Venturing into sustainability: The impact of CVC on environmental and financial performance

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Abstract

In this dissertation I investigate the impact of corporate venture capital (CVC) on corporate investors' environmental and financial performance. Against the theoretical backdrop of Resource Based View, I find that a larger CVC portfolio has a positive effect on environmental scores of 0.18 points per venture. I also find that green CVC investors, i.e CVCs with at least one green startup in their portfolios, exhibit a 5.68 points higher environmental score and a 2.04 percentage point higher ROA, compared to traditional CVC investors. The sample consists of 75 U.S. firms with CVC activity between 2002-2022.

Keywords: corporate venture capital; environmental performance; financial performance; resource based view

Sumário Executivo

Nesta dissertação investigo o impacto de programas de capital de risco corporativo (CRC) no desempenho ambiental e financeiro dos investidores corporativos. No pano teórico da Visão Baseada em Recursos, concluo que uma carteira de investimentos CRC maior tem um efeito positivo na performance ambiental de 0.18 pontos por empresa investida. Também concluo que investidores CRC verdes, i.e investidores CRC com pelo menos uma *start-up* verde nos seus portfólios, demonstram pontuações ambientais superiores em 5.68 pontos e um Retorno sobre Ativos superior em 2.04 pontos percentuais quando comparados com investidores CRC tradicionais. A amostra consiste em 75 empresas americanas com atividade em CRC entre 2002 e 2022.

Palavras-chave: capital de risco corporativo, desempenho ambiental, desempenho financeiro, visão baseada em recursos

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Para a minha mãe. Espero que te orgulhe.

Para o meu pai. Obrigado por seres tudo.

1. Introduction

In this paper, I firstly study the effect of corporate venture capital (CVC) activity on the environmental and financial performance of 75 firms based in the United States (U.S.). I investigate the effect of the size of the corporate investor's investment portfolio and its environmental performance and find a positive relationship. Secondly, I rely on a green CVC binary variable in order to grasp the differences in performance between green (i.e firms that have at least one green startup in their investment portfolio) and traditional CVC investors (i.e firms that do not have green investments in their portfolios). I find that, on average, green investors have both superior environmental (measured by environmental scores) and short-term financial performance (measured via ROA).

Corporate venture capital refers to equity investments made by non-financial corporations in entrepreneurial ventures (Dushnitsky & Lenox, 2006; Wadhwa et al., 2016)**,** typically used by incumbents to absorb new knowledge and access new technologies (Da Gbadji et al., 2015). Resource based view (RBV), a theoretical framework used in management studies to analyse the strategic competitive position of firms poses, in its original form, that differences in performance across firms stem from competitive advantages gained through the heterogeneity in access to human, physical and capital resources (Barney, 1991; Wernerfelt, 1984). More recent approaches of the theory call for the inclusion of social and environmental factors as firm performance determinants (Pereira & Bamel, 2021), with Battisti et al. (2022) proposing, under RBV, that corporate venture capital is a valuable mean for firms to gain access to knowledge and new technologies that may translate to superior firm performance. The authors find that CVC investors have superior environmental and social outcomes than firms without CVC programs. On green innovation literature, Bendig et al. (2022) take an intra-CVC approach to find that a higher number of investments in green startups (green CVC) is positively associated with corporate investors' green innovation output. Under RBV, this result indicates that incumbents can leverage green CVC to access untapped technologies, and hence benefit from a new competitive advantage in their environmental outcomes.

Combining the notion that CVC is used as an innovation mechanism with the current strands of RBV literature, I investigate whether the increased innovation output stemming from green CVC translates to superior environmental outcomes. Against this backdrop, if firms are actually yielding

a sustainable competitive advantage from corporate venture capital, under RBV their firm performance should also see an improvement. I choose to investigate this relationship using ROA, as a proxy for short-term financial performance, and Tobin's Q as a measure for both short and long-term financial performance. This research also contributes to the literature on the interplay between environmental and financial performance. The academic discussion on the topic seems to hinge on the existence of a short-term financial cost in improving environmental performance found, for example, by Hoang et al. (2020) and Horváthová (2012). By using both short term and long term measures for financial performance, I am also able to contribute in this regard. Most recently, Benkraiem et al. (2023) find a positive association between environmental and financial performance in an intra-CVC sample using greenhouse gas emissions as the measure for environmental performance. Furthermore, the authors find a positive relationship between green innovation and financial performance. This result provides further evidence for the strategic importance of CVC programs in innovation practices.

In sum, I propose to analyze, under the theoretical framework of RBV with a sample of active CVC investors, the difference between traditional and green corporate investors regarding environmental and financial performance as well as the effect of investment amounts through CVC programs on corporate investors' environmental performance.

The remainder of the paper is structured as follows. In Section 2, I present a review of the relevant literature and develop the hypotheses. Section 3 describes data collection and presents both the methodology and variables used to test said hypotheses. Section 4 presents and analyzes the results of the empirical analysis and in Section 5 I draw and discuss conclusions, present the limitations of this study and proposes possible avenues for future research.

2. Literature Review and Hypothesis Development

2.1 Resource Based View and CVC activity

The resource based view is a theoretical framework used in strategic management. It was originally developed by Wernerfelt (1984) as a mean to evaluate the strategic positioning of a firm *vis-à-vis* its competitors. Its central notion is that each firm has a unique bundle of resources; under RBV,

this heterogeneity in resource availability is the main driver of differences in performance across firms over time (Barney, 1991). The same author poses that a firm's competitive advantage stems from its access to valuable, rare, inimitable and non-substitutable (VRIN) resources. However, an endowment of VRIN resources is not enough to ensure a sustainable competitive advantage, as different firms with the same access to VRIN resources will implement and manage them differently, and therefore present different levels of performance. In other words, as per Bates & Flynn (1995), strategic management of resources is essential in maintaining superior performance over time. In sum, RBV captures the idea that a firm's resource endowment and internal ability to effectively manage said resources will translate to an ability to make use of fruitful environmental opportunities (Peteraf, 1993; Safari & Saleh, 2020) and exploit them to gain a sustainable competitive advantage over its competitors (Collis & Montgomery, 1995).

The premise that a firm can generate a sustainable competitive advantage has been challenged (Fiol, 2001) under the notion that organizations and resources are in constant change and therefore cannot sustain competitive advantages over time. Santoro et al. (2020) and Teece (2018) highlight the role of dynamic capabilities (i.e the ability that firms possess to quickly adapt to changes in its market environment) in long-term profitability. Battisti et al. (2022) and Battisti et al. (2019) pose that firms, as non-static entities, must use their dynamic capabilities to foster innovation as a mean to adapt to their contexts and sustain their competitive advantages. Under RBV, this translates to the idea that innovation practices ensure a sustainable management of VRIN resources in a dynamic context, and therefore ensure the maintenance of a competitive advantage (Chesbrough et al., 2014).

