



Article

# Corporate Venture Capital and Sustainability

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**Abstract:** Corporate Venture Capital (CVC) has been receiving increasingly more attention all over the world as a special way for accessing new ideas and innovative opportunities through minor-share investing in established companies. The purpose of CVC investments may either be purely financial or to pursue strategic goals. Organisations often seek to take actions that impact positively on sustainability by assembling related knowledge and technologies. These resources may come from invested startups through the use of a CVC programme. This research aims to measure and analyse the Corporate Venture Capital programmes of companies listed in the ISE B3 Corporate Sustainability Index. To this end, a three-step methodology was conducted. First, a systematic review of the literature took place, followed by a review of companies based on secondary sources such as their websites. Finally, a survey was developed and was opted to survey companies through their Investor Relationship (IR) public channels. Results show that 27 of the companies listed in the ISE B3 Index have CVC programmes that contemplate organizational initiatives besides investment. In this sense, one can claim that at least 70% of the ISE B3 Index companies are somehow involved in CVC operations. The results contribute to the literature on corporate venture capital and sustainability by showing that companies spend from 10% to 15% of their capital in sustainable businesses in order to remain competitive.

**Keywords:** corporate venture capital; sustainability; startups; open innovation



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## 1. Introduction

The business world is rapidly digitising, breaking established barriers in the industry and creating opportunities and disrupting long-term successful business models [1]. In the last decades, the digital revolution has played a major role influencing industries, markets and the very behaviour of consumers [2]. Even organisations that have been operating for over a hundred years have engaged in adapting their business portfolio to try and respond to the rapid environmental changes [3].

In face of this reality, companies are required to develop mechanisms to keep themselves updated and remain competitive. They have thus found in corporate entrepreneurship an approach that encompasses every process used by medium and large-sized companies in the sense of innovating and rejuvenating businesses to achieve and maintain competitive superiority [4]. One of those initiatives is known as Corporate Venture Capital (CVC) [5].

However, one cannot discuss CVC initiatives without first addressing the main aspect on which it lays its foundations: innovation. In contemporary society, innovation is a vital aspect for countries to build up their competitive advantage and provide well-being for

their citizens [6]. The methods employed for promoting innovation in companies have been switched from an internal perspective to another one that surpasses the boundaries of the organisation. It happens now through Open Innovation (OI) [7].

### 1.1. Open Innovation

The main premise of OI lies in the fact that a company should either create and capture value using technologies that were developed by third parties, or publicise the technology developed by themselves. For corporations, the open innovation perspective and the possibility of establishing a relationship with the ventures has transformed the way in which knowledge is generated and developed. This is then used to accelerate the process of innovation, reducing development-related costs and increasing the overall impact of innovation [8]. Still, OI requires an extensive scale of methodologies that involve external sources of technologies, such as alliances and acquisitions, technological markets and CVC [9].

Prior to this OI perspective, innovation would usually be achieved by private or public investment in research and development companies [10]. OI researchers, on the other hand, claim that knowledge can be generated by distinct resources, which go beyond those offered by companies and the government [11].

A shift of paradigm from closed to open innovation is followed by a change in positioning regarding innovation, where the focus is no longer the company itself but the company's networks [12]. As the authors of [13] claim, OI requires, among other tactics, resource allocation for academic research. Decision makers are then encouraged to consider enrolling in postgraduation and continuous corporate learning courses [14]. Education and training can be considered as core aspects of an institutional policy for the advance of OI.

A single shift of paradigm, although a welcome one, is not sufficient for the advancement of open innovation by itself. An innovation system, as well as the conceptualization of a method for transferring knowledge, appear as the most relevant for advancing systemic innovation, which will further lead to CVC initiatives.

### 1.2. The National Innovation System and Knowledge Transfer

The National Innovation System (NIS), as defined by [15], is the network of institutions from the public and private sectors whose activities and interactions imitate, impact, modify and diffuse new technologies. It has been studied by academics such as in [16], who analysed how the NIS of a country can be influenced at a corporate level and by further changes in innovation practices.

The NIS approach emphasises the power of Knowledge Transfer (KT) [17]. During the era of closed innovation, most innovative businesses were reluctant in transferring knowledge, particularly outside their boundaries. Patents, for instance, have been considered as a main knowledge asset and were commonly regarded as “the crown's jewels”, rather than a method for transferring knowledge [18].

One can find a typical example of NIS in the triple helix involving university, industry and government. It can be much more effective when technologies that are not used in large organisations are commercialised through spin-offs, or when they become accessible to other companies through licensing. KT, therefore, is an important premise when it comes to implementing OI.

Knowledge can be considered, in this context, a fundamental resource, the main source of value for any type of organisation [19] and a strategically meaningful resource for a company [20]. Organisations might explore new and existing knowledge by exchanging it with other organisations [21].

Knowledge transfer, in this sense, has been a prolific topic in the literature. The paper by [22], for instance, developed a model to explain knowledge transfer among organisations from an analysis of relationships among companies participating in a CVC programme. The authors analysed 7 CVCs in Germany and claimed that it is possible to employ the model to draw insights from any kinds of interorganisational relationships.

There is, therefore, clear evidence of the relevance of knowledge transfer and an established innovation system when it comes to establishing innovation. There is still, however, a need to have a productive systemic innovation in place, along with a clear business ecosystem, for a CVC initiative to successfully take place.

### 1.3. Systemic Innovation and Business Ecosystems

When it comes to Open Innovation, one can say that there are two main denominations: Systemic Innovation (SI) and Autonomous Innovation (AI). The first type requires complimentary innovations so that its value can be perceived, while the second one can be developed separately [23]. SI has been drawing more attention due to recent cases of successful business and due to the world's economy steering towards sustainability [24,25]. Our study intends to analyse the CVC activities in listed companies that are known sustainable-oriented businesses.

