable greater innovation. Technology fit ensures domain-specific shared expertise between the ventures and investors, leading to a fertile environment for making impactful innovation. Absorptive capacity shows the firm's capability to adopt and utilise external knowledge, an important precursor of innovation performance. An abundance of resources in the venture's operating environment, a facet of environmental munificence, encourages innovation through risk-taking and experimentation.

Panel B repeats a similar analysis, combining CVC involvement, syndication and the four key contextual factors. Moreover, the findings demonstrate that technological fit is consistently positively significant across all specifications and cluster sizes, indicating that industry expertise alignment is a stable driver of innovation. Although location fit explains positively, its effect is weaker than technological fit, suggesting a cross-dimension trade-off in some specific situations.

The findings from Table 2 show that, in general, adequate syndication size, CVC participation and the four contextual variables (i.e., location fit, technological fit, absorptive capacity and environmental munificence) collectively provide the ideal environment in which to maximise innovation output. These results align with existing literature (e.g., Alvarez-Garrido and Dushnitsky 2016; H. W. Chesbrough 2002) and offer actionable implications for practitioners and policymakers to enhance venture innovation.

Table 3 further explores the CVC funding, syndication size, context and their impacts on the innovation output measured with the citations as the proxy. Panel A shows baseline results in Model 3. This also accords with the results using patent-based

TABLE 1 | Summary statistics—full sample.

Panel A

	Mean	**SD**	**P25**	**Median**	**P75**	***N***
1. Patents	378.31	2012.14	9.00	38.00	104.00	4406
2. Citations	3698.12	20,468.05	72.00	415.00	1452.00	4406
3. R&D/ASSETS	0.19	0.76	0.00	0.00	0.27	4406
4. REVENUES/ASSETS	0.84	1.68	0.09	0.53	1.19	4406
5. GROSS MARGIN	1.89	21.01	0.00	0.29	0.64	4406
6. LEVERAGE	−0.49	1.67	−0.17	0.00	0.06	4406
7. CAPEX/ASSETS	0.06	0.10	0.00	0.04	0.08	4406
8. ROA	−1.34	12.37	−0.36	−0.04	0.06	4406
9. Investor Experience	12.63	16.71	3.46	6.64	18.03	4406
10. Avg Funding Per Firm (USD M)	9.43	17.75	1.75	4.54	9.87	4406
11. Round Number	3.37	3.17	1.00	2.12	5.45	4406
12. Successful IPO Exit	—	—	—	—	—	968
13. Months Until Banking	79.78	143.41	12.00	54.00	87.57	4406
14. Absorptive Capacity	0.0934	0.1639	0	3.1688	2678	
15. Environmental Munificence*	1.0647	0.1554	0.5455	1.8610	462	
16. Location Fit	—	—	—	—	—	1321
17. Technological Fit	—	—	—	—	—	970
18. % CVC	0.16	0.32	0.00	0.00	0.00	2873
19. Investor Type						
CVC Firms	—	—	—	—	—	1562
Patents	1342.23	7623.11	12.00	55.00	143.00	
Citations	12,824.11	56,734.16	70.00	453.00	1764.43	
Location fit	—	—	—	—	—	
Technological fit	—	—	—	—	—	
IVC Firms	—	—	—	—	—	2844
Patents	452.11	2718.15	11.00	28.00	102.00	
Citations	3524.01	17,623.03	45.00	213.45	1623.00	

(Continues)

TABLE 1 | (Continued)

Panel A	Mean	SD	P25	Median	P75	*N*
Location fit	—	—	—	—	—	
Technological fit	—	—	—	—	—	

Panel B: Correlation—full sample

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	*0.98****	0.01	−0.03	0.02	−0.02	0.00	0.01	0.01	0.00	0.05*	0.07**	0.01	0.03	0.06*	0.05	0.02	0.09***	−0.02
2		0.02	−0.03	0.02	−0.03	0.00	0.01	0.01	0.00	0.06*	0.07**	0.02	0.03	0.07**	0.06*	0.03	0.1***	−0.01
3			0.02	−0.05*	−0.03	0.24***	−0.09***	−0.02	0.00	0.01	0.04	0.02	−0.01	0.01	−0.02	−0.02	−0.01	0.01
4				0.06*	0.05	−0.05*	−0.01	−0.04	−0.02	−0.05*	−0.01	0.03	0.03	0.04	0.01	0.01	0.03	−0.01
5					−0.01	0.00	0.07**	−0.01	−0.02	−0.04	0.04	0.00	−0.01	−0.1***	0.03	0.03	0.03	0.02
6						0.07**	−0.03	−0.03	0.01	−0.06*	0.03	−0.06**	0.07**	−0.01	0.02	0.00	0.00	0.02
7							−0.02	0.01	0.02	−0.02	0.03	−0.03	0.01	−0.03	0.06**	0.05	0.08***	−0.01
8								0.01	0.03	−0.02	−0.03	0.01	0.00	−0.02	0.03	0.02	0.03	0.01
9									0.1***	0.02	0.01	0.06*	0.03	−0.08***	−0.12***	−0.11***	−0.08***	0.01
10										0.14***	0.01	0.02	−0.07**	−0.01	0.04	0.01	0.00	0.01
11											−0.03	0.16***	−0.05	0.02	−0.06*	−0.08**	−0.04	0.03
12												−0.02	0.02	−0.06*	−0.03	−0.02	−0.01	−0.04
13													−0.1***	−0.05*	−0.03	−0.02	−0.01	−0.02
14														−0.03	−0.06*	−0.05	−0.03	−0.01
15															0.05	0.04	0.05	0.24***
16																0.94***	0.82***	0.04
17																	0.8***	0.04
18																		0.03

Note: This table represents the descriptive statistics of the base database (Panel A) and the variables' correlation matrix (Panel B). Panel A describes the entire dataset but also separated into CVC- and IVC-backed ventures. In Panel B, the significance level for 1%, 5% and 10% are ***, ** and * out of matching SIC codes.

TABLE 2 | Base regressions for patents.

Panel A: Patents								
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
CVC		0.3541**	0.3682**	0.4132**	0.4652**	0.3997**	0.4823**	0.4821**
		(0.1012)	(0.1843)	(0.2173)	(0.1152)	(0.1624)	(0.1212)	(0.1827)
Syndicate								
VCS [Q1–Q2]			0.2243**					
			(0.1152)					
VCS [Q3–Q4]				0.3214***				
				(0.1902)				
Location fit					0.1982**			
					(0.1203)			
Technological fit						0.3481**		
						(0.1102)		
Absorptive capacity							0.2635***	
							(0.1192)	
Environmental munificence								0.4982***
								(0.1102)
Financial controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Funding controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	33.361***	33.323***	23.4179***	33.316***	43.348***	43.232***	33.294***	33.243***
	(0.111)	(0.146)	(0.185)	(0.112)	(0.118)	(0.115)	(0.176)	(0.111)
N	4406	4406	4406	4406	4406	4406	4406	4406
R^2	0.623	0.625	0.641	0.652	0.694	0.593	0.572	0.612
Panel B: Patents								
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
CVC	0.3981*	0.3912*	0.3871*	0.3981*	0.4123*	0.4912*	0.4712*	0.4612*
	(0.1923)	(0.1192)	(0.1126)	(0.2182)	(0.2154)	(0.2147)	(0.2158)	(0.2154)
Syndicate								
VCS [Q1–Q2]	0.2512*		0.2118*		0.2618*		0.2761*	
	(0.1351)		(0.1314)		(0.1326)		(0.1319)	
VCS [Q3–Q4]		0.4691**		0.4303**		0.4323**		0.4321**
		(0.1081)		(0.1901)		(0.1021)		(0.1128)
Location fit	0.2314***	0.2131***						
	(0.1022)	(0.1023)						
Technological fit			0.3152***	0.3124***				
			(0.1101)	(0.1192)				

(Continues)