In order to innovate, firms can rely on their internal knowledge base and skills to develop new technologies or processes (i.e closed innovation practices) or tap into external ideas, transferring knowledge and value creation outside its boundaries (Almirall & Casadesus-Masanell, 2010; Battisti et al., 2019). According to Battisti et al. (2022), in practice firms can only follow open innovation practices by either acquiring existing firms or running CVC programs (Da Gbadji et al., 2015). Investing incumbents are exposed to external knowledge from two sources: by either delegating managers to work with the startup or through board seats gained in the investment (Dushnitsky & Lenox, 2005). Belderbos et al. (2018) further note that even in the very likely case of startup failure, incumbents can still gain insights. For example, investing incumbents can extract

knowledge from failing ventures by having a clearer grasp on why a certain technology did not succeed. Hence, by running CVC programs, as pointed out by J.-J. Li et al. (2021), firms are able to increase their internal knowledge and resource bases, expecting the creation or development of a sustainable competitive advantage. Finally, Battisti et al. (2022) show that CVC programs may also be used as a mean to improve the social and environmental performance of incumbents.

Given the dynamics of inter-organizational learning, where learning opportunities for incumbents are intuitively as great as the quantity of knowledge they are exposed to, and as pressure from government regulations and stakeholders for firms to focus more on creating social, environmental and economic value rather than short-term profits in order to remain competitive has been increasing over time (Patzelt & Shepherd, 2011), long-term financial success seems increasingly contingent on factors such as social or environmental performance (Torugsa et al., 2013), CVC should prove as a valuable mean for firms to not only generate superior financial performance via a sustainable competitive advantage, but to also foster better environmental practices. Furthermore, a larger CVC portfolio should provide more learning opportunities and superior outcomes (Bendig et al., 2022). Building on the work of Battisti et al. (2022), who find that CVC investors have superior social and environment outcomes among the Fortune 500 firms, I look directly into CVC investors and pose that the number of firms in a CVC portfolio is positively associated with the corporate investors' environmental performance.

H1: The amount of CVC investment by an incumbent is positively associated with its environmental performance.

2.2 *Green CVC*

Accessing external sources of knowledge is a valuable mean for increasing firms' internal knowledge base, recognized in both innovation and organizational learning (Benson & Ziedonis, 2008). Green CVC, i.e CVC investments in green entrepreneurial ventures, differs from traditional CVC. It shows a higher prevalence of social benefit considerations, riskier market environments with a high degree of regulation (Bendig et al., 2022) and a high technology risk (Hegeman & Sørheim, 2021). The latter study poses that access to the technological know-how of green startups is one of the key strategic objectives for engaging in green CVC. Previous studies identify other strategic benefits, such as signaling a level of commitment to green sustainability to stakeholders (De Lange & Valliere, 2020) or an improvement of their CSR outcomes (Battisti et al., 2022).

The startup space is essential when it comes to fostering cleaner production approaches (Henry et al., 2020). CVCs can contribute to green startup success through their own network and by providing triple bottom line support, entailing social, environmental and financial aspects (Bocken, 2015). On the investor side, the same study concludes that green entrepreneurship challenges traditional business models, sacrificing short-term financial returns for social and environmental benefits. Portfolio diversity will naturally reduce concerns over the potentially lower and slower financial returns. While the financing of green production has been previously covered by Huhtala (2003), there is still too little empirical research on the interaction between incumbents and startups in the green economy (Fichter et al., 2021). In their 2021 paper, Hegeman & Sørheim (2021) call for further research on the interplay between incumbents and green startups regarding green innovation.

Bendig et al. (2022) find that the number of CVC investments in green startups is positively associated with incumbents' green innovation output, identifying green startups via their industry and/or technology application. Furthermore, there is a generally accepted positive link between green innovation and environmental performance. (e.g. Lee & Min (2015) and Ma et al. (2021) find that green R&D expenditures negatively impact carbon emissions, therefore improving environmental performance).

In this study, I propose to contribute to the research gap identified by Fichter et al. (2021). Given the results obtained by Bendig et al. (2022), the generally positive relationship between green innovation and environmental performance and the previously discussed role of CVC (under RBV) in fostering innovation, I propose to investigate a sample of CVC investors and pose that firms with at least one green investment in their portfolio (green CVC investors) should show superior environmental performance. To the best of my knowledge, no other study has empirically tested the difference between green and traditional CVC investors' environmental performance.

H2: Green CVC investors show better environmental performance than traditional CVCs.

2.3 Environmental and financial performance

The relationship between environmental and financial performance has been extensively studied over the past decades, with most recent studies pointing to a positive link between the two. The

positive relationship is a "win-win" situation for firms, as they improve their environmental performance with no detriment (on the contrary) to their financial results (Delmas et al., 2015).

Busch & Hoffmann (2011) find a positive effect between environmental and financial performance, in Tobin's Q, when using outcome-based environmental measures, yet the relationship is negative when measuring environmental performance through process management measures. Ambec & Lanoie (2008) analyse both the cost and revenue side of improving environmental performance and find that the benefits are more likely to outweigh the potential drawbacks. Conversely, a meta-analysis (Dixon-Fowler et al., 2013) shows that environmental performance has a stronger effect on market measures of financial performance, which supports the idea that there is a short-term cost for improving environmental performance that is positively perceived in measures that capture medium to long-term performance (Ambec & Lanoie, 2008; Delmas et al., 2015). These findings are corroborated by Horváthová (2012), who finds a short-term negative effect for one-year lagged environmental performance variables which becomes a positive effect for the two-year lag, and Hoang et al. (2020) who find a positive effect of higher GHG emissions on short-term financial performance which becomes negative in the long-term. On the other hand, there is evidence for a potential cost reduction phenomenon in in firms with high environmental performance which consequently improves their financial performance (Russo et al., 2021). Whether firms incur in increased or reduced costs stemming from the increased environmental performance appears to be the main determinant of the effect found being positive, negative or null (Benkraiem et al., 2023).

Another meta-analysis (Endrikat et al., 2014) points to a positive association and finds that, strategically speaking, there is greater benefit in a proactive approach towards environmental performance rather than reactive. Ganda & Milondzo (2018) measure financial performance in clean and dirty industries via ROE, ROA and ROS and find mixed, yet majorly positive, support for a positive relationship between environmental and financial performance. These results support the findings of Iwata & Okada (2011), who analyse a mixed sample as well as clean industries in particular and find that a reduction in GHG emissions leads to improved financial performance.