The second requirement, Business Ecosystems (BE) [26], is a network of actors that encompasses institutions and companies. This network envelops a series of technologies, knowledge and competences that are shared. The network is expressed by cooperation and competition, with the goal of developing new products and services. Symbiosis, development platforms and coevolution are the three main factors within BE [27].

During the idea generation and conceptual development of an SI, new business models, rather than products and services, should be proposed. An innovative organisation must choose in which value network it will compete and determine which strategies it is going to employ should they join the BE [28]. In 1990, Cisco achieved a high growth rate by mapping and dominating network patterns through the acquisition of key actors in its BE [27].

There are two perspectives in which a company can pursue a BE relationship: vertical and horizontal. Some authors argue that vertical integration, which is the development and improvement of products and services inside their own line of business, is the best strategy [29]. However, Ref. [18] shows that the relationship between the degree of vertical integration and corporate performance yields a reverse U-shaped result, and it may create barriers for knowledge acquisition should it be excessively exploited.

## 2. Specific Context

Since the contextual and introductory concepts involving OI have been presented, we have opted to discuss in detail the characteristics and expectations involving CVC programmes as one of the possible strategies for OI. In this section, we address concepts, objectives, modes, historical evolution and examples of CVC.

### 2.1. On the Subject of Corporate Venture Capital

CVC consists in purchasing minor participation in already established companies, also known as incumbents, in their so-called ventures [30]. Corporate investors are usually drawn to financial and strategic advantages when they structure their CVC. Between both terms, the strategic goals are the ones considered the most important [31].

When an organisation addresses small innovative businesses through CVC, it is able to access external resources in a more rapid manner. It then becomes easier to develop their own resources. Another aspect that is worth pointing out is that organisations often hold portfolios composed of startups, thus investing small amounts of money in their businesses. It is then possible to have access to a lot of innovative businesses. In other words, the access is widened and the risk is mitigated [32–34].

Due to market dynamics, corporations ought to explore and work with new resources so that they can improve their competitiveness and create new ones. When an incumbent invests in startups, it has to absorb disruptive knowledge. If proven successful, new products can be developed, and the company can gain access to new markets [35,36].

Comparing CVC against other learning investments, such as joint ventures and strategic alliances, it seems to be characterized mainly by higher flexibility and lower risk [37]. In

this sense, it is the most appropriate strategy for companies to learn about new technologies with disruptive potential, especially in a context of market uncertainty [38].

## 2.2. The Objectives of CVC

Aside from financial objectives, CVC investments carry a variety of strategic implications. Particularly, CVCs programmes are carried out as an effective route for innovation. These programmes represent a form of external R&D that can stimulate innovation from corporate investors and promote the development of technologies and the establishment of new products [39].

Ref. [40] defines strategic goals as the implicit justification for the establishment of a CVC programme, while addressing the financial criteria is a necessary condition for its sustainability. The most cited strategic goals are: to identify opportunities for business and relationships; to open windows for new technologies and markets; to identify possible objects for acquisition; and to commercialize idle resources [41].

Still on strategic goals for CVC investments, Ref. [22] acknowledges at least four types of CVC investment: (1) driving: investment with strategic rationale and close ties between the startups and the investors; (2) enabling: investments that focus primarily on strategic motivations, while the operations of the invested company are not strongly linked to the investors' operation; (3) emergent: investment is strongly related to the operations of the investing company, while not so much attention is given to its strategy; and (4) passive: startups that are not linked to the operational capacities of the corporation and are not at all connected to the corporation's strategies.

The study by [42] involved a survey with 19 participant CVCs. Most of them, 42%, reported that the strategic goals are a priority. Financial goals were priority a for over 21%. The combination of financial and strategic goals was reported by 37% of the companies. Considering the set of 42% which prioritise strategy, 25% claimed to have also obtained financial goals. Therefore, one can consider that mixing strategic and financial goals may not be a good option. In another study [43] with German CVCs, the success of programmes focused specifically on either financial or strategic goals was pointed out. Hybrid approaches do not present interesting results.

Corporate investors are attractive partners for ventures, since the resources and marketing of incumbents can compensate for the ventures' marketing shortcomings and inabilities [44]. An organisation with wide marketing resources tends to be more able to identify how new knowledge produced in the venture can be effectively commercialized [45]. Consequently, the incumbent is more effective in helping the venture to commercialize its inventions [46].

The intensive experience in a specific industry can be more useful in the process of valuation of a venture [46]. On the one hand, there is an inversion between the topics of selection capacities and valuations. Diversity in the industry might enable the selection of better financial returns. On the other hand, the specificity of the industry can improve valuation.

Ref. [47] points out that there are two capacities that CVC units must have in order to generate value: (1) the capacity of selection that determines whether the CVC will choose companies that will generate short-term financial return and will deliver strategic results on the long term, and (2) the capacity of valuation that aids the CVC programme to determine a fair price for a participation in the business. Several studies have investigated how venture capitalists conduct their investment decisions [20].

## 2.3. Corporate Venture Capitalists, Independent Venture Capitalists and Syndication

Corporate investors either create investment portfolios [34] or co-invest along with Independent Venture Capitalists (IVC), as they usually are trusted regarding the quality of investment opportunities. This co-investment model is referred to as syndication. CVC investors conduct investments in syndicates more frequently than IVCs, who are more prone to investing with other IVCs [31].

The syndicates are one of the most familiar and significant forms of alliance in the venture capital industry [48]. It is analogous to a joint venture, in which two or more investors take part in an independent legal entity. The return offered is determined by the entity's performance. Syndicates share experience, possibly leading to better decisions regarding what and in whom to invest [49].