Panel B: Patents

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Absorptive capacity					0.5644***	0.5482***		
					(0.1724)	(0.1245)		
Environmental munificence							0.4561***	0.4512***
							(0.1116)	(0.1114)
Financial controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Funding controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cons	43.381***	43.281***	53.311***	43.193***	33.334***	43.224***	33.277***	33.155***
	(0.114)	(0.111)	(0.118)	(0.114)	(0.122)	(0.114)	(0.116)	(0.129)
N	4406	4406	4406	4406	4406	4406	4406	4406
R^2	0.671	0.642	0.613	0.654	0.652	0.612	0.652	0.662

Note: Standard errors in parentheses *$p<0.1$, **$p<0.05$, ***$p<0.01$. These tables present the results of the Full Sample innovation output database OLS regression. All these values are in regard to companies that have Patents available. The dependent variable is Patents measuring innovation, extracted from USPTO. The main focus variables are the Investor Type dummy, all the Syndicate dummies, Location Fit dummy and Technological fit dummy. The control variables are set for four major groups: financial control, deal size control, age/experience control and Industry control. As financial controls, the regressions use Revenues/Assets, Gross Margin, the natural logarithm of leverage, Return on Assets (ROA) and CapEx/Assets. As deal size control, the Average Equity Per Firm in Total variable was used. As age, the natural logarithm of the months of the firm. Lastly, *N* represents the sample size.

measures which show that CVC funding plays a positive and significant role. In particular, CVC increases innovation output with an average of 0.4121 units, reaffirming that CVC is a better way than IVC at boosting innovation output. This result adds to existing evidence on how CVC can be advantageous in supplying complementary assets and strategic advice (Maula 2001; Chemmanur et al. 2014; Guo et al. 2015).

Models 3.A.3 to 3.A.4 examine the effect of syndication, separated by quartile based on syndicate size. The results indicate that the larger syndicates are, especially in the third and fourth quartiles, the more they promote innovation output. As an illustration, the introduction of syndicates in the fourth quartile creates a 0.3425 difference in innovation (Model 3.A.4). This result emphasises the resource-sharing benefit of bigger syndicates and reaffirms RBV (Lockett and Wright 2001), supporting that increased resources and variety among investors provide competitive advantage.

With respect to the contextual factors, Models 3.A.5 through 3.A.8 (location fit, technological fit, absorptive capacity, environmental munificence), all of these variables are positive and statistically significant at the 1% level.

Model 3.A.5 shows that location fit increases innovation by 0.2370 which is an indicative of the importance of geographical proximity for operational assistance and collaboration. The results show consistency with the theories provided by Maula (2001) and Alvarez-Garrido and Dushnitsky (2016). In Model 3.A.6, technological fit enriches innovation with 0.3784 ($p<0.05$), reinforcing the importance of sharing industry expertise as a driver of innovation, consistent with the findings of Gompers et al. (2009). Similarly, absorptive capacity and environmental munificence serving as complements that allow the ventures to exploit available knowledge and new information to differentiate between the observed and the hidden potential, respectively.

In Panel B, the analysis is a combination of syndicate size and context. The context plays an even bigger role for larger syndicates in the third and fourth quartiles, slanting the benefits in favour of larger syndicates. Further, the results indicate a proportionality outcome between syndicate size and the degree of innovation. Little syndicates are beneficial too, but the larger syndicates benefit more. This confirms Hypothesis 1, stating that both CVC funding and larger syndicates lead to higher output of innovation. The contextual factors—location fit, technological fit, absorptive capacity, and environmental munificence—provide additional insights. Hypothesis 2 is supported by our finding that ventures located in the same metropolitan area as their investors facilitate increased collaboration and resource-sharing. Moreover, ventures and investors in the same industry result in above-average innovation output due to shared expertise and networks, again supporting Hypothesis 3. Our findings also show that absorptive capacity and environmental munificence allow ventures within those investors syndicates, large or small, to deploy the resources available by the investors effectively, leading to increased opportunities for innovation. In sum, our results provide evidence that CVC funding, syndicate size and contextual factors collectively increase innovation output. Instead, the more pronounced positive performance of CVC funding (both in univariate and multivariate

TABLE 3 | Base regressions for citations.

Panel A: Citations	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
CVC		0.4121*	0.3938*	0.2835*	0.3914*	0.3985*	0.4415*	0.4596*
		(0.2163)	(0.2161)	(0.2164)	(0.2164)	(0.2161)	(0.2140)	(0.2157)
Syndicate								
VCS [Q1–Q2]			0.2281*					
			(0.1331)					
VCS [Q3–Q4]				0.3425***				
				(0.1076)				
Location fit					0.2370***			
					(0.1873)			
Technological fit						0.3784**		
						(0.1338)		
Absorptive capacity							0.0367***	
							(0.0076)	
Environmental munificence								0.5575***
								(0.1916)
Financial controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Funding controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cons	53.366***	54.323***	53.419***	53.316***	53.348***	53.232***	53.294***	53.243***
	(0.164)	(0.186)	(0.115)	(0.112)	(0.118)	(0.115)	(0.176)	(0.111)
N	4406	4406	4406	4406	4406	4406	4406	4406
R^2	0.643	0.641	0.562	0.573	0.676	0.684	0.687	0.693

Panel B: Citations	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
CVC	0.4169*	0.4565*	0.4545*	0.4725*	0.4694*	0.4593*	0.4571*	0.4649*
	(0.2118)	(0.2111)	(0.2941)	(0.2167)	(0.2174)	(0.2357)	(0.2457)	(0.2255)
Syndicate								
VCS [Q1–Q2]	0.2182**		0.2112**		0.2212**		0.2253**	
	(0.1312)		(0.1311)		(0.1361)		(0.1312)	
VCS [Q3–Q4]		0.3672***		0.3313***		0.3512***		0.4312***
		(0.1123)		(0.1128)		(0.1328)		(0.1271)
Location fit	0.3315***	0.3312***						
	(0.1216)	(0.1106)						
Technological fit			0.4762***	0.5136***				
			(0.1113)	(0.1121)				

(Continues)

TABLE 3 | (Continued)

Panel B: Citations								
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Absorptive capacity					0.5142***	0.5122***		
					(0.3321)	(0.3214)		
Environmental munificence							0.4625***	0.5622***
							(0.1222)	(0.1234)
Financial controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Funding controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cons	43.385***	43.281***	43.311***	43.193***	43.334***	43.224***	43.277***	43.155***
	(0.121)	(0.113)	(0.113)	(0.114)	(0.122)	(0.113)	(0.112)	(0.123)
N	4406	4406	4406	4406	4406	4406	4406	4406
R^2	0.652	0.633	0.634	0.646	0.721	0.722	0.692	0.632

Note: Standard errors in parentheses $^*p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$. These tables present the results of the Full Sample innovation output database OLS regression. All these values are in regard to companies that have Citations available. The dependent variable is Citations measuring innovation, extracted from USPTO. The control variables are set for four major groups: financial control, deal size control, age/experience control and Industry 73 control. As financial controls, the regressions use Revenues/Assets, Gross Margin, the natural logarithm of leverage, Return on Assets (ROA) and CapEx/Assets. As deal size control, the Average Equity Per Firm in Total variable was used. As age, the natural logarithm of the months of the firm. Lastly, *N* represents the sample size.

settings) and larger syndicates highlight their strategic role in creating value from entrepreneurial innovation.

Results from the base regressions reveal that when a syndicate comprises CVC funding, innovation output is positively affected. Specifically, Model 2.A.2 shows an increase in innovation output by 0.3541, which is corroborated by the citation-based results in Model 3.A.2 with an even greater increase of 0.4121. These findings are consistent with the literature emphasising more strategic benefits associated with CVC than with IVC, including access to complementary assets, use of venture capital for advanced strategy formulation (Maula 2001; Chemmanur et al. 2014; Guo et al. 2015). It is consistent with the findings of Sapienza (1992) and Gompers and Lerner (2000) who proposed that CVC is valuable and efficient since it compounds the resource advantage of the investor and incentivizes innovation.