Contrarily to the majority of research, evidence is found for a negative relationship between financial and environmental performance in the paper industry (Wagner, 2005; Wagner et al., 2002) while Wang et al. (2014) find an effect of the same direction across all industries in Australia. Further empirical support is provided by Gonenc & Scholtens (2017), who find a negative effect

across fossil fuel subindustries. The regulatory environment also appears to be relevant, as low penalties for increased GHG emissions (mainly in developing countries) naturally reduce the financial incentives for reducing emissions (Rokhmawati et al., 2015, 2017). US firms, on the other hand, see a greater benefit from increased financial performance than their international counterparts (Dixon-Fowler et al., 2013). Finally, Misani & Pogutz (2015) find that firms with intermediate levels of GHG emissions had better financial performance than firms with high or low levels of emissions.

More recently, the literature has expanded to corporate investors, with studies being carried out in carbon risk pricing in M&A transactions (Bose et al., 2021) and pollution prevention investments by Chinese firms (Shen et al., 2021). Finally, Benkraiem et al. (2023) study the relationship between environmental and financial performance in the CVC space and find that lower greenhouse gas (GHG) emissions translate to superior financial performance at firm-level, measured as either ROA, ROE and Tobin's Q. Building on the results of this paper as well as Bendig et al. (2022), as discussed in section 2.2, and the positive relationship between environmental and financial performance, I test whether green CVC investors have superior financial performance compared to traditional CVC investors. The goal is to contribute to the ongoing discussion on green entrepreneurship and its relationship with incumbents as well as contributing to the discussion on the interplay between environmental and financial performance. To the best of my knowledge, no other study has empirically tested the difference between green and traditional CVC investors' financial performance.

H3: Green CVC investors show better financial than traditional CVCs.

3. Data and Methodology

3.1 Sample selection and data collection

The final sample for this study consists of longitudinal data on 75 U.S. firms between 2002 and 2022, resulting in 1,215 observations. In order to construct this sample I collected and merged data from three different sources. Firstly, I used the ThomsonOne database to retrieve investment information on all first-time CVC investments in the selected period. I filtered to only include first-time investments as corporate investors' learning from their investees mainly stems from the due diligence process and board seats granted after the first investment (Dushnitsky & Lenox, 2005).

Environmental and Corporate Governance Pillar scores were retrieved from Refinitiv Eikon. This extraction determined the selected target period, as ESG score data is only available from 2002 onwards. Finally, financial and accounting data was retrieved from the Standard & Poor's Compustat database.

In order the ensure proper merging of the data, I manually checked each of the 913 different investors resulting from the ThomsonOne database and linked each of them to their ultimate corporate parent at investment date (if applicable), attributing to each its corresponding ticker symbol, which was used as the identifier to merge the three databases. I removed firms for which no financial or environmental score data was available, resulting in a final sample of 1,215 observations for 75 firms.

3.2 Variables description

3.2.1 Dependent variables

Two different dependent variables are introduced to test the three hypotheses. In order to test H1 and H2, environmental performance is measured via the Refinitiv Eikon environmental pillar score. It reflects a weighted average of a firm's performance in i) emissions and environmental management systems, ii) product innovation and green revenues and iii) water and electric resource use. It is calculated in a percentile ranking methodology, meaning the scores are attributed to each firm between 0 and 100 based on a its relative performance to their peers. To test H3, financial performance is measured by a firm's ROA and Tobin's Q. The former is a return on investment *vis-à-vis* total assets and is used to measure short-term financial performance, computed as the ratio between a firm's net income and total assets. Tobin's Q, on the other hand, reflects both short and long-term financial performance and is calculated as the ratio between a firm's total market value (extracted from Compustat) and its total assets.

3.2.2 Independent variables

The difficulty with my approach stems from the fact that it is difficult to pinpoint when a firm has exited a corporate investors' portfolio, unless the exit is related to a public event such as an IPO or M&A transaction. In order to employ a common standard for the number of years corporate investors are expected to hold CVC investments, I follow the practice of Wadhwa et al. (2016) and

assume a holding period of 4 years. The authors research exit dates for CVC portfolio firms in multiple databases and find that the average time between the first investment and an exit is close to 4 years. By assuming a 4-year holding period I am able to construct the two independent variables: one, to test H1, depicting the number of firms in a corporate investor's portfolio in a given year; a second, simply indicating whether a corporate investor as at least one green firm in their portfolio.

In order to test H1, I construct a variable, CVCPortfolio. which depicts the number of firms in a corporate investor's CVC portfolio in a given year (Wadhwa et al., 2016) by counting the number of investments in a given year for a given firm and assuming the forementioned 4-year holding period to operationalize the final variable.

To test H2 and H3, I use a Green CVC binary variable indicating whether a firm has a green startup in its portfolio in year t. Following the approach of Bendig et al. (2022), I identify green investments if the investee in the ThomsonOne database fulfills at least one of the following conditions: either its Company Technology Application field is "clean technology" and/or its Company VE Primary Industry Sub-Group 3 (a detailed industry classification) belongs to a set of green industries[1]. While Bendig et al. (2022) are interested in the number of green investments, I adopt the approach to, at baseline, simply distinguish regular corporate investors from their "green" counterparts.

3.2.3 Control Variables

I used two different, yet partially overlapping, sets of control variables. For the estimation of environmental and financial performance, the control variables used are: i) corporate governance pillar score (Jo & Harjoto, 2011) as a proxy for corporate governance performance. As noted by

[1] The following industries are considered green: Air Filters & Air Purification & Monitoring Equipment; Solar Energy; Photovoltaic Solar; Energy Co-Generation; Other Alternative Energy (incl. Nuclear Energy); Water Treatment Equipment & Waste Disposal Systems; Energy Conservation Related; Other Solar; Wind Energy; Energy Management; Alternative Energy; Other Environmental Related; Chemical and Solid Material Recycling; Geothermal Energy; Biotech Processes for Pollution/Toxic Waste Control; Environmental Related; Water, Sewage, Chemical & Solid Waste Treatment Plants

Battisti et al. (2022), the quality of a firm's corporate governance influences the choices related to the remaining CSR outcomes and should therefore be considered when analyzing environmental performance; ii) firm size, as larger firms should have more resources to dedicate to both CSR practices and CVC programs (measured as total assets in a logarithmic scale to smooth out the stark differences between small and large firms (Jo & Harjoto, 2011; Nirino et al., 2020)); iii) firm leverage, measured by the leverage ratio (total debt to total assets), as it reflects the relative attention a firm must pay to its shareholders versus its lenders, which will influence the choices related to environmental outcomes (Battisti et al., 2022); iv) R&D expenditures in a logarithmic scale, mitigating the same issues of large differences between the smallest and largest firms. Moreover, following Benkraiem et al. (2023), I also include v) R&D intensity as a proxy for innovation capacity, measured as the ratio of R&D expenditure to total revenue; vi) year-on-year revenue growth; vii) capital intensity, measuring the ratio of capital expenditures to total assets. Finally, as increased investment experience is linked to the ability to benefit from exposure to startups in a more efficient manner (Wadhwa et al., 2016), I use the cumulative sum of all CVC investments up to year t as a proxy for CVC experience, the final control variable in this paper. It is introduced as a natural logarithm, capturing the idea of diminishing marginal returns in the forementioned ability to benefit more efficiently from startup exposure (Bendig et al., 2022).