In their study, Ref. [50] showed that about 78.8% of the CVC programmes are prone to syndicate their investments. The goal of syndicates with IVCs is to diversify CVC portfolio [51]. Several studies compared the performance and outcome reached by IVCs against CVCs. Most of the studies employ the VentureXpert database, which is the most widely employed database in VC research, as it includes each VC investment since 1961 [52].

The work by [53] states that exclusively IVC-funded businesses yield lower postfunding innovation rates, while those funded by capable and influent CVCs present higher innovation rates. The IVCs are mainly interested in increasing investment values and subsequent capital gains, emphasizing the value chain of activities that do not necessarily include focus on innovation.

Ref. [54] raised a couple of questions. Among investments operated by IVCs and CVCs, which ones present the strongest entrepreneurial intensity? Their conclusions point towards IVCs. On the other hand, Ref. [55] states that CVCs and IVCs are complimentary, not mutually exclusive. Ref. [47] claims that the more CVCs programmes syndicate their investments, the less likely it is for the portfolio to reach an Initial Public Offering (IPO).

#### *2.4. History, Evolution and Examples of CVC*

Although recently associated with the new OI concept, CVC is not a recent topic. It has been discussed since the 1960s, and came in waves, following the same economic cycles, peaking in the late 1960s, in the 1980s and finally in the 1990s [56]. We are supposedly going through a fourth wave of CVCs [57]. Since the 1990s, the relevance of CVC programmes has been growing around the world. These programmes usually prospect business with high potential for return and growth [58].

In general terms, CVC investment increased 19% from USD 4.2 billion in 2017 to USD 5.1 billion in 2018. The owner of 13 unique investments in 2018, Baidu Venture, from China, was the most active CVC, followed by Intel Capital with 12 unique investments in the area of artificial intelligence, in 2018. By focusing on CVCs in the period between 2013 to 2018, considering digital and disruptive technologies, [54] studied the behaviour of the most active CVCs: Google Ventures, Intel Capital, Baidu Ventures, Legend Capital and Salesforce Ventures.

### **3. Research Gap**

According to what has been exposed so far, it is evident that companies explore and pursue strategic renovation through external initiatives such as CVC investment, strategic alliances and acquisitions [32]. While acquisitions and alliances have been extensively employed, the research on CVC is limited and has recently drawn increasingly more attention [31].

CVC programmes face resistance by some companies, in addition to limitations in research. Generally, big companies are better at maturing the resources that they already own than at exploring new resources, and they are more adapted to conduct incremental improvements in existing technologies than exploring new discoveries [59].

Furthermore, it is necessary to construct a thorough governance when it comes to ventures, as they may threaten traditional businesses from the investing incumbents, and therefore, demand ambidextrous management. In reality, ventures can offer companies opportunities to construct new and distinct potentialities. If these are successful, they can explore, support, expand and even threaten the feasibility of current corporate capacities.

Another aspect that comes to attention when analysing CVC programmes is the nature of the investment-seeking companies. There are several strategies for OI and in this paper, we focus on analysing one of them, namely CVC. The main research question that we



intend to answer is whether companies that are recognised by their actions in sustainability have opted for CVC programmes as a strategy for OI. Thus, in the following sections, we discuss the issue of corporate ambidexterity, as well as the types of companies that historically have adopted CVC.

### 3.1. Corporate Ambidexterity

An issue regarding CVCs is that the pursuit of new competences may prematurely cannibalize the returns of existing competences [60]. Incumbent companies usually resist exploratory initiatives that threaten to alter their resources and lead them towards distinct purposes [61,62], while companies with few resources, such as ventures, have a lot less to lose and to protect, therefore earning more when conducting exploratory initiatives [63].

The concept of dynamic capacity, introduced by [64], determines the readiness of a company to integrate, develop and reorganise the internal resources of a set of externally-acquired competences. This aims to make the company better to face a scenario of inconsistency. Companies, therefore, ought to work with their own resources to become more competent at what they already do through incremental innovation. Furthermore, companies must explore markets and new technologies with the purpose of generating radical innovation.

This strategy, that involves a blend of the exploitation and exploration approaches, is usually known as ambidexterity [65]. Exploitation when it comes to maturing what the company has already produced, while exploration refers to exploring the unknown and developing new technologies, products and services. Companies that manage to balance efficiently and pursue both exploitation and exploration activities are referred to as ambidextrous. Ref. [2] claims that, from the corporate organisation's point of view, the capacity of becoming ambidextrous is strongly related to the dynamic capacities of a company.

This combined attention to actors both inside and outside of the company's boundaries enable the CVC unit to simultaneously use existing capacities while constructing new ones. Thus, through an ambidextrous orientation, the CVC unit is able to coordinate and legitimise its activities, enabling it to have better chances to pursue a continuous role as part of the investing company.

Thus, CVC units need to work with ambidextrous orientation [66]. Even if CVC devices are profit-oriented, their main scope is to provide information regarding possibilities and opportunities that may sustain investing companies in the sense of exploiting what already exists and exploring new resources.

### 3.2. Types of Companies and Adherence to CVC

In their study, Ref. [22] claimed that 50% of every CVC investment is employed in three sectors. The information technology (IT) sector claims first place with 23% of overall investment, followed by Communication Technology (CT) with around 17% of invested capital. Biotechnology and biochemistry come third with 10%. An industry that is routinely conducting CVC investments is the pharmaceutical one [31], which also is responsible for patenting technologies [67] and creating products that are highly regulated [68]. This explains the extensive amount of CVCs and studies of innovation management currently addressing the pharmaceutical industry [69].

The disruptive technologies, under the entrepreneurial and technical point of view, have drawn more attention from academic researchers since the 2000s. There are not many studies, however, that seek to investigate the relationship among disruptive technologies, corporate investors and invested startups. According to [70], digital transformation is only at its beginning. Several opportunities are still being created based on data management, connectivity and processing power. Companies will then be able to develop innovative products and services, increase their operational efficiency and perfect and create new business models.