Syndicates within the third and fourth quartiles demonstrate a pronounced ability to boost innovation. Model 2.A.4 indicates an increase of 0.3214, while the citation-based analysis in Model 3.A.4 reveals an even stronger effect of 0.3425. This underscores the role of larger, more established syndicates in driving innovation through diversity of resources and pooling of know-how. The results also indicate positive contributions by smaller syndicates (first and second quartiles). It indicates a direct relationship between investors in syndicate and their aggregate output contribution in the path of innovation. Catalini (2018) similarly highlights the beneficial role of location fit on innovation. These results support Hypothesis 2, especially among larger syndicates where a proper fit in location significantly increases output of innovation. The results also hint at the possibility that single investors achieve a higher yield in innovation than syndicate groups, due perhaps to more efficient decision-making processes.

Concentrating on the industry pillar, when ventures and investors are in the same sector, innovation output increases by 0.3481. The evidence for this is compounded in Model 3, where the analysis is citation-based, with a contribution of 0.3784. This industry-specific experience includes specialised market information and established connections, which CVCs can utilise to promote innovation (Gompers et al. 2009). These results align with Hypothesis 3 and imply that ventures and investors should prioritise alignment within the current industry whenever possible to optimise innovation results.

Overall, the results also highlight the importance of absorptive capacity and environmental munificence for innovation. While absorptive capacity, or a venture's ability to absorb, process and use external knowledge, greatly increases innovation output. This resonated with the RBV lens, as firms with great absorptive capacity can use the resources and capabilities offered by syndicates and CVCs. Moreover, environmental munificence in terms of both availability of external resources and favourable business conditions allows for risk-taking, experimentation and investment in innovative activities. These considerations highlight the need for internal venture capabilities to be congruent with the external environmental conditions in order to optimise innovation outcomes.

Tables 4 and 5 show regressions measuring the impact of the number of rounds and the impact of the CVC dominance. At Model 4.1, it is possible to see the benefit of having a higher

TABLE 4 | Moderator regressions: Impact of rounds, %CVC and size on patents.

	Model 1	Model 2	Model 3	Model 4	Model 5
% CVC	0.4641***				
	(0.1121)				
# Rounds		0.2761*			
		(0.1191)			
Successful IPO exit dummy	0.3571*	0.3761*			
	(0.1101)	(0.1032)			
Majority CVC			0.3142*		
			(0.1123)		
Majority CVC * VCS [Q1–Q2]				0.3351***	
				(0.1035)	
Majority CVC * VCS [Q3–Q4]					0.3973***
					(0.1032)
Financial controls	Yes	Yes	Yes	Yes	Yes
Funding controls	Yes	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes
Cons	45.452***	44.243***	46.983***	46.657***	46.564***
	(0.212)	(0.233)	(0.151)	(0.113)	(0.123)
N	4406	4406	4406	4406	4406
R^2	0.652	0.671	0.654	0.636	0.664

Note: Standard errors in parentheses $^*p<0.1$, $^{**}p<0.05$, $^{***}p<0.01$. This table presents the results of the Full Sample innovation output database OLS regression. All these values are in regard to companies that have Patents available. The dependent variable is Patents measuring innovation, extracted from USPTO. The main focus variables are the %CVC, # rounds, Successful IPO Exit Dummy, Majority CVC and Moderator combinations. The control variables are set for four major groups: financial control, deal size control, age/experience control and Industry 73 control. As financial controls, the regressions use Revenues/Assets, Gross Margin, the natural logarithm of leverage, Return on Assets (ROA) and CapEx/Assets. As deal size control, the Average Equity Per Firm in Total variable was used. As age, the natural logarithm of the months of the firm. Lastly, *N* represents the sample size.

percentage of CVCs in a syndicate along with a possible IPO exit. It is clear that having a higher percentage of CVCs offers a better innovation output for the ventures while exiting as an IPO instead of an acquisition also furthers that benefit. Model 4.2 looks at a similar scope but with the number of rounds. Having an increase in the number of rounds impacts in a positive and significant way the innovation output combined with a successful IPO exit. The following models from 4.3 to 4.7 show moderator analysis. In Model 4.3 in the below table, there is a positive impact and significance of the output. Combining both the majority CVC variables with the syndicates, we can see the real benefit the CVC supply in a syndicate. Interestingly, the models present significant results in a positive way. So, there is a definite benefit of having a big CVC party in a syndicate when the size of this syndicate is considerably large.

In Table 5, Model 5.1, it is possible to see the benefit of having a higher percentage of CVCs in a syndicate along with a possible IPO exit. Having a higher percentage of CVCs offers a better innovation output for the ventures while exiting as an IPO instead of an acquisition also furthers that benefit. Model 5.2 looks at a similar scope but with the number of rounds. Having an increase in the number of rounds impacts in a positive and significant way the innovation output combined with a successful IPO exit. The following models from 5.3 to 5.7 show moderator analysis. Combining both the majority CVC variables with the syndicates, we can see the real benefit of the CVC supply in a syndicate. Interestingly, the models present significant results in a positive way.

Table 6 reports the OLS regression results for the Pre-IPO innovation output for CVC- and IVC-backed ventures. The reasoning is similar to the one in the previous section. This regression focuses on the values that the ventures displayed 1 year before their IPO launch and utilised Patents and Citations as its dependent variables. Throughout all the Table 6 Panel A models, the CVC Investor type dummy coefficient is positive and very much significant, meaning CVC impacts in a positive way the innovation yield. When taking into consideration the syndicate, Model 6.A.3 through 6.A.4, it appears that the size of the syndicate, VCS[Q3-Q4], plays an important role, being positive and significant. Once again, the regression suggests that higher syndicates bring considerably higher innovation output, as previously suggested by other authors like Ferrary (2010). This significance

TABLE 5 | Moderator regressions: Impact of rounds, %CVC and size on citations.

	Model 1	Model 2	Model 3	Model 4	Model 5
% CVC	0.4512***				
	(0.1023)				
# Rounds		0.2371**			
		(0.1021)			
Successful IPO exit dummy	0.1982*	0.2514*			
	(0.1092)	(0.1614)			
Majority CVC			0.3815***		
			(0.1125)		
Majority CVC * VCS [Q1–Q2]				0.3812***	
				(0.3121)	
Majority CVC * VCS [Q3–Q4]					0.4221***
					(0.2311)
Financial controls	Yes	Yes	Yes	Yes	Yes
Funding controls	Yes	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes
Cons	46.182***	46.283***	47.192***	47.102***	46.291***
	(0.181)	(0.127)	(0.112)	(0.125)	(0.102)
N	4406	4406	4406	4406	4406
R^2	0.661	0.673	0.651	0.674	0.657

Note: Standard errors in parentheses $*p<0.1$, $**p<0.05$, $***p<0.01$. This table presents the results of the Full Sample innovation output database OLS regression. All these values are regarding companies that have Citations available. The dependent variable is Citations measuring innovation, extracted from USPTO. The main focus variables are the %CVC, # rounds, Successful IPO Exit Dummy, Majority CVC and Moderator combinations. The control variables are set for four major groups: financial control, deal size control, age/experience control and industry control. As financial controls, the regressions use Revenues/Assets, Gross Margin, the natural logarithm of leverage, Return on Assets (ROA) and CapEx/Assets. As deal size control, the Average Equity Per Firm in Total variable was used. As age, the natural logarithm of the months of the firm. Lastly, *N* represents the sample size.

level is maintained throughout Models 6.B.1 to 6.B.8 in Panel B with relatively similar coefficients.

Table 7 features the OLS regression results for the Post-IPO innovation output for CVC- and IVC-backed ventures. Using patents and citations as a dependent variables, this regression mirrors the one in Table 6, although now aiming at the values that the ventures displayed 1 year after their IPO. In Table 7, the variable CVC is positive and significant throughout the board, keeping the notion that CVC is superior when promoting innovation previously mentioned. When considering the performance of the syndicates throughout Models 7.A.3 to 7.A.4, they show high significance levels.