3.3. Empirical model

The relationship between the size of a firm's CVC portfolio and its environmental performance (H1) is captured by equation (1):

$$(1)\quad EnvironmentalPerformance_{it} = \beta_0 + \beta_1 CVCPortfolio_{it} + \beta_2 Gov_{it} + \beta_3 Size_{i\ t} + \beta_4 Leverage_{it} + \beta_5 RD_{it} + \beta_6 RevenueGrowth_{it} + \beta_7 CapitalIntensity_{it} + \beta_8 CVCExperience_{it} + \beta_9 \sum Industry_i + \beta_{10} \sum Year_t + \varepsilon_{it}$$

where the dependent variable, $EnvironmentalPerformance_{it,}$ is measured by the environmental pillar score of firm i at time t. The independent variable $CVCPortfolio_{it}$ measures the number of firms in an investor i's CVC Portfolio at year t. Control variables are CVC Experience, corporate

governance (Gov), firm size (Size), leverage, the natural logarithm of R&D expenditures (RD), *yoy* revenue growth and the ratio of capital expenditures to total assets (CapitalIntensity).

Equation (2) aims to capture the difference in environmental performance between corporate investors with at least one green investment in their portfolio compared to the ones that do not (H2):

$$
\begin{aligned}
(2)\quad & EnvironmentalPerformance_{it} \\
& = \beta_0 + \beta_1 GreenCVC_{it} + \beta_2\, Gov_{it} + \beta_3 Size_{i,t} + \beta_4 Leverage_{it} + \beta_5 RD_{it} \\
& + \beta_6 CapitalIntensity_{it} + \beta_7 RevenueGrowth_{it} + \beta_8 CVCExperience_{i,t} \\
& + \beta_8 \sum Firm_i + \beta_9 \sum Year_t + \varepsilon_{it}
\end{aligned}
$$

where, compared to equation (1), the dependent and control variables remain unchanged while introducing a different variable of interest, GreenCVC, which is a categorical variable indicating whether firm i in year t has a green startup in its CVC portfolio.

Finally, equation (3) aims to depict the difference between the financial performance of corporate investors which hold at least one green investment in their portfolio compared to the ones that do not (H3):

$$
\begin{aligned}
(3)\quad & FinancialPerformance_{it} \\
& = \beta_0 + \beta_1 GreenInvestor_{it} + \beta_2\, Gov_{it} + \beta_3 Size_{i,t} + \beta_4 Leverage_{it} \\
& + \beta_5 RD_{it} + \beta_6 RevenueGrowth_{it} \\
& + \beta_7 CapitalIntensity_{it} + \beta_8 CVCExperience_{it} + \beta_9 InnovationCapacity_{it} \\
& + \beta_{10} \sum Firm_i + \beta_{11} \sum Year_t + \varepsilon_{it}
\end{aligned}
$$

where the dependent variable measures the financial performance of firm i at year t via either ROA or Tobin's Q. The independent and control variables are close to identical to model (2), introducing innovation capacity as a new control variable, following (Benkraiem et al., 2023)

All models are estimated using ordinary least squares (OLS) regressions. In all three I control for year and industry fixed effects, with the latter being based on two-digit SIC codes. The model specification choices are furthermore confirmed by a Hausman test (Hausman, 1978). Confirmation of the hypotheses is contingent on the coefficients of the variables of interest. For H1

to be validated, the β1 coefficient in model (1) must be significant and positive, meaning that exposure to more startups is positively related with corporate investors' environmental performance. For H2 and H3 to be validated their respective β1 must be positive and significant in models (2) and (3), meaning (respectively) that corporate investors with green startups in their investment portfolios have better environmental (in the case of model (2)) or financial performance (in the case of model (3)).

Figure 1: Research framework

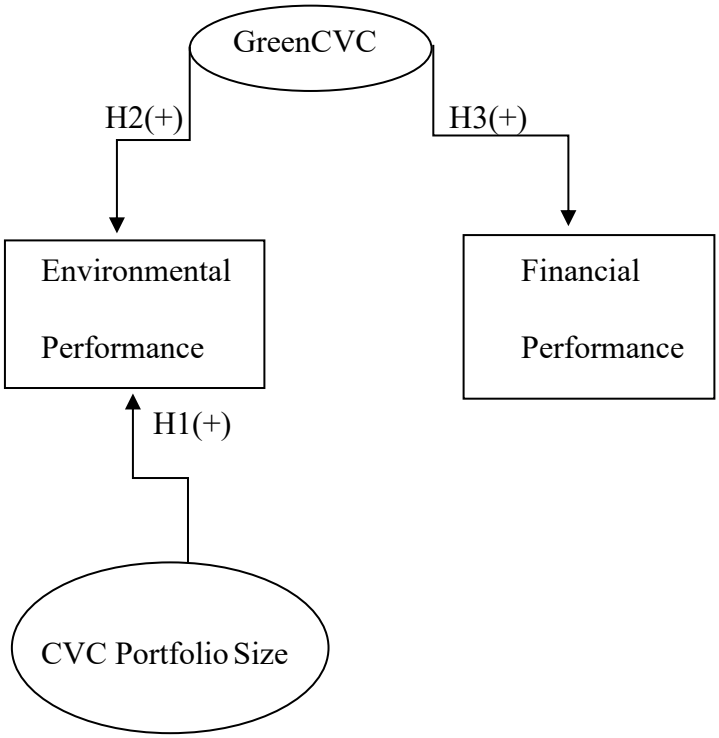

Figure 1 includes the dependent variables (financial and environmental performance) and independent variables (GreenCVC and CVC Investment Amount). Hypothesis 1 (H1) posits that corporate investors' amount invested in startups through CVC programs has a positive effect on their respective environmental performance. Hypotheses 2 (H2) and 3 (H3) suggest a positive relationship between a firm having at least one green startup in their investment portfolio and their respective environmental (H2) and financial (H3) performances.