Ref. [37] studied a sample of companies involved in high-technology industries in the United States of America. Since most high-tech companies face a greater level of uncertainty

in comparison with traditional industry, one can assume that such companies have more incentives to attempt exploratory learning through CVC investing.

### 3.3. Sustainability

Although regulation has demanded companies to become involved with ecological activities [71], actions of ecological responsibility are also required by their stakeholders. According to [72], there are three main reasons for companies to seek environmentally favourable actions: competitiveness, legitimisation and ecological responsibility. Apart from that, the search for sustainable companies has also been demanded by venture capitalists [73].

For [74], cleantech is a sort of product, service or process that works with nonrenewable resources adequately, or which generates less pollution than conventional solutions. It is therefore related to four main sectors: energy, transportation, water and materials [75].

It is quite common that clean techs demand higher upkeep. Moreover, due to being restricted to limited markets due to their reach, validating their products and services is a challenging task. This is the period of time which encompasses the so-called Valley of Death in the startup world, which is the most attractive for venture capitalists [76].

Ref. [77] developed a study in which they question which are the CVCs that are currently engaged with sustainable startups and what their reasoning is. CVC investments in cleantech startups are growing [78]. Ref. [79] examined the CVC programmes of four major electricity operations in Europe (E.ON, EDF, Enel and Iberdrola). Eight out of ten of the greatest electrical companies in Europe stated that open innovation is a part of their strategy. Nine out of ten are operating CVC funds (or somehow funding startups). CVC particularly fits in industries that are in the midst of rapid change, such as the energy market.

## 4. Research Objectives

The objective of this paper is to provide a measure of the rate and quality of the CVC programmes from Brazilian companies listed in the ISE B3, Brazil's stock market. The quality of a CVC programme can be measured by a few criteria, such as knowledge-based sharing among investing companies and their investor and the degree of autonomy of a CVC programme, among other measures.

When it comes to autonomy, the study by [80] employed four dimensions to evaluate this aspect of CVC programmes: (1) the source of funding, (2) its objectives, (3) the staff and (4) the management process. The objective was to examine the influence of autonomy, incentive schemes and monitoring of a CVC initiative on the flow among corporate investors and companies in its portfolio. It was possible to determine the influence of the degree of innovation from the corporate investor and the performance of companies in its portfolio. It was then possible to measure the impact of the innovation degree of the corporate investor and the performance of companies in the portfolio. The conclusions found a positive relationship between autonomy and innovation in the corporate investor.

CVC seems to be a valuable approach for seeking technologies and opportunities for business [80]. However, companies that do not display the capacity of absorbing technologies and combining them with current knowledge base can have limited benefits. On the other hand, companies that already present a satisfying performance in R&D activities may obtain a wide variety of competences related to identifying and recombining knowledge.

CVC is often complex, and demands a broad scope of experience, taking into account the target and the original companies. As most investors lack experience, it is difficult for CVC investors to engage in this new activity. This is intensified by the lack of historical references. For [47], the CVC experience characteristics—the intensity, diversity and acquisition experience—are fundamental to build important capacities which will have the potential of improving the chances of success of a CVC programme.

In uncertain environments, results are hard to predict, and cause and effect relationship inferences are even more difficult to be drawn. In regard to CVC investments, early-stage companies are the riskiest when compared with late-stage ones. This is due to the fact that

they are at the beginning and have not yet reached critical validation milestones. In this sense, it is perilous to claim that a startup with good performance in its early stage will be able to sustain it throughout the next stages [47].

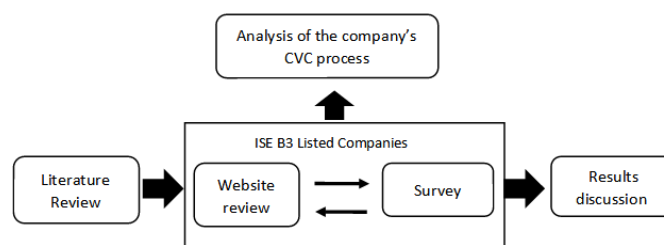
## 5. Research Structure

This paper presents nine sections. Sections 2–4 provide a literature review focusing on corporate venture capital research gap and objectives. Section 6 is about this research's methodology. Section 7 discusses the results, and Section 8 presents the conclusions and contributions of this paper.

## 6. Material and Methods

### 6.1. Sample Definition

In order to achieve our objective, we opted to conduct exploratory research. It was deemed most appropriate in the sense that it provides the opportunity to perceive the characteristics of a phenomenon before searching for explanations regarding cause and effect. Ref. [79] developed this three-step methodology, described in detail in Figure 1, which we adapted to our research.



**Figure 1.** Research Steps.

### 6.2. First Stage: Literature Review

The first stage involved a systematic review of the literature. We have employed both bibliographies as well as bibliometric analyses. These complementary methods are used to obtain most of the current literature before a more costly field investigation [27].

Three selection criteria were defined for this stage:

- Database definition, so that scientific papers from main journals were considered, all of them rated by the Scopus, Science Direct and Web of Science databases.
- Keyword search: The terms “Corporate venture capital” and “Sustainability” were screened in title, abstract and keywords, encompassing the periods ranging from 2005 to 2021.
- Content analysis by identifying key concepts such as corporate venture capital and sustainability.

As a result of this process, the final sample consists of 20 articles published from 2009 to 2021, in 17 scientific journals. Table A1 displays the number of publications by year and journal (see Appendix A).

### 6.3. Second Stage: Company Website Review

The second stage of the research consisted in collecting public data from the companies' websites. We then opted to analyse and compare distinct CVC operations regarding their main characteristics. This was seen in [79], which claimed that the use of multicase studies from distinct companies allows for a holistic view of CVC due to the possibility of finding patterns.