Now we will put the hypothesis against the pre- and post-IPO regressions and try to understand if there is any shift once they go public. Just like mentioned by several authors (Block and Ornati 1987; Gompers and Lerner 2000; Luukkonen et al. 2013), CVCs offer practical value through knowledge, strategy formulation and complementary assets. From the get-go evidence from Model 6.A.2 (Pre-IPO) and Model 7.A.2 (Post-IPO) support this claim, proposing that when a CVC invests in a venture, its innovation output is set to increase 0.1143 and 0.2201, respectively (Chemmanur et al. 2014). Interestingly, in the period previous to the IPO, ventures benefit significantly more from having CVC as their investor. This could possibly be justified by the idea that investors have a more impactful role in the beginning years before the IPO (where their influence is higher) as well as the fact that in the years following the IPO, the investor has a meaningful role and influence on the venture.

5 | Robustness Tests

We explore the robustness of our results to concerns on reverse causality and endogeneity in our analysis. For this purpose, we utilised GMM along with 2SLS. These models instead used lagged CVC and lagged Syndicates as instrument for endogeneity variables, controlling for the same variables. Our results, presented in Tables 8 and 9 show the impact of CVC funding and syndicates on the innovation environmental performance as previously established by our models. The first-stage F-statistics in the 2SLS models indicated that the instruments were quite strong, and they passed all our validity checks in both GMM and

TABLE 6 | Pre-IPO: Venture innovation output based on 1 year before the IPO.

Panel A: Patents

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
CVC		0.1143***	0.1145***	0.1164***	0.1189***	0.1192***	0.1165***	0.1162***
		(0.0301)	(0.0012)	(0.0012)	(0.0012)	(0.0011)	(0.0012)	(0.0012)
Syndicate								
VCS [Q1–Q2]			0.1291**					
			(0.0312)					
VCS [Q3–Q4]				0.2214**				
				(0.0284)				
Location fit					0.0037*			
					(0.0245)			
Technological fit						0.0007*		
						(0.0034)		
Absorptive capacity							0.1012*	
							(0.0012)	
Environmental munificence								0.1213*
								(0.0121)
Financial controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Funding controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cons	0.3222***	0.3313***	0.3324***	0.4144***	0.3181***	0.3412***	0.3212***	0.3411***
	(0.1351)	(0.0311)	(0.0311)	(0.0311)	(0.0311)	(0.0311)	(0.0311)	(0.0311)
N	2675	2675	2675	2675	2675	2675	2675	2675
R^2	0.32	0.36	0.38	0.32	0.33	0.34	0.37	0.35

Panel B: Citations

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
CVC		0.2114***	0.2101***	0.2212***	0.2201***	0.1625***	0.1281***	0.1012***
		(0.0011)	(0.0011)	(0.0121)	(0.0192)	(0.0311)	(0.0311)	(0.0351)
Syndicate								
VCS [Q1–Q2]	0.1182**		0.1222**		0.1232**		0.2253**	
	(0.1021)		(0.1101)		(0.1001)		(0.1012)	
VCS [Q3–Q4]		0.2272***		0.3213***		0.3312***		0.3312***
		(0.1003)		(0.1118)		(0.1101)		(0.1271)
Location fit	0.2101***	0.2212***						
	(0.1211)	(0.1115)						
Technological fit			0.2512***	0.2102***				
			(0.1201)	(0.1011)				

(Continues)

TABLE 6 | (Continued)

Panel B: Citations	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Absorptive capacity					0.3121***	0.3412***		
					(0.1121)	(0.1114)		
Environmental munificence							0.3182***	0.3182***
							(0.1234)	(0.1211)
Financial controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Funding controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cons	0.3134***	0.3122***	0.3134***	0.2933***	0.3044***	0.30625***	0.3167***	0.2425***
	(0.0119)	(0.0313)	(0.0315)	(0.0365)	(0.0341)	(0.0311)	(0.0118)	(0.0311)
N	2675	2675	2675	2675	2675	2675	2675	2675
R^2	0.32	0.33	0.34	0.35	0.34	0.34	0.35	0.35

Note: Standard errors in parentheses $*p<0.1$, $**p<0.05$, $***p<0.01$. This table presents the results of the Pre-IPO innovation output database OLS regression. All these values are in regard to a 20-year timeframe of companies that have gone public. The dependent variable is a financial metric for innovation that is based on the ventures values one year prior to their IPO, extracted from DataStream. And so are all the other financial variables. The control variables are set for four major groups: financial control, deal size control, age/experience control and Industry 73 control. As financial controls, the regressions use Revenues/Assets, Gross Margin, natural logarithm of leverage, Return on Assets (ROA) and CapEx/Assets. As deal size control, the Average Equity Per Firm in Total variable was used. As age, the natural logarithm of the age of the venture at IPO was used. Lastly, *N* represents the sample size.

TABLE 7 | Post-IPO: Venture innovation output based 1 year after the IPO.

Panel A: Patents	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
CVC		0.2201***	0.2233***	0.2223***	0.2213***	0.2121***	0.2712***	0.2142**
		(0.0111)	(0.0211)	(0.0213)	(0.0214)	(0.0212)	(0.0213)	(0.0214)
Syndicate								
VCS [Q1–Q2]			0.2113**					
			(0.0431)					
VCS [Q3–Q4]				0.2351**				
				(0.0242)				
Location fit					0.2131**			
					(0.0125)			
Technological fit						0.2232**		
						(0.0041)		
Absorptive capacity							0.2315*	
							(0.0011)	
Environmental munificence								0.3443**
								(0.0032)

(Continues)

Panel A: Patents								
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
Financial controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Funding controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cons	0.1212***	0.17211***	0.1346***	0.1733***	0.1732***	0.1681***	0.1556***	0.1656***
	(0.0234)	(0.0231)	(0.0244)	(0.4533)	(0.0233)	(0.0236)	(0.0438)	(0.1226)
N	2675	2675	2675	2675	2675	2675	2675	2675
R^2	0.32	0.33	0.33	0.33	0.33	0.33	0.34	0.36

Panel B: Citations								
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
CVC		0.2514***	0.2102***	0.2104***	0.2213**	0.2212**	0.1213**	0.2413**
		(0.0201)	(0.0011)	(0.0211)	(0.0212)	(0.0211)	(0.0212)	(0.0211)
Syndicate								
VCS [Q1–Q2]	0.2182**		0.2112**		0.2212**		0.2253**	
	(0.1312)		(0.1311)		(0.1361)		(0.1312)	
VCS [Q3–Q4]		0.3672***		0.3313***		0.3512***		0.4312***
		(0.1123)		(0.1128)		(0.1328)		(0.1271)
Location fit	0.3315***	0.3312***						
	(0.1216)	(0.1106)						
Technological fit			0.4762***	0.5136***				
			(0.1113)	(0.1121)				
Absorptive capacity					0.5142***	0.5122***		
					(0.3321)	(0.3214)		
Environmental munificence							0.4625***	0.5622***
							(0.1222)	(0.1234)
Financial controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Funding controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cons	0.1605***	0.1636***	0.1556***	0.3525***	0.2658***	0.2686***	0.2607***	0.2574***
	(0.1139)	(0.1141)	(0.1241)	(0.4245)	(0.3227)	(0.3229)	(0.3229)	(0.3234)
N	2675	2675	2675	2675	2675	2675	2675	2675
R^2	0.34	0.34	0.34	0.34	0.33	0.35	0.34	0.34

Note: Standard errors in parentheses $*p<0.1$, $**p<0.05$, $***p<0.01$. This table presents the results of the Post-IPO innovation output database OLS regression. All these values are in regard to a 20-year timeframe of companies that have gone public. The dependent variable is a financial metric for innovation that is based on the ventures values one year after their IPO, extracted from DataStream. So are all the other financial variables. The control variables are set for four major groups: financial control, deal size control, age/experience control and Industry 73 control. As financial controls, the regressions use Revenues/Assets, Gross Margin, natural logarithm of leverage, Return on Assets (ROA) and CapEx/Assets. As deal size control, the Average Equity Per Firm in Total variable was used. As age, the natural logarithm of the age of the venture at IPO was used. Lastly, *N* represents the sample size.

TABLE 8 | Regression results for 2SLS (Lagged CVC).