4. Empirical results

4.1 Descriptive statistics

Table 1 shows the summarized statistics for the research sample. The distribution of environmental scores shows a mean (median) of 52.05 (59.08), slightly skewed to the left (-0.51) and with relatively few extreme values (as its observed kurtosis stands at 2.03). Measures of financial performance show an average ROA (Tobin's Q) of 0.07 (2.19) with a median of 0.75 (1.62). Both of their results for kurtosis imply a high likelihood for extreme values, standing at 41.31 (16.31), which is in both cases consistent with the skewness values of -3.18 and 2.84 for ROA and Tobin's Q, with the former (latter) expected to have a higher number of observations to the left (right) of their respective means.

A given CVC investor in a given year holds an average (median) of 3 ventures in their portfolios. Its median of 0, however, indicates that at least half of firm-year pairs represent empty CVC portfolios, i.e holding no ventures. Its skewness (kurtosis) of 5.83 (43.55) indicate a distribution that is very heavily skewed to the right-hand side of the mean, with a very high likelihood for extreme values. This indicates that while the average portfolio size is relatively low, there are a few cases with an abnormally high number of ventures, resulting in both heavy right skewness and kurtosis. Finally, the average value of 0.073 for the GreenCVC categorical variable indicates that only 7.3% of firm-year pairs reflect CVC portfolios with at least one green venture.

Table 1: Summary Statistics

Variables	Mean	Standard Deviation	Min	Max	Skewness	Kurtosis	Median
EnvironmentalScore	52.052	29.667	0	98.55	-0.509	2.026	59.08
CVCPortoflio	3.351	10.503	0	122	5.828	43.554	0
GreenCVC	0.073	0.261	0	1	3.276	11.731	0
ROA	0.074	0.088	-1.104	0.511	-3.181	41.311	0.075
TobinsQ	2.191	1.999	0	20.616	2.837	16.314	1.62
GovernanceScore	62.209	21.279	4.03	98.58	-0.442	2.284	65.19
LeverageRatio	0.187	0.141	0	1.128	1.092	5.521	0.17
Size	9.985	1.393	5.395	13.045	-0.372	2.637	10.15
RD	6.852	1.532	1.386	11.201	-0.403	3.474	6.87
CapitalIntensity	0.034	0.03	0.003	0.243	2.425	10.857	0.02

RevenueGrowth	0.105	0.229	-0.745	3.258	3.962	45.226	0.07
InvestorExperience	6.929	24.262	0	253	6.694	53.418	1
InnovationCapacity	0.121	0.107	0	1.555	3.56	38.628	0.11

This table shows the four distribution moments (mean, standard deviation, skewness and kurtosis) as well as minima, maxima and medians for for all dependent, independent and control variables included in the different models.

Table 2 reports pairwise correlations between the variables included in the models. Environmental performance shows positive and significant correlation of 0.216 with the number of firms a CVC investor is actively exposed to, denoting some degree of co-movement between the two variables. It has a moderate positive relationship with firm size (0.584), corporate governance performance (0.476) and R&D expenditure, indicating that large innovative firms with good CSR practices should show better results concerning environmental scores. The size of the CVC portfolio also shows a positive and significant relationship (correlation of 0.348) with R&D expenditure. Financial performance measures have a positive relationship between them, with the correlation between ROA and Tobin's Q standing at 0.176; no other noteworthy correlations are found, bar a moderately positive relationship revenue growth and Tobin's Q (0.437). In order to avoid multicollinearity issues in the regression models, unreported VIF tests were performed (Cohen et al., 2003), revealing no cause for concern, as no value exceeded the accepted benchmark of 10.

Table 2: Correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) EnvironmentalScore	1											
(2) CVCPortoflio	0.216***	1										
(3) GreenCVC	0.120***	0.278***	1									
(4) ROA	0.214***	0.100***	0.064**	1								
(5) TobinsQ	-0.154***	0.052*	-0.056*	0.176***	1							
(6) GovernanceScore	0.476***	0.095***	0.151***	0.138***	-0.145***	1						
(7) Leverage	0.151***	-0.107***	0.012	-0.160***	-0.148***	0.127***	1					
(8) Size	0.584***	0.281***	0.163***	0.104***	-0.342***	0.370***	0.147***	1				
(9) RD	0.527***	0.348***	0.01	0.196***	0.027	0.235***	-0.054*	0.640***	1			
(10) CapitalIntensity	0.004	0.255***	0.175***	0.022	0.019	-0.036	-0.132***	0.138***	0.140***	1		
(11) RevenueGrowth	-0.218***	0.012	0.001	0.061**	0.437***	-0.206***	-0.139***	-0.166***	-0.071***	0.053*	1	
(12) CVCExperience	0.237***	0.824***	0.253***	0.104***	0.009	0.145***	-0.022	0.277***	0.339***	0.272***	-0.01	1

This table shows pairwise correlations between all variables included in the models. *, **, and *** denote statistical significance, respectively, at the 10%, 5%, and 1% levels.

4.2 Regression Analysis

4.2.1 Main regression results

Table 3 presents the results of the main regressions proposed in this paper, resulting in three main findings which support my three hypotheses. Firstly, I find that CVCPortfolio has a positive effect on the environmental pillar scores of corporate investors, significant at the 5% level. Its positive coefficient of 0.182 implies that an additional venture in a corporate investor's CVC portfolio contributes 0.182 points to the corporate investor's environmental score. This result provides support for H1, implying that exposure to a higher number of startups via CVC programs is expected to improve environmental performance. Additionally, it corroborates the findings of Battisti et al. (2022), who suggest a positive relationship between CVC activity and CSR outcomes.

Secondly, looking at the GreenCVC coefficient in models (2) and (3) I find that firms with at least one green firm in their investment portfolio (green investors) outperform non-green investors in environmental scores by 5.66 points. This result is significant at the 1% level and provides support for H2, implying investors incorporating green ventures in their portfolios have superior environmental performance. The same can be said regarding short-term financial performance. The GreenCVC coefficient in model (3) of 0.02, positive and significant at the 5% level, highlights a positive relationship between including green ventures in CVC investment portfolios and environmental outcomes. This result implies that green CVC investors show a superior ROA of 2 percentage points (on average) when compared with CVC investors which do not include green firms in their portfolios, providing support for H3. The GreenCVC coefficient in model (4), on the other hand, implies no statistically significant difference between green and traditional CVC investors regarding long-term financial performance, measured by Tobin's Q.

These findings do not corroborate the strand of literature which suggests that there is a short-term cost associated with implementing cleaner practices which hinders short-term financial performance (Ambec & Lanoie, 2008; Delmas et al., 2015; Horváthová, 2012), while market measures of financial performance which incorporate medium to long-term expectations should be positively impacted by investment in cleaner practices (Dixon-Fowler et al., 2013). I find, on the other hand, that investment in green ventures is associated with better short-term profitability, having no significant effect on market measures of medium to long-term financial performance.