We focused exclusively on a sample of companies listed in the B3 ISE sustainability index in 2021. According to their website, there are 39 listed companies that fulfil this requirement, from distinct sectors. In total, 11 are from electricity and energy, 5 from services and sales, 6 from finance and banking, 8 from processing industry, 3 from construction and infrastructure, 2 from investment, 2 from communications, 1 from healthcare and 1 from car rental activities.



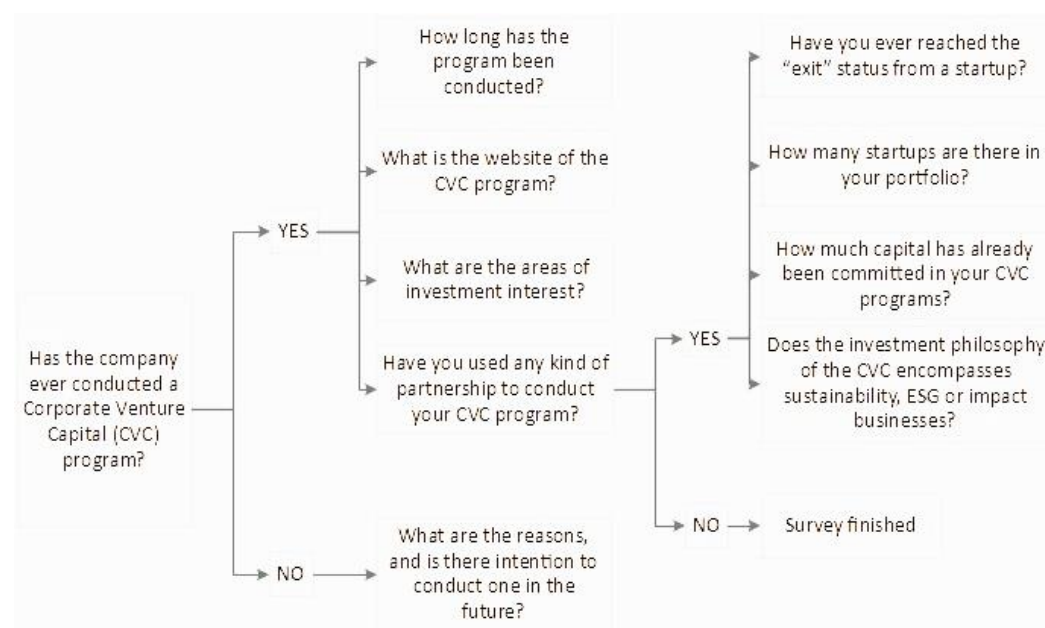
Apart from the website review, we gathered information from secondary sources, such as annual reports, dissertations and journal reviews in the areas of administration, investment and sustainability. Official websites were also screened for data regarding the promotion and incentive of corporate venture capital, tools for its application and the determination of areas in which they are more prone to investing in the future.

#### 6.4. Third Stage: Survey

The third stage consists of a survey, which was sent to the 39 companies taking part in our study. We considered it relevant to try to gather this information straight from the studied companies to provide a clear basis for exploration. However, due to the low response rate, it was decided not to use survey data from any company.

The survey was composed of 10 questions in order to gather quantitative data about CVC programmes, investments and diversity of stages, their areas of development, company performance, programme website, partnerships and startup work and investment encompassing sustainability, Environmental, Social and Governance (ESG) aspects, or impact businesses.

Considering the study by [22], four dimensions were employed to evaluate the autonomy of a CVC programme: the funding source, funding objective, staffing and decision-making process, in order to determine the autonomy and measure the rate of innovation of the corporate investor and the companies' performance. This was the basis upon which our survey was built. Figure 2 summarises the survey's questions.



**Figure 2.** Survey summary.

#### 6.5. Variable Definition

Using our final sample, the 39 ISE B3-listed companies, an analysis of the main components was conducted, as described below:

The importance of financial goals and strategic goals: search and collection of information regarding financial and organisational goals according to their purpose.

Investment value criterion: related to the investment decisions according to the company's priorities.

Decision-making autonomy: used as an indicator of independence of the CVC unit, according to (a) funding source, (b) investment goal, (c) staffing and (d) decision-making process.

Financial commitment: determines the long-term commitment to the conduction of the investment. This is important, as it measures financial results and involves two main

categories: (a) a clearly defined fund or free to access that contemplates a long-term time frame or (b) no clear definition of the fund, or even, no financial manners contemplating a long-term time frame.

Success stories: used as a measure of performance, or success rate, to determine whether the companies have had any successful cases in their programme.

Financial success: refers to the amount contributed to the programme.

## 7. Results Discussion

We have opted to survey companies through their Investor Relationship (IR) public channels. Due to the low response rate, it was decided not to use survey data from any company. Cielo [81] was one of the companies that stated that they had no CVC initiatives to be noted. Nonetheless, there is an M&A area which conducts periodic market studies related to its core business. Lojas Americanas S.A [82] is another company that also employs CVC, however, with a subsidiary called IF Capital, which is responsible for M&A operations. It is possible to argue that companies are generally more acquainted with M&A than CVC.

Copel [83] claimed to conduct a CVC initiative, called Copel Volt, which has been operating for six months. Their investment thesis encompasses the energy tech sector exclusively. The operation was supported by a partner company. Since the programme is quite recent, there has yet to be an exit. The initial investment value is BRL 1.5 million. There are no startups in their portfolio. CPFL [84], however, also operating in the electricity sector, maintains open innovation programmes and does not possess any ongoing CVC operations.

EDP Ventures [85], from Energias BR, is considered the first Venture capital vehicle in the Brazilian electricity sector, with over BRL 30 million in investment funds. EDP registered one case of investment union, in the startup Delfos, which operates in the predictive maintenance of power generation units. EDP has operated as a leader investor, being responsible for the greatest share of capital. They have also participated in the BMG investments of Uptech and Bossa Nova Investimentos.