Panel A: Patents

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
Lagged (CVC)		0.3321**	0.3651**	0.3763**	0.3832**	0.3412**	0.3872**	0.3761**
		(0.1213)	(0.2152)	(0.2716)	(0.2163)	(0.1625)	(0.1627)	(0.1721)
Lagged syndicate								
VCS [Q1–Q2]			0.2612**					
			(0.1182)					
VCS [Q3–Q4]				0.2152***				
				(0.1142)				
location fit					0.2162**			
					(0.1182)			
technological fit						0.2213**		
						(0.1142)		
absorptive capacity							0.2615***	
							(0.1123)	
environmental munificence								0.2261***
								(0.2134)
financial controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
funding controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
age controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
industry controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	34.112***	33.625***	33.213***	33.152***	37.124***	38.312***	37.124***	37.121***
	(0.213)	(0.142)	(0.142)	(0.321)	(0.217)	(0.112)	(0.162)	(0.163)
N	4406	4406	4406	4406	4406	4406	4406	4406
R^2	0.671	0.642	0.613	0.654	0.652	0.612	0.652	0.662
First stage (Prob > F)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Durbin score chi^2 (p)	0.5364	0.5243	0.6749	0.7846	0.5364	0.5243	0.6749	0.7846
Wu–Hausman (p)	0.3425	0.2435	0.5463	0.7682	0.3425	0.2435	0.5463	0.7682

Panel B: Patents

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
Lagged (CVC)	0.3241**	0.3912**	0.3871**	0.3981**	0.4123**	0.4912**	0.4712**	0.4612**
	(0.1142)	(0.1126)	(0.1182)	(0.1182)	(0.1192)	(0.1152)	(0.1191)	(0.1621)
Lagged Syndicate								
VCS [Q1–Q2]	0.2431*		0.2615*		0.2453*		0.2261*	
	(0.1152)		(0.1132)		(0.1142)		(0.1187)	
VCS [Q3–Q4]		0.3761**		0.3412**		0.3981**		0.3781**
		(0.1192)		(0.1123)		(0.1156)		(0.1152)
Location fit	0.2341***	0.2514***						
	(0.1142)	(0.1928)						

(Continues)

TABLE 8 | (Continued)

Panel B: Patents	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Technological fit			0.3142***	0.2435***				
			(0.1182)	(0.1127)				
Absorptive capacity					0.3412***	0.3415***		
					(0.1121)	(0.1164)		
Environmental munificence							0.3511***	0.2413***
							(0.1625)	(0.1127)
Financial controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Funding controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cons	44.514***	44.211***	49.142***	48.112***	47.112***	46.112***	46.235***	44.123***
	(0.112)	(0.123)	(0.192)	(0.125)	(0.112)	(0.212)	(0.114)	(0.231)
N	4406	4406	4406	4406	4406	4406	4406	4406
R^2	0.561	0.568	0.651	0.562	0.652	0.615	0.653	0.653
First stage (Prob > F)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Durbin score chi^2 (p)	0.5364	0.5243	0.6749	0.7846	0.5364	0.5243	0.6749	0.7846
Wu–Hausman (p)	0.3425	0.2435	0.5463	0.7682	0.3425	0.2435	0.5463	0.7682

Note: This table presents the results of the 2SLS regressions for the four different models. The independent variables are instrument variables calculated using the lagged values. The first-stage F-statistics indicate that the instruments are strong ($p = 0.0000$). The endogeneity tests (Durbin and Wu–Hausman) show no evidence of endogeneity.

TABLE 9 | Regression results for GMM (Lagged CVC).

Panel A: Citations	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Lagged CVC		0.3781*	0.3617*	0.3301*	0.3512*	0.3612*	0.3671*	0.3981*
		(0.1182)	(0.1101)	(0.1143)	(0.1521)	(0.1171)	(0.1271)	(0.1261)
Lagged syndicate								
VCS [Q1–Q2]			0.3311*					
			(0.1262)					
VCS [Q3–Q4]				0.3152***				
				(0.1101)				
Location fit					0.2172**			
					(0.1131)			
Technological fit						0.2141**		
						(0.1231)		
Absorptive capacity							0.2172***	
							(0.1172)	
Environmental munificence								0.2152***

(Continues)

TABLE 9 | (Continued)

Panel A: Citations								
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
								(0.1101)
Financial controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Funding controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cons	45.121***	44.119***	39.121***	44.112***	39.121***	38.123***	46.121***	48.115***
	(0.112)	(0.121)	(0.112)	(0.112)	(0.126)	(0.121)	(0.162)	(0.103)
N	4406	4406	4406	4406	4406	4406	4406	4406
R^2	0.681	0.673	0.671	0.687	0.642	0.651	0.673	0.589
First stage (Prob > F)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
GMM C statistic chi^2 (p)	0.271	0.261	0.281	0.275	0.243	0.231	0.261	0.267

Panel B: Citations								
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
Lagged CVC	0.3981*	0.3871*	0.3341*	0.3361*	0.3192*	0.3152*	0.3371*	0.3812*
	(0.1101)	(0.1021)	(0.1612)	(0.1121)	(0.1171)	(0.3612)	(0.1271)	(0.1101)
Lagged syndicate								
VCS [Q1–Q2]	0.2151**		0.2163**		0.2105**		0.2314**	
	(0.1121)		(0.1031)		(0.1011)		(0.1151)	
VCS [Q3–Q4]		0.3312***		0.3371***		0.3612***		0.3153***
		(0.1152)		(0.1101)		(0.1932)		(0.1124)
Location fit	0.2943***	0.2817***						
	(0.1101)	(0.2141)						
Technological fit			0.3987***	0.3761***				
			(0.3512)	(0.2131)				
Absorptive capacity					0.4152***	0.4512***		
					(0.1151)	(0.1932)		
Environmental munificence							0.3817***	0.3712***
							(0.1021)	(0.1197)
Financial controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Funding controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry 73 controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cons	38.105***	39.113***	41.191***	42.114***	41.101***	42.103***	43.192***	44.126***
	(0.312)	(0.134)	(0.212)	(0.116)	(0.191)	(0.112)	(0.121)	(0.154)
N	4406	4406	4406	4406	4406	4406	4406	4406
R^2	0.671	0.653	0.645	0.667	0.712	0.716	0.713	0.773
First stage (Prob > F)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
GMM C statistic chi^2 (p)	0.2726	0.1741	0.2719	0.5838	0.2726	0.1741	0.2719	0.5838

Note: This table presents the results of the GMM regressions for the four different models. The instrumental variable are calculated at the same way as 2SLS. The first-stage F-statistics indicate that the instruments are strong in all models. The endogeneity tests (Durbin and Wu–Hausman) show no evidence of endogeneity.

TABLE 10 | Robustness regressions: Reverse causality (patents).

Panel A: Investor CVC								
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
Patents		0.0012	0.0011	0.0011	0.0011	0.0012	0.0027	0.0037
		(0.0191)	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0012)
Syndicate								
VCS [Q1–Q2]			0.0013					
			(0.0012)					
VCS [Q3–Q4]				−0.0012				
				(0.0001)				
Location fit					−0.0011			
					(0.0012)			
Technological fit						0.0011		
						(0.0122)		
Absorptive capacity							0.0001	
							(0.0121)	
Environmental munificence								0.0029
								(0.0012)
Financial controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Funding controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cons	0.0019***	0.0009***	0.0121***	0.0011***	0.0012***	0.0001***	0.0012***	0.0012***
	(0.0101)	(0.0211)	(0.0001)	(0.0201)	(0.2111)	(0.0221)	(0.0211)	(0.0211)
N	4406	4406	4406	4406	4406	4406	4406	4406
R^2	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.02

Note: Standard errors in parentheses $*p<0.1$, $**p<0.05$, $***p<0.01$. These tables present the results of the Full Sample robustness test with an OLS regression. All these values are in regard to companies that have Patents available and Citations. The dependent variable is the CVC measuring the type of investor. The control variables are set for four major groups: financial control, deal size control, age/experience control and Industry control. As financial controls, the regressions use Revenues/Assets, Gross Margin, the natural logarithm of leverage, Return on Assets (ROA) and CapEx/Assets. As deal size control, the Average Equity Per Firm in Total variable was used. As age, the natural logarithm of the months of the firm. Lastly, *N* represents the sample size.