As for the control variables, I find that corporate governance has a positive and significant effect at the 1% level on both environmental and financial performance. On the other hand, a higher degree of leverage, and therefore a higher degree financial risk, implies lower financial performance in the short-term, with a negative effect on ROA of -7 percentage points, while having no significant effect on environmental performance nor Tobin's Q. A larger asset base and R&D expenditure is also positively related to environmental performance, as the coefficients for Size and RD in models (1) and (2) are positive and statistically significant. A higher *yoy* revenue growth is positively associated with financial performance in both the short and long-term, having a positive and significant effect on ROA and Tobin's Q, whilst negatively affecting environmental performance.

Finally, innovation capacity and capital intensity have no effect on environmental performance while having a negative impact on ROA. This is to be expected, as firms with large relative investment in R&D and capital investments expect a payoff in the medium to long-term, which is captured by Tobin's Q but not ROA.

Table 3: Main results

Variables	(1) EnvironmentalScore	(2) EnvironmentalScore	(3) ROA	(4) Tobin's Q
CVCPortfolio	0.182**	-	-	-
	(0.0837)	-	-	-
GreenCVC	-	5.658***	0.0204**	0.183
	-	(2.159)	(0.0101)	(0.179)
GovernanceScore	0.253***	0.245***	0.000378***	0.00674***
	(0.0281)	(0.0281)	(0.000132)	(0.00235)
Leverage	3.592	1.477	-0.0703***	-0.638
	(4.856)	(4.812)	(0.0224)	(0.399)
Size	4.869***	4.974***	-0.0256***	-1.123***
	(0.852)	(0.848)	(0.00512)	(0.0912)
RD	4.566***	4.641***	0.0332***	0.837***
	(0.794)	(0.793)	(0.00478)	(0.0851)
CapitalIntensity	-27.17	-25.70	-0.243**	2.596
	(20.89)	(20.85)	(0.0980)	(1.746)
RevenueGrowth	-12.73***	-12.86***	0.0436***	3.317***
	(2.489)	(2.488)	(0.0116)	(0.207)
CVCExperience	-0.0813**	-0.0325	9.79e-05	-0.00240

	(0.0363)	(0.0234)	(0.000109)	(0.00194)
InnovationCapacity	-	-	-0.366***	-1.231*
	-	-	(0.0352)	(0.627)
Constant	-71.14***	-73.32***	0.110***	7.046***
	(7.070)	(7.038)	(0.0362)	(0.644)
Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	1,097	1,097	1,097	1,097
R-squared	0.679	0.680	0.231	0.557

This table examines the effect of the number of firms in a corporate investor's portfolio on their environmental performance (Model (1)) as well as the difference between green and non-green investors' environmental (Model (2)) and financial (Model (3)) performance. Models (1) and (2) are all based on environmental pillar scores as a measure for environmental performance. Model (3) makes use of ROA, to measure financial performance. Year and industry dummies are included in all models. Standard errors are shown in parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1% levels.

4.2.2 Robustness Checks

The main goal of this section is to scrutinize the consistency and reliability of the main findings presented in 4.2.1 by testing the model under different specifications. I will first introduce temporal lags to the main models. Then I split my dataset into two periods, up to and after 2010. The intent is to test the robustness of the findings to the introduction of temporal dynamics, in the first case, and in the second case testing the sensitivity of the findings to different time periods, as firms face increasing pressure from stakeholders to incorporate social and environmental concerns into their activity. It is therefore expected that differences may be seen with a split dataset.

4.2.2.1 Lagged environmental and financial performance

I replicate each of the 4 models with one, two and three-period lagged dependent variables. Results for equation (1) are shown in Table 4, results for equation (2) are shown in Table 5 and results for equations (3) and (4) are shown in Table 6.

As firms incorporate the knowledge extracted from their ventures over time, it is expected that the impact of which on environmental performance may be felt with a delay. It is therefore of interest to analyse the effect of previous years' portfolio size on environmental performance. Looking at Table 4, the coefficient for CVCPortfolio stands at 0.174 (significant at the 5% level),

demonstrating the positive relationship between lagged environmental performance and the number of ventures a firm is exposed to. No statistically significant effect is found for the two and three period lags. Regarding the difference between green and traditional CVC investors on environmental performance, I find that the positive effect on environmental performance highlighted in the contemporary model in Table 3 is persistent and increasing over time. Notably, looking at Table 5, the difference lengthens from 6.91 points in t+1 to 9.02 points in t+3, suggesting the effect of incorporating green startups into CVC investment portfolios become more pronounced as time passes. This underscores the long-term benefits of green CVC when considering environmental performance. On financial performance, looking at Table 6, I find that the positive effect of including at least one green venture in a corporate investor's CVC portfolio is persistent over time and holds the same magnitude as in the contemporary model of 2 percentage points, underscoring the previously found positive effect of green CVC on short-term financial performance. Once again, no effect is found in respect to Tobin's Q.

Table 4: Results with lagged environmental scores, one to three periods

Variables	(1) EnvironmentalScore	(2) EnvironmentalScore	(3) EnvironmentalScore
Lag	t+1	t+2	t+3
PortfolioSize	0.174*	0.141	0.0986
	(0.0891)	(0.0928)	(0.0942)
GovernanceScore	0.204***	0.162***	0.152***
	(0.0289)	(0.0299)	(0.0304)
Leverage	-2.800	-7.247	-10.63*
	(5.064)	(5.294)	(5.499)
Size	4.544***	3.977***	3.017***
	(0.890)	(0.941)	(0.982)
RD	4.818***	5.209***	5.743***
	(0.841)	(0.897)	(0.945)
CapitalIntensity	-34.44	-31.69	-28.79
	(21.48)	(22.16)	(22.79)
RevenueGrowth	-11.62***	-12.02***	-10.82***
	(2.532)	(2.931)	(2.938)
CVCExperience	-0.0809**	-0.0742*	-0.0582
	(0.0395)	(0.0430)	(0.0458)
Constant	-69.00***	-60.82***	-44.74***
	(7.235)	(7.427)	(7.543)
Industry FE	YES	YES	YES
Year FE	YES	YES	YES
Observations	1,025	954	886
R-squared	0.655	0.618	0.578

This table examines the effect of the lagged number of firms in a corporate investor's portfolio on their environmental performance. Environmental performance is measured via environmental pillar scores and is lagged in (1), (2) and (3) by one (t+1), two (t+2) and three (t+3) periods. Year and industry dummies are included in all models. Standard errors are shown in parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1% levels.