Among the companies that currently possess ongoing CVC programmes, the strategic goals are evidenced in the investment philosophy which focuses on areas that are closely related to their core business. Thus, just as Copel possesses a newly developed programme, AES Brasil [86], a company that operates in the electricity business, invests in energy projects related to the Internet of Things, Energy Storage, Energy efficiency, Distributed Generation and Electrical Vehicles. On the other hand, some companies seek to widen their portfolio in terms of diversity, and thus seek entrepreneurial initiatives that reach outside the borders of their core businesses. Such is the case of Lojas Renner [87], which prospects startups that develop sustainable solutions, focus on Industry 4.0, energy, circular economy, construction, logistics and retail.

Some companies present in their CVC initiatives more than one line of incentive. Bradesco, for instance, owns two startup investment funds. InovaBra-I follows the line of algorithms, machines and applications, digital platforms and infrastructure. InovaSeg bets on companies related to insurtech, healthtech, data analytics, big data, digital connectivity and cybersecurity. InovaBra-I manages over BRL 200 million and seeks investment opportunities from over BRL 10 million, focused mainly in Series A and B investment rounds. InovaSeg manages over BRL 150 million in funds and seeks startups in lesser states of maturity, with investment values ranging from BRL 3 million to BRL 20 million [88].

In some cases, it is not clear whether the innovative initiative is actually a CVC programme, or a specific OI strategy. For instance, BRF [89] states that it keeps a hub which involves partnerships with startups and universities. It is an OI programme, with no resemblance to a CVC project. Ecorodovias [90] also publicizes a few initiatives of interaction with universities. Through OI projects, and partnerships with Faculdade de Informática e Administração Paulista (FIAP), from São Paulo, Brazil, the organisation seeks solutions in the market for their challenges, coming closer to entrepreneurs and generating business for speeding up innovation.

Santander [91] reported two stimuli programmes. The first one contemplates university students and initial entrepreneurs who have an entrepreneurial profile and are engaged in assembling teams for startups. The students receive a scholarship of about BRL 2.000 for six months to face challenges similar to the ones found by Santander. The second programme is directed to startups and scale-ups which have interest in cocreating solutions along with the bank.

Moreover, in the finance sector, Itaú Unibanco's CVC, managed by Kinea, a fund investment company which belongs to the holding, recently announced a BRL 6 million investment in a Series A round on Monkey Exchange, the biggest marketplace of receivables in Latin America. The CVC fund was created with the goal of generating value for the bank through minority investing in startups in the financial services and technology sectors [92].

A company that surpasses the others in terms of CVC is Banco BTGP. The boostLAB, its CVC programme, acts under several pillars. It has accelerated over 40 startups and has conducted businesses with over 70% of them [93]. Besides investing, boostLAB is also a business hub for BTG Pactual with tech companies. They offer several financial products to startups, such as: currency exchange, venture debt, funding, receivables anticipation, fundraising mandates and M&A. Another discovery is the fact that some companies possess an exclusive area for investments involving Private Equity instead of CVC, as is the case with CCR.

Another common initiative of some companies is advancing innovative entrepreneurship through financial incentives, without holding equity in startups. They are incentives with small amounts of capital as a means of increasing the value of entrepreneurship initiatives. In some situations, these incentives are a part of contests and are prizes in hackathons. Eletrobras [94] is another company that reported similar initiatives. A common procedure, for some companies, are the so-called pitch days, innovation programmes that focus on solving the most diverse challenges. Light S/A has conducted, to this day, eight pitch days, including the sustainability pitch day, which seeks partnerships for the correct disposal of residues used in the paper industry [95].

Dexco, formerly Duratex, created a CVC fund for investing in startups and scale-ups in multiple stages. Their initial funding starts at BRL 100 million. One of the recently funded companies was Noah Wood Building Design, which is focused on sustainable construction. Noah is a construtech which acts in the development of real estate business for the construction of commercial buildings. The investment brings Dexco closer to the ESG criterion [96].

Considering sustainability actions, the company Weg conducts an initiative for advancing the use of sustainable casing for electric engines. Their investment philosophy encompasses electric traction, renewable energies, energy efficiency, building and infrastructure, product sensors, failure diagnosis, connected products and energy accumulators [97].

Still considering sustainability-related issues, the business of protein production out of vegetables has drawn attention from several investing players. Marfrig, a known rival of Minerva, created a joint venture called Plant Plus in a partnership with the Archer-Daniels-Midland Company for the production of plant-based meat. In Brazil, a noticeable startup that follows this purpose is Fazenda Futuro, which has received BRL 115 million in funds from the investment round led by BTG Pactual [98].

To summarise, from the 39 companies that take part in B3 ISE sustainability index (2021 year base), Brazil's official stock market, according to the research involving public information as well as information given by the companies, 27 of them presented, in some degree, a CVC programme. In this sense, one can claim that at least 70% of the companies are somehow involved in CVC operations.

Our research has brought significant results, which are here summarised and further explored in this section:

- Generally, companies are more accustomed to M&A practices and private equity than CVC practices. Investing in early-stage companies is still unthinkable for many corporations.

- Although a CVC aims at either financial or strategic goals, the second option appears with more significance. This is proven by the companies' investment theses that are more prone to focus on the core activities of a business.
- Only a few companies have demonstrated varied strategies in a single CVC programme which holds more than one investment fund. Most companies are focused on a single investment vehicle that best represents the main thesis of the company.
- In a few cases, it is hard to determine whether the company actually owns a CVC programme, or if it is just an alternate corporate venturing practice that does not necessarily predict investing in startups.
- At least 70% of ISE B3-listed companies own, to a certain level, a CVC programme.
- Despite the extensive number of ISE B3-listed companies that started adopting CVC programmes in Brazil, their intensity is still low when compared with the average values of large companies not listed in the same index.
- The number of companies that have chosen to externalise their research and development activities through CVC is growing.