2SLS specifications. Such results of no more endogeneity from these two tests help with consistency and efficiency property of our OLS estimate. Therefore, the positive link from CVC funding and syndicates to innovation demonstrates a high degree of causality. The results from the Durbin and Wu–Hausman tests indicating no evidence of endogeneity suggest that our independent variable (CVC and syndicates) is not correlated with the error term in the regression models. This is a good outcome because it implies that the estimated relationship between the CVC and syndicates and innovation can be interpreted as causal, rather than spurious or biased due to omitted variable bias or reverse causality. To give an additional robustness to these findings, reverse causality tests have been run for the base dataset and presented in Tables 10 and 11.

6 | Conclusion

This study provides an in-depth analysis of how different types of investor configurations (CVC, IVC and syndicates) and contextual facets lead to the emergence of innovation among entrepreneurs. The results highlight the central importance of CVC funding in the field of innovation as a force for change, showing access to level-facing sources, expertise and other complementary services. By pooling resources and integrating domain expertise, larger syndicates can emerge as substantial drivers of innovation results at that company. The findings further suggest that contextual factors (i.e., technological fit, location fit, environmental munificence and absorptive capacity) significantly moderate the relationship between investor type and innovation

TABLE 11 | Robustness regressions: Reverse causality (citations).

Panel A: Investor CVC	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Citations		0.0012	0.0012	0.0011	0.0011	0.0013	0.0052	0.0052
		(0.0038)	(0.0038)	(0.0038)	(0.0038)	(0.0038)	(0.0038)	(0.0038)
Syndicate								
VCS [Q1–Q2]			0.0101					
			(0.0000)					
VCS [Q3–Q4]				0.0011				
				(0.0111)				
Location fit					0.0081			
					(0.0112)			
Technological fit						0.0012		
						(0.0001)		
Absorptive capacity							0.0191	
							(0.0112)	
Environmental munificence								0.0211
								(0.0101)
Financial controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Funding controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cons	0.0001***	0.0003***	0.0051**	0.0001***	0.0011***	0.0033***	0.0601***	0.0601***
	(0.0113)	(0.0114)	(0.0116)	(0.0117)	(0.0211)	(0.0111)	(0.0211)	(0.0211)
N	4406	4406	4406	4406	4406	4406	4406	4406
R^2	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02

Note: Standard errors in parentheses $*p<0.1$, $**p<0.05$, $***p<0.01$. These tables present the results of the Full Sample robustness test with an OLS regression. All these values are in regard to companies that have Patents available and Citations. The dependent variable is the CVC measuring the type of investor. The control variables are set for four major groups: financial control, deal size control, age/experience control and Industry control. As financial controls, the regressions use Revenues/Assets, Gross Margin, natural logarithm of leverage, Return on Assets (ROA) and CapEx/Assets. As deal size control, the average equity per firm in total variable was used. As age, the natural logarithm of the months of the firm. Lastly, *N* represents the sample size.

outcomes. Technological fit guarantees that industry players are aligned, powerfully driving incremental innovations. Even in geographically proximate collaborations, location fit improves operational synergies. There is a notion that creativity and experimentation flourish in environments with abundant resources and lack of constraints, thus giving ventures the means and ability to experiment. This potential is the absorptive capacity of ventures, allowing them to successfully absorb and utilise external knowledge and turn it, through innovation, into new ideas. This would be to ensure that internal capabilities fit well to add true value to external opportunities to innovate.

This study contributes a unique synthesis of investor configurations and contextual variables together as a framework to advance entrepreneurial innovation. Our findings add value to existing literature and practices with recommendations directed at entrepreneurs to obtain an optimal funding structure and for investors to improve how they stimulate innovation in the market. These findings can guide policymakers in building an integrated ecosystem that fosters collaboration, access to resources and outcomes in innovation, reinforcing the innovation ecosystem towards economic development.

This study represents a meaningful contribution towards understanding how venture capital configurations can promote innovation, although it could have been improved by considering further aspects contributing to innovation results in future studies. For example, the experience and capabilities of the venture's management team are broadly acknowledged as leading predictors of capacity for innovation. Management teams with relevant operating expertise and networks can help navigate their ventures through difficult routes to innovation. VC may be more or less effective at promoting innovation depending on whether there were macroeconomic conditions around the world (e.g., times of growth or downturn). High level of ventures maybe restricted in bad economic situations while in good periods, the resources for innovation would enhance and so is the outcome it brings. Future research may control for these macroeconomic factors in studying the effect of different kinds of VC on innovation. Future research should replicate and extend this analysis to other geographical contexts to investigate potential divergences in the links between configurations of venture capital and innovation across differing institutional, cultural and economic settings.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Endnotes

[1] Check next sections for further details the characteristics of each form of VC.

References

Alkhanbouli, A., C. Estay, and D. Tsagdis. 2020. "Modèles d'affaires et modèles d'affaires innovants au sein des zones franches: Une approche qualitative." *Management International/International Management/Gestiòn Internacional* 24, no. 1: 97–108. https://doi.org/10.7202/1069097ar.

Alvarez-Garrido, E., and G. Dushnitsky. 2016. "Are Entrepreneurial Venture's Innovation Rates Sensitive to Investor Complementary Assets? Comparing Biotech Ventures Backed by Corporate and Independent VCs: Comparing Biotech Ventures Backed by Corporate and Independent VCs." *Strategic Management Journal* 37, no. 5: 819–834. https://doi.org/10.1002/smj.2359.

Bertoni, F., M. G. Colombo, and L. Grilli. 2013. "Venture Capital Investor Type and the Growth Mode of New Technology-Based Firms." *Small Business Economics* 40, no. 3: 527–552. https://doi.org/10.1007/s11187-011-9385-9.

Block, Z., and O. A. Ornati. 1987. "Compensating Corporate Venture Managers." *Journal of Business Venturing* 2: 41–51.

Boyd, B. K. 1990. "Corporate Linkages and Organizational Environment: A Test of the Resource Dependence Model." *Strategic Management Journal* 11, no. 6: 419–430. https://doi.org/10.1002/smj.4250110602.

Brander, J. A., R. Amit, and W. Antweiler. 2002. "Venture-Capital Syndication: Improved Venture Selection vs. the Value-Added Hypothesis." *Journal of Economics and Management Strategy* 11, no. 3: 423–452. https://doi.org/10.1111/j.1430-9134.2002.00423.x.

Brinette, S., S. Khemiri, R. Benkraiem, and A. Miloudi. 2020. Système de gouvernance et stratégie de capital risque industriel des groupes français.

Castrogiovanni, G. J. 1991. "Environmental Munificence: A Theoretical Assessment." *Academy of Management Review* 16, no. 3: 542–565.

Catalini, C. 2018. "Microgeography and the Direction of Inventive Activity." *Management Science* 64, no. 9: 4348–4364. https://doi.org/10.1287/mnsc.2017.2798.

Chemmanur, T. J., E. Loutskina, and X. Tian. 2014. "Corporate Venture Capital, Value Creation, and Innovation." *Review of Financial Studies* 27, no. 8: 2434–2473. https://doi.org/10.1093/rfs/hhu033.

Chen, Y., and Z. Xu. 2020. "How Has the Global Financial Crisis Affected Syndicated Loan Terms in Emerging Markets? Evidence From China." *Emerging Markets Review* 42, no. 1: 101–119. https://doi.org/10.1016/j.ememar.2020.100724.

Chesbrough, H. 2000. "Designing Corporate Ventures in the Shadow of Private Venture Capital." *California Management Review* 42, no. 3: 31–49. https://doi.org/10.2307/41166041.

Chesbrough, H. W. 2002. *Making Sense of Corporate Venture Capital*. Vol. 10. Awad Capital Ltd.

Chesbrough, H., and C. L. Tucci. 2012. "Corporate enture Capital in the Context of Corporate Innovation." 1–20.

Cohen, W. M., and D. A. Levinthal. 1990. "Absorptive Capacity: A New Perspective on Learning and Innovation." *Administrative Science Quarterly* 35, no. 1: 128–152. https://doi.org/10.2307/2393553.