Table 5: Results with lagged environmental scores, one to three periods

Variables	(1) EnvironmentalScore	(2) EnvironmentalScore	(3) EnvironmentalScore
Lag	t+1	t+2	t+3
GreenCVC	6.912***	7.540***	9.021***
	(2.274)	(2.404)	(2.418)
GovernanceScore	0.194***	0.151***	0.139***
	(0.0288)	(0.0298)	(0.0303)
Leverage	-4.981	-9.071*	-12.19**
	(5.015)	(5.240)	(5.424)
Size	4.599***	3.947***	2.866***
	(0.884)	(0.935)	(0.973)
RD	4.954***	5.408***	6.019***
	(0.839)	(0.895)	(0.940)
CapitalIntensity	-32.09	-29.03	-26.53
	(21.40)	(22.06)	(22.60)
RevenueGrowth	-11.76***	-12.23***	-11.17***
	(2.525)	(2.920)	(2.918)
CVCExperience	-0.0406	-0.0463	-0.0473
	(0.0257)	(0.0282)	(0.0301)
InnovationCapacity	-	-	-
	-	-	-
Constant	-71.60***	-63.45***	-47.40***
	(7.197)	(7.385)	(7.477)
Industry FE	YES	YES	YES
Year FE	YES	YES	YES
Observations	1,025	954	886
R-squared	0.657	0.621	0.584

This table examines the lagged difference between green and traditional CVC investors' environmental performance. Environmental performance is measured via environmental pillar scores and is lagged in (1), (2) and (3) by one (t+1), two (t+2) and three (t+3) periods. Year and industry dummies are included in all models. Standard errors are shown in parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1% levels.

Table 6: Results with lagged environmental scores, one to three periods

Variables	(1) ROA	(2) ROA	(3) ROA	(4) Tobin's Q	(5) Tobin's Q	(6) Tobin's Q
Lag	t+1	t+2	t+3	t+1	t+2	t+3
GreenCVC	0.0207*	0.0255**	0.0205*	0.119	0.0882	0.0683
	(0.0111)	(0.0102)	(0.0121)	(0.187)	(0.197)	(0.200)
GovernanceScore	0.000394***	0.000246*	0.000135	0.00890***	0.00748***	0.00692***
	(0.000142)	(0.000127)	(0.000153)	(0.00239)	(0.00247)	(0.00252)
Leverage	-0.0296	-0.00709	-0.0103	0.0888	-0.174	0.491
	(0.0245)	(0.0222)	(0.0272)	(0.412)	(0.429)	(0.448)
Size	-0.0239***	-0.0223***	-0.0157**	-1.060***	-1.102***	-1.136***
	(0.00561)	(0.00508)	(0.00625)	(0.0943)	(0.0985)	(0.103)
RD	0.0303***	0.0277***	0.0248***	0.736***	0.752***	0.785***
	(0.00530)	(0.00484)	(0.00597)	(0.0890)	(0.0936)	(0.0982)
CapitalIntensity	-0.220**	-0.126	-0.112	2.139	0.786	0.251
	(0.106)	(0.0943)	(0.115)	(1.776)	(1.825)	(1.886)
RevenueGrowth	0.00839	-0.0496***	-0.0174	1.780***	0.0472	0.197
	(0.0124)	(0.0125)	(0.0148)	(0.209)	(0.642)	(0.649)
CVCExperience	0.000117	0.000113	8.53e-05	-0.00154	1.305***	1.240***
	(0.000126)	(0.000119)	(0.000151)	(0.00212)	(0.241)	(0.243)
InnovationCapacity	-0.215***	-0.141***	-0.122***	0.320	-0.000774	-0.000845
	(0.0375)	(0.0332)	(0.0395)	(0.631)	(0.00231)	(0.00248)
Constant	0.0996**	0.138***	0.120***	7.435***	7.940***	7.962***
	(0.0389)	(0.0346)	(0.0416)	(0.654)	(0.669)	(0.685)
Industry FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Observations	1,025	954	886	1,025	954	886
R-squared	0.161	0.195	0.147	0.512	0.495	0.498

This table examines the lagged difference between green and traditional CVC investors' financial performance. Financial performance is measured via ROA ((1) to (3)) and Tobin's Q ((4) to (6)) and is lagged by one (t+1), two (t+2) and three (t+3) periods. Year and industry dummies are included in all models. Standard errors are shown in parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1% levels.

4.2.2.2 Robustness in two different periods (2002-2010 and 2011-2022)

In this subsection, I report the results of the main regressions in two different time periods, splitting the original dataset into two: pre and post-2010. This choice allows me to not only provide further robustness to my main findings by recognizing and assessing potential changes in the relationships over time. Results are reported in Table and Table 8 for 2002-2010 and 2011-2022, respectively.

I find, looking at Table 7, that in the first period an increase in the number of ventures yields an increase of 0.48 points in the corporate investor's environmental score. Additionally, firms incorporating green ventures outperform traditional CVC investors by 22 points. However, no significant effect is found in the second period. This may indicate that the increasing pressure from regulators and stakeholders highlighted in Section 2.1 may have prompted traditional investors to embrace cleaner practices, narrowing the environmental performance gap and changing the way firms incorporate environmental considerations in their decision-making.

On financial performance, no statistically significant effect is found for Tobin's Q nor ROA up to 2010. From 2011 onwards, looking at Table 8, the difference in short-term profitability is notable, standing at 2.3 percentage points. These findings suggest that in the initial period there is no short-term profitability benefit in including environmentally oriented ventures in CVC portfolio decisions does not translate directly to improved financial outcomes. However, as the regulatory environment has pushed firms into adopting cleaner practices (Patzelt & Shepherd, 2011), the latter period results show a notable difference (0.0236) in short-term profitability, suggesting that incorporating green ventures into firms' CVC activity has recently become synonymous with improved short-term financial outcomes, while my long-term market measure of financial performance remains apparently unaffected by green CVC. While in the first period the stark effect of 22 points of green CVC on environmental scores emphasizes the importance of including green ventures in CVC portfolio decisions, the later period highlights the potential for these decisions to positively influence short-term profitability. These insights underscore the nuanced relationship between financial and CSR-based outcomes, shaping both long-term profitability and sustainability goals.