The significance and relevance of implementing steps connected to a commitment to sustainability and market value is well-known. Launched in 1999 by the New York Stock Exchange, the Dow Jones Sustainability Index (DJSI) was the first one to address sustainability [99]. On the other hand, considering emerging economies, the first recorded index was set in motion in Johannesburg, South Africa, in 2004. Moreover, in Brazil, the ISE (Corporate Sustainability Index) was the first sustainability index ever recorded to focus on sustainability.

Considering the limited appearances of CVC and sustainability studies, this discussion advances in terms of benefits and importance of CVC programmes and fundings already identified and analysed. Ref. [52] states that of the 508 projects, 271 (53%) received CVC funding. The percentage of projects financed by CVC was higher than in previous studies because its unit of analysis was at the level of new ventures. Thus, a similar rate of occurrences of the participation of resources from CVC can be seen.

Ref. [53] states that for the number of transactions and the corresponding invested amounts for each investment round, it is first verified that, in 2019, CVCs carried out 327, for a total value of approximately USD 14 billion, with some of the listed companies being Google Ventures, Comcast Ventures, Salesforces Ventures, Cisco Investments, Johnson & Johnson Innovation, GE Ventures, Dell Technologies Capital and Amazon Alexa Fund.

Ref. [100] displayed the relationship between disruptive technologies and CVCs. The study considered two distinct methods for developing the process of technological innovation: internal and external strategies. The traditional strategy recommends internalising R&D to maintain competitive advantage. However, examples from Silicon Valley, which can be considered a mature innovative entrepreneurial ecosystem, point in the direction that most of the companies, especially the most successful and technological ones, opt to externalise their research department through CVC.

Through CVC, companies can rapidly increase their rate of innovation, enabling access to new knowledge from the ventures and thus avoiding high R&D costs [39]. Ref. [101] investigated how the resources and competitive environment of an incumbent company, either alone or combined, influenced the motivations and opportunities to generate new partnerships involving CVC.

Ref. [102] carried out a study with 20 CVC programmes. For a CVC, the financial and strategic goals are considered, as well as access to new technologies. In a study by [40], it was found that for 65% of CVC programmes, the strategic goals are considered as essential. The study by [54] displays the extent of CVC growth. In 2018, there was a record in the average of investment carried out through CVC. There were over USD 26.3 million. The previous record was in 2015, of over USD 24.1 million. Additionally, in 2018, 264 new CVC programmes launched, 35% more than previously observed in 2017.

It is worth pointing out that some industrial segments are more prone to explore CVC than others. For instance, in the study by [101], 84% of the companies did not conduct any CVC investments. One of the reasons for this is that incumbents which operate in

dynamic environments are under more pressure than others. Organisations that act in rapidly changing technological environments and highly competitive areas are more prone to become involved in CVC activities [102].

There are some problems usually reported in the literature when it comes to relating venture capital and sustainability. Venture capital investors possess a natural resistance to long periods of development and the intensive capital nature of clean techs [103]. Investors are also frightened of being exposed to government regulations, which are unstable and carry an unfavourable history [104].

Great opportunity lies in linking CVC with companies that are engaged with sustainability, those who adhered to sustainability indices and those who aim at digitisation and coming closer to startups. Companies that are invested via CVC can solve real-life problems, open up new channels and bring innovation to the topic of sustainability.

## 8. Concluding Remarks

Although we are currently living in a so-called fourth wave of CVC worldwide, when it comes to Brazil, the subject is still viewed as a new topic. EDP, as an example, which owns the first CVC initiative in the electrical sector, was conducted in 2018. BoostLAB, from *BTG Pactual* was elected twice in a row, in 2019 and 2020, by the *Global Finance* magazine as one of the 25 best financial innovation centres in the world, as a single representative from Brazil. In a certain way, CVC initiatives have taken place in the last five years.

If, on the one hand, at least 70% of the companies present some kind of initiative-related CVC programme, on the other hand, one cannot deny that most of them present an evident orientation towards OI. One can perceive that companies consider the importance of relating with small and innovative businesses, so that they may be able to obtain strategic benefits from the relationship.

Several companies reported the importance of coming closer to universities, research and technology centres. Some have even claimed to conduct programmes along with professors and undergraduate students. One must notice, however, that this research, initially based on a survey sent to the investment relationship area of organisations, resulted in few participants, even though the companies were clearly informed that the survey had academic purposes.

One of the goals of this paper was to relate CVC initiatives with known companies by the degree of importance given to sustainability. In this sense, however, few of them actually point directly or indirectly to sustainability activities as a goal for corporate investments. Around 10 to 15% of them state effectively sustainable initiatives as results of corporate investment programmes.

Considering the elementary characteristics of CVC, such as investment thesis, most companies still lack maturity in exposing their programmes publicly. Few companies give their CVC programmes a specific website. It is unusual to find detailed information about which areas the CVC seeks to address, as well as the average funding values, portfolio specification and stage of the prospective startups. Thus, in some cases, it was difficult to perceive whether the company owned an actual CVC programme or just an Open Innovation initiative.

Given that CVC programmes have often been launched in Brazil by well-established organisations, one can notice a clear variation in both the degrees of maturity and activity of corporate venturing. There are several models that range from simple boosting programmes for new businesses and ideas to mature structures with well-structured venture investment vehicles.

It is unusual for a large organisation not to have any relationship with startups, even if still at an early stage. On the other hand, when comparing with developed economies, corporate venturing is still a subject to be cultivated in Brazil. Thus, large and medium-sized enterprises may be able to benefit from this strategy that supports the practices that have already been tested regarding research and development.