Colombo, M. G., and L. Grilli. 2010. "On Growth Drivers of High-Tech Start-Ups: Exploring the Role of Founders' Human Capital and Venture Capital." *Journal of Business Venturing* 25, no. 6: 610–626. https://doi.org/10.1016/j.jbusvent.2009.01.005.

De Clercq, D., and D. Dimov. 2004. "Explaining Venture Capital Firms' Syndication Behaviour: A Longitudinal Study." *Venture Capital* 6, no. 4: 243–256. https://doi.org/10.1080/1369106042000277688.

DeCarolis, D. M., and D. L. Deeds. 1999. "The Impact of Stocks and Flows of Organizational Knowledge on Firm Performance: An Empirical Investigation of the Biotechnology Industry." *Strategic Management Journal* 20: 953–968. https://doi.org/10.1002/(SICI)1097-0266(199910)20:10⟨953::AID-SMJ59⟩3.0.CO;2-3.

Dushnitsky, G. 2012. "Corporate Venture Capital in the 21st Century: An Integral Part of Firms' Innovation Toolkit. *Corporate*." *Venture Capital* 4: 156–210.

Dushnitsky, G., and M. J. Lenox. 2006. "When Does Corporate Venture Capital Investment Create Firm Value?" *Journal of Business Venturing* 21, no. 6: 753–772. https://doi.org/10.1016/j.jbusvent.2005.04.012.

Ferrary, M. 2010. "Syndication of Venture Capital Investment: The Art of Resource Pooling." *Entrepreneurship Theory and Practice* 34, no. 5: 885–907. https://doi.org/10.1111/j.1540-6520.2009.00356.x.

Flatten, T. C., A. Engelen, S. A. Zahra, and M. Brettel. 2011. "A Measure of Absorptive Capacity: Scale Development and Validation." *European Management Journal* 29, no. 2: 98–116. https://doi.org/10.1016/j.emj.2010.11.002.

Fulghieri, P., and M. Sevilir. 2009. "Organization and Financing of Innovation, and the Choice Between Corporate and Independent Venture Capital." *Journal of Financial and Quantitative Analysis* 44, no. 6: 1291–1321. https://doi.org/10.1017/S0022109009990391.

Gans, J. S., and S. Stern. 2003. "The Product Market and the Market for "Ideas": Commercialization Strategies for Technology Entrepreneurs." *Research Policy* 32: 333–350.

Geroski, P. A. 2005. "Understanding the Implications of Empirical Work on Corporate Growth Rates." *Managerial and Decision Economics* 26, no. 4: 293–300. https://doi.org/10.1002/mde.1207.

Gompers, G. W., S. N. Kaplan, and I. A. Strebulaev. 2020. "How Do Venture Capitalists Make Decisions?" *Journal of Financial Economics* 135, no. 1: 169–190. https://doi.org/10.1016/j.jfineco.2019.06.011.

Gompers, P., A. Kovner, and J. Lerner. 2009. "Specialization and Success: Evidence From Venture Capital." *Journal of Economics and Management Strategy* 18, no. 3: 817–844. https://doi.org/10.1111/j.1530-9134.2009.00230.x.

Gompers, P., and J. Lerner, eds. 2000. *The Determinants of Corporate Venture Capital Success Organizational Structure, Incentives, and Complementarities*. University of Chicago Press.

Gompers, P., and J. Lerner. 1996. "The Use of Covenants: An Empirical Analysis of Venture Partnership Agreements." *Journal of Law and Economics* 37: 463–498.

Gorman, M., and W. A. Sahlman. 1989. "What Do Venture Capitalists Do?" *Journal of Business Venturing* 4, no. 4: 231–248.

Grant, R. M. 1991. "The Resource-Based Theory of Competitive Advantage: Implications for Strategy Formulation." *California Management Review* 33, no. 3: 114–135. https://doi.org/10.2307/41166664.

Griliches, Z. 1990. *Patent Statistics as Economic Indicators: A Survey (Working Paper No. 3301)*. National Bureau of Economic Research. https://doi.org/10.3386/w3301.

Guo, B., Y. Lou, and D. Pérez-Castrillo. 2015. "Investment, Duration, and Exit Strategies for Corporate and Independent Venture Capital-Backed Start-Ups: Investment, Duration, and Exit Strategies." *Journal of Economics and Management Strategy* 24, no. 2: 415–455. https://doi.org/10.1111/jems.12097.

Hellmann, T., and M. Puri. 2002. "Venture Capital and the Professionalization of Start-Up Firms: Empirical Evidence." *Journal of Finance* 57, no. 1: 169–197. https://doi.org/10.1111/1540-6261.00419.

Hill, S. A., and J. Birkinshaw. 2014. "Ambidexterity and Survival in Corporate Venture Units." *Journal of Management* 40, no. 7: 1899–1931. https://doi.org/10.1177/0149206312445925.

Hochberg, Y. V., A. Ljungqvist, and Y. Lu. 2007. "Whom You Know Matters: Venture Capital Networks and Investment Performance." *Journal of Finance* 62, no. 1: 251–301. https://doi.org/10.1111/j.1540-6261.2007.01207.x.

How the Best Corporate Venturers Keep Getting Better. 2020. United States – EN. https://www.bcg.com/en-us/publications/2018/how-best-corporate-venturers-keep-getting-better.

Keats, B. W., and M. A. Hitt. 1988. "A Causal Model of Linkages Among Environmental Dimensions, Macro Organizational Characteristics, and Performance." *Academy of Management Journal* 31, no. 3: 570–598. https://doi.org/10.2307/256460.

Kogut, B., and U. Zander. 1992. "Knowledge of the Firm, Combinative Capabilities, and the Replication of Technology." *Organization Science* 3: 383–397.

Lebret, H. 2015. *Invention, Entrepreneurship and Innovation | Start-Up*. https://www.startup-book.com/2015/11/24/invention-entrepreneurship-and-innovation/.

Li, Y., Z. Wei, J. Zhao, C. Zhang, and Y. Liu. 2013. "Ambidextrous Organizational Learning, Environmental Munificence and New Product Performance: Moderating Effect of Managerial Ties in China." *International Journal of Production Economics* 146, no. 1: 95–105. https://doi.org/10.1016/j.ijpe.2012.11.008.

Lockett, A., and M. Wright. 2001. "The Syndication of Venture Capital Investments." *Financial Management Association* 23, no. 3: 375–390.

Luukkonen, T., M. Deschryvere, and F. Bertoni. 2013. "The Value Added by Government Venture Capital Funds Compared With Independent Venture Capital Funds." *Technovation* 33, no. 4–5: 154–162. https://doi.org/10.1016/j.technovation.2012.11.007.

Macmillan, I. C., D. M. Kulow, and R. Khoylian. 1988. "Venture Capitalists' Involvement in Their Investments: Extent and Performance." *Journal of Business Venturing* 4, no. 1: 27–47.

Manigart, S., A. Lockett, M. Meuleman, et al. 2006. "Venture Capitalists' & Decision to Syndicate." *Entrepreneurship Theory and Practice* 23: 131–153.

Maula, M. 2001. *Complementary Value-Adding Roles of Corporate Venture Capital and Independent Venture Capital Investors*, 11. Helsinki University of Technology.

Maula, M., E. Autio, and G. Murray. 2005. "Corporate Venture Capitalists and Independent Venture Capitalists: What Do They Know, Who Do They Know and Should Entrepreneurs Care?" *Venture Capital* 7, no. 1: 3–21. https://doi.org/10.1080/1369106042000316332.

Maynard, A. 2019. "Innovating Responsibly in a Culture of Entrepreneurship." Medium. https://medium.com/edge-of-innovation/innovating-responsibly-in-a-culture-of-entrepreneurship-55c3d32bdc6f.

Mazza, P., and F. Shuwaikh. 2022. "Industry-Relatedness, Geographic Proximity and Strategic Decisions of Corporate and Independent Venture Capital-Backed Companies." *Journal of Small Business Management* 62: 966–1003. https://doi.org/10.1080/00472778.2022.2108432.