Table 7: Period 2002-2010

VARIABLES	(1) EnvironmentalScore	(2) EnvironmentalScore	(3) ROA	(3) Tobin's Q
CVCPortoflio	0.481*	-	-	
	(0.263)	-	-	
GreenCVC	-	22.59***	0.0138	0.419
	-	(4.841)	(0.0263)	(0.368)
GovernanceScore	0.358***	0.350***	0.000612**	0.00861**
	(0.0464)	(0.0453)	(0.000238)	(0.00350)
Leverage	15.29*	18.67**	-0.151***	-1.682**
	(8.952)	(8.781)	(0.0456)	(0.666)
Size	5.637***	6.061***	-0.0263***	-0.777***
	(1.640)	(1.605)	(0.0100)	(0.147)
RD	3.976**	3.600**	0.0324***	0.568***
	(1.612)	(1.576)	(0.00995)	(0.144)
CapitalIntensity	15.71	15.25	-0.465**	7.756***
	(37.75)	(36.48)	(0.189)	(2.780)
RevenueGrowth	-14.96***	-15.58***	0.0840***	2.094***
	(4.020)	(3.925)	(0.0207)	(0.302)
InvestorExperience	-0.197	-0.122	0.00555	0.000562
	(0.189)	(0.0944)	(0.00761)	(0.00718)
InnovationCapacity	-	-	-0.357***	-0.527
	-	-	(0.0496)	(0.727)
Constant	-81.89***	-95.50***	0.112*	5.151***
	(10.68)	(10.74)	(0.0628)	(0.899)
Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	416	416	416	416
R-squared	0.669	0.684	0.292	0.508

This table examines the effect of the number of firms in a corporate investor's portfolio on their environmental performance in the period 2002-2010. Environmental performance is measured via environmental pillar scores. Year and industry dummies are included in all models. Standard errors are shown in parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1% levels.

Table 8: Period 2011-2022

VARIABLES	(1) EnvironmentalScore	(2) EnvironmentalScore	(3) ROA	(4) Tobin'sQ
CVCPortoflio	0.0188	-	-	-
	(0.0939)	-	-	-
GreenCVC	-	-1.925	0.0236**	0.102
	-	(2.561)	(0.0113)	(0.230)
GovernanceScore	0.145***	0.144***	0.000186	0.00461
	(0.0350)	(0.0350)	(0.000157)	(0.00319)
Leverage	-3.060	-2.486	-0.0663**	-0.430
	(5.835)	(5.725)	(0.0257)	(0.523)
Size	4.237***	4.175***	-0.0255***	-1.291***
	(0.981)	(0.973)	(0.00695)	(0.141)
RD	5.095***	4.802***	0.0334***	0.958***
	(0.888)	(0.911)	(0.00632)	(0.129)
CapitalIntensity	-63.62**	-67.37***	-0.0961	0.545
	(25.43)	(24.37)	(0.116)	(2.354)
RevenueGrowth	-12.73***	-12.68***	0.00958	4.005***
	(3.093)	(3.091)	(0.0137)	(0.280)
InvestorExperience	-0.0165	0.564	3.22e-05	-0.00233
	(0.0372)	(0.625)	(0.000107)	(0.00217)
InnovationCapacity	-	-	-0.393***	-1.693
	-	-	(0.0607)	(1.236)
Constant	-30.75***	-27.83***	0.168***	7.092***
	(8.753)	(8.885)	(0.0464)	(0.943)
Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	681	681	681	681
R-squared	0.622	0.622	0.243	0.611

This table examines the effect of the number of firms in a corporate investor's portfolio on their environmental performance in the period 2011-2022. Environmental performance is measured via environmental pillar scores. Year and industry dummies are included in all models. Standard errors are shown in parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1% levels.

5. Conclusions, discussion and limitations

In this paper, I examine the effect of the number of ventures in a corporate investor's CVC portfolio on environmental performance, as well as the difference in environmental and financial performance between green corporate investors (i.e firms holding at least one green venture in their CVC portfolio) and traditional CVCs using a sample of U.S. corporate investors from 2002 to 2022. I firstly find that, on average, an additional venture in a CVC portfolio yields a positive 0.18 points in the corporate investor's environmental score. I also find that green investors show, on average, both superior environmental and short-term financial performance; their environmental scores are higher on average by 5.67 points and their ROA is 2 percentage points higher, with no significant effect being found for Tobin's Q, measuring both short-term and long-term profitability.

Subsequently, I introduce time lags to the dependent variables and find that while the effect of the corporate investor's portfolio size is noteworthy with a one-period lag, no effect is found for the two and three-period lagged specifications. The differences between green and traditional corporate investors in terms of environmental scores and short-term profitability are consistent across the lagged specifications, with the former having an increasing effect. I also run the same analysis on a split dataset, with the two periods being 2002-2010 and 2011-2022 and find that the identified relationships between the variables have greatly shifted over time. On the one hand, in the first period the relationship between portfolio size and environmental performance remains positive, with a magnitude of 0.48 points on average per additional venture; additionally, results show that green investors outperform traditional CVCs in environmental scores by an average of 22 points. On the other hand, in the second period both of these effects are rendered insignificant, as I only find that green investors outperform traditional investors on ROA by an average of 2.36 percentage points.

This paper contains both practical and theoretical contributions. Firstly, it extends the work of Battisti et al. (2022) by analysing corporate venture capital activity under a RBV framework. While the authors show that CVC may be an important tool for companies to innovate as a mean to sustain a competitive advantage in CSR outcomes, proving that they are superior to the ones of companies with no CVC activity, I focus on a sample comprising exclusively corporate investors and find that there is a substantial 5.66 point difference between corporate investors with green

firms in their portfolios and traditional corporate investors. In other words, when it comes to environmental outcomes, there is an even greater potential for a sustainable competitive advantage to be had over the remaining corporate investors by being exposed to external knowledge from green startups. I try to grasp the magnitude of this effect by analyzing whether portfolios with a larger number of firms, therefore exposing incumbents to a larger knowledge base, should positively impact environmental outcomes.

Secondly, I find that not only is this competitive advantage seen at the CSR outcome level, but it translates to superior financial performance, as green investors also show higher ROAs (an accounting measure for short-term financial performance). This result depicts the "win-win" relationship between environmental and financial performance that has dominated the current literature (Delmas et al., 2015). It contributes to the ongoing discussion on the short-term costs of improving environmental outcomes, considering that many studies which deal with the interplay between environmental and financial performance find that there is a short-term cost for medium to long-term financial gain in improving financial performance (Ambec & Lanoie, 2008; Delmas et al., 2015; Dixon-Fowler et al., 2013; Hoang et al., 2020; Horváthová, 2012). I, on the other hand, do not find that same trade-off in the universe of active CVCs. In fact, my study of CVC activity shows both a short-term financial benefit with no palpable effect in Tobin's Q.

Furthermore, this result has implications for both firms and policymakers. On the one hand, the short-term financial benefit and positive effect on environmental outcomes should prove an incentive for firms to engage in CVC activity, as the findings suggest that it is a valuable tool for firms to generate a competitive advantage or meeting the market dynamics and regulatory environment. Conversely, policymakers and governments need to create the correct incentives and framework to foster CVC investments, namely in green ventures. As pointed out by Rokhmawati et al., (2015, 2017), this necessity is particularly urgent in developing countries, where low penalties for higher emission levels reduce the financial incentives to invest in cleaner practices.

While this paper contributes to the existing CVC literature, it isn't without limitations