This study is not without limitations. The coverage of the survey, as well as the chosen methodology, were obvious limitations of this paper, since the results are mainly based on exploratory analyses of the companies' websites. Therefore, for future research, we recommend the analysis of Brazilian companies not listed in B3. We also recommend the study of databases organised by companies and institutions, such as Thomsom VentureXpert.

Brazil's official stock exchange, B3, currently owns three sustainability indices: Efficient Carbon Index (ICO2 B3), GPTW B3 Index (IGPTW B3) and Corporate Sustainability Index (ISE B3). This paper focused exclusively on the ISE B3 Index. A comparative analysis among the other indices as to the degree of activity related to Corporate Venturing would aid in widening the range of this research.

Future studies would also benefit from performing analyses of the intensity of CVC programmes in other companies that belong to broader indices, such as B3's Bovespa Index. A question to be answered in future studies is whether ISE B3-listed companies perform corporate investment on startups to a more intensive degree when compared with organisations that compose the Bovespa Index, for example.

Furthermore, one should notice that there are several CVC models in the market. A CVC can be structured as a business unit or to represent an independent business with its own identity. Additionally, a CVC may allow the participation of an independent VC as a partner. Future studies could aim to understand the model that each organisation is using and draw insights from their comparison. Measuring the financial and strategic performance of the CVC models adopted could be an interesting path to be pursued.

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## Appendix A

**Table A1.** Number of publications by year and journal.

Journal	Documents	Document Title	Topics	Cites (Scopus, July 2022)	Year
Journal of Business Venturing	2	Developing the selection and valuation capabilities through learning: The case of corporate venture capital	Analysis of 2110 cases of VenureXpert's CVC investments measuring the impact of the intensity of experience of the development of activities.	160	2009
		Towards understanding who makes corporate venture capital investments and why	Analysis of 477 established companies deciding to participate in CVC in technology and marketing issues.	253	2011
Strategic Entrepreneurship Journal	2	An empirical test of the relational view in the context of corporate venture capital	Analysis of a CVC investment relationship model based on knowledge sharing and through a process of income generation.	44	2011
		The selection and nurturing effects of corporate investors on new venture innovativeness	Studied the influences of investors on new venture funding that affect the selection of opportunities.	81	2016
Technological Forecasting and Social Change	2	Exploring the impact of open innovation on national systems of innovation—A theoretical analysis	Studied the impact of open innovation based on national analytical approaches to improve its effectiveness.	174	2011
		Fuzzy front end of systemic innovations: A conceptual framework based on a systematic literature review	Reviewed the fuzzy front-end stage of systemic innovation, ranging from mapping and strategic planning.	76	2012
Business Process Management Journal	1	To invest or to harvest? Corporate venture capital ambidexterity for exploiting/exploring innovation in technological business	Carried out on 18 CVC companies to determine ambidexterity; all companies dedicated to the technological area.	17	2020
Electricity Journal	1	Corporate venture capital programs of European electric utilities: Motives, trends, strategies and challenges	Conducted on 4 large European public companies seeking CVC programme methodologies.	17	2017
Entrepreneurship: Theory and Practice	1	Organizational Aspirations and External Venturing: The Contingency of Entrepreneurial Orientation	Developed the influence of capital-based entrepreneurial orientation.	35	2020
Industry and Innovation	1	Technological Diversification Through Corporate Venture Capital Investments: Creating Various Options to Strengthen Dynamic Capabilities	Research on the relationship between CSV and technological diversification of 5 high-tech industries.	75	2015
International Journal of Innovation Management	1	Reconciling competing institutional logics in corporate venture capital units	Studied 20 CVC units and developed an analysis of organisational structure.	4	2020
International Studies of Management and Organization	1	Social capital and knowledge relatedness as promoters of organizational performance: An explorative study of corporate venture capital activity	Study of the theory of social capital with the vision of the knowledge-based company.	33	2010
Jmm International Journal on Media Management	1	Strategic Media Venturing: Corporate Venture Capital Approaches of TIME Incumbents	A study of 68 companies dedicated to the area of telecommunications, electronics and information technology was carried out to review the differences and similarities of venture capital	33	2017
Journal of Business Research	1	When corporations get disruptive, the disruptive get corporate: Financing disruptive technologies through corporate venture capital	Developed the role of the CVC in the support of digital technologies to analyse financial strategies for new ventures.	21	2020
Journal of Cleaner Production	1	Why do they do it? Corporate venture capital investments in cleantech startups	Covered the study of 26 case studies of companies that invested in cleantech start-up companies	17	2021

Table A1. Cont.

Journal	Documents	Document Title	Topics	Cites (Scopus, July 2022)	Year
Journal of Knowledge Management	1	Knowledge management behaviors in venture capital crossroads: a comparison between IVC and CVC ambidexterity	Researched the ambidextrous development of CVC on the 15 most active IVCs in the 2019 management, focusing on their organisation and financial objectives.	24	2020
Journal of Management	1	Ambidexterity and Survival in Corporate Venture Units	Conducted a study on why some units succeed or fail in 95 ambidextrous development VC units.	413	2014
Management Research Review	1	Bilateral inter-organizational learning in corporate venture capital activity: Governance characteristics, knowledge transfer, and performance	Analysed 232 VC investments to investigate the impact of governance characteristics and bilateral learning between organisations.	46	2012
Managerial and Decision Economics	1	Two's company, three's a crowd: The impact of corporate venture capital unit's investment partners on the corporate investor's innovation performance	Studied the relationship between the CVC venture capital unit and traditional venture capital VCs.	0	2021
Venture Capital	1	Corporate venture capital organizations in Germany	Analysed 20 German CVC organisations and compared with U.S. and European CVC firms	50	2005

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