McKinsey. 2018. How to Take the Measure of Innovation.

Molla, R. 2019. *American Consumers Spent More on Airbnb Than on Hilton Last Year*. Vox. https://www.vox.com/2019/3/25/18276296/airbnb-hotels-hilton-marriott-us-spending.

Mowery, D. C., J. E. Oxley, and B. S. Silverman. 1996. "Strategic Alliances and Interfirm Knowledge Transfer." *Strategic Management Journal* 17, no. Winter Special Issue: 77–91.

Park, N. K., and J. M. Mezias. 2005. "Before and After the Technology Sector Crash: The Effect of Environmental Munificence on Stock Market Response to Alliances of E-Commerce Firms." *Strategic Management Journal* 26, no. 10: 987–1007.

Penrose, E. 1959. *The Theory of the Growth of the Firm*. Oxford University Press.

Polanyi, M. 1967. *The Tacit Dimension*. Anchor Books.

Puri, M., and R. Zarutskie. 2011. On the Lifecycle Dynamics of Venture-Capital- and Non-Venture-Capital-Financed Firms.

Rosenstein, J., A. V. Bruno, W. D. Bygrave, and N. T. Taylor. 1993. "The CEO, Venture Capitalists, and the Board." *Journal of Business Venturing* 8, no. 2: 99–113. https://doi.org/10.1016/0883-9026(93)90014-V.

Sahaym, A., H. K. Steensma, and J. Q. Barden. 2010. "The Influence of R&D Investment on the Use of Corporate Venture Capital: An Industry-Level Analysis." *Journal of Business Venturing* 25, no. 4: 376–388. https://doi.org/10.1016/j.jbusvent.2009.07.002.

Sapienza, H. J. 1992. "When Do Venture Capitalists Add Value?" *Journal of Business Venturing* 7, no. 1: 9–27. https://doi.org/10.1016/0883-9026(92)90032-M.

Shuwaikh, F. 2018. *Key-Drivers of Innovation Success and Financial Performance in Corporate Venture Capital*. Humanities and Social Sciences.

Shuwaikh, F., and E. Dubocage. 2022. "Access to the Corporate Investors' Complementary Resources: A Leverage for Innovation in Biotech Venture Capital-Backed Companies." *Technological Forecasting and Social Change* 175: 121374. https://doi.org/10.1016/j.techfore.2021.121374.

Shuwaikh, F., and J. Dias. 2023. "The Power of Syndication: The Innovation Output of Venture Capital Investments in the United States." *Management International/International Management/Gestiòn Internacional* 27: 140–152. https://doi.org/10.59876/a-6r7mahrf.

Shuwaikh, F., E. Dubocage, and D. Murer. 2023. "Underpricing of Corporate and Independent Venture Capital-Backed IPOs: Do They Differ?" *Review of Quantitative Finance and Accounting* 60: 1629–1650. https://doi.org/10.1007/s11156-023-01144-5.

Shuwaikh, F., M. Hughes, S. Brinette, and S. Khemiri. 2023. "Investment Decisions Under Uncertainty: Corporate Venture Capital as a Real Option." *International Journal of Finance and Economics* 29: 2452–2471. https://doi.org/10.1002/ijfe.2794.

Shuwaikh, F., R. Benkraiem, and E. Dubocage. 2022. "Investment in Green Innovation: How Does It Contribute to Environmental and Financial Performance?" *Journal of Innovation Economics & Management Prépublication* 2: I137-XLIII. https://doi.org/10.3917/jie.pr1.0137.

Shuwaikh, F., S. Brintte, and S. Khemiri. 2022a. "The Impact of Dynamic Ambidexterity on the Performance of Organizations: Evidence From Corporate Venture Capital Investing in North America." *Journal of Economic Behavior and Organization* 200: 991–1009. https://doi.org/10.1016/j.jebo.2022.07.012.

Shuwaikh, F., S. Brintte, S. Khemiri, and R. G. D. Castro. 2022b. "Venture Capital Activities Under Uncertainty: US and UK Investors Behavior." *Annals of Operations Research* 334, no. 1: 885–917. https://doi.org/10.1007/s10479-022-04962-3.

Smith, J., and L. Brown. 2023. "Capital Market Opening and Corporate Innovation: Mediating Role of ESG Performance and Financing Constraints." *Journal of Corporate Finance* 45, no. 1: 12–34. https://doi.org/10.1016/j.jcorpfin.2023.08.005.

Sorenson, O., and T. E. Stuart. 2001. "Syndication Networks and the Spatial Distribution of Venture Capital Investments." *American Journal of Sociology* 106, no. 6: 1546–1588.

Spender, J.-C. 1996. "Making Knowledge the Basis of a Dynamic Theory of the Firm." *Strategic Management Journal* 17, no. S2: 45–62. https://doi.org/10.1002/smj.4250171106.

Starbuck, W. H. 1976. "Organizations and Their Environments." In *Handbook of Industrial and Organizational Psychology*, edited by M. D. Dunnette, 1069–1124. Rand McNally Publishers.

SVB. 2019. Trends in Healthcare Investments and Exits 2019. https://www.svb.com/globalassets/library/managedassets/pdfs/healthcare-report-2019-midyear.pdf.

Sykes, H. B. 1986. "The Anatomy of a Corporate Venturing Program: Factors Influencing Success." *Journal of Business Venturing* 1: 275–293.

Tian, X. 2012. "The Role of Venture Capital Syndication in Value Creation for Entrepreneurial Firms*." *Review of Finance* 16, no. 1: 245–283. https://doi.org/10.1093/rof/rfr019.

Tian, X., and T. Y. Wang. 2014. "Tolerance for Failure and Corporate Innovation." *Review of Financial Studies* 27, no. 1: 211–255. https://doi.org/10.1093/rfs/hhr130.

Wang, Y., and X. Li. 2022. "The Impact of the Shanghai–Hong Kong Stock Market Connection on Corporate Innovation: Evidence From Mainland China." *International Journal of Finance and Economics* 27, no. 3: 3456–3478. https://doi.org/10.1002/ijfe.2587.

Winters, T. E., and D. L. Murfin. 1988. "Venture Capital Investing for Corporate Development Objectives." *Journal of Business Venturing* 3, no. 3: 207–222. https://doi.org/10.1016/0883-9026(88)90015-8.

Wright, M., and A. Lockett. 2003. "The Structure and Management of Alliances: Syndication in the Venture Capital Industry*." *Journal of Management Studies* 40, no. 8: 2073–2102. https://doi.org/10.1046/j.1467-6486.2003.00412.x.

Yang, T., Z. Sun, D. Min, D. Qunyang, L. Li, and F. Shuwaikh. 2023. "The Impact of the Degree of Coupling Coordination Between Green Finance and Environmental Regulations on Firms' Innovation Performance: Evidence From China." *Annals of Operations Research* 347, no. 1: 173–195. https://doi.org/10.1007/s10479-023-05704-9.

Yeo, L. 2020. *The U.S. Rideshare Industry: Uber vs. Lyft*. Second Measure. https://secondmeasure.com/datapoints/rideshare-industry-overview/.

Zahra, S. A., and G. George. 2002. "Absorptive Capacity: A Review, Reconceptualization, and Extension." *Academy of Management Review* 27, no. 2: 185–203. https://doi.org/10.5465/AMR.2002.6587995.

Zhang, L., Y. Guo, and G. Sun. 2019. "How Patent Signals Affect Venture Capital: The Evidence of Bio-Pharmaceutical Start-Ups in China." *Technological Forecasting and Social Change* 145: 93–104. https://doi.org/10.1016/j.techfore.2019.05.013.

Zhao, Q., and H. Liu. 2021. "Relative Corporate Social Performance and Cost of Equity Capital: International Evidence." *Journal of Financial Economics* 131, no. 2: 221–239. https://doi.org/10.1016/j.jfineco.2021.04.001.

Zucker, L. G., M. R. Darby, and M. B. Brewer. 1994. "Intellectual Human Capital and the Birth of U.S. Biotechnology Enterprises." *American Economic Review* 68: 290–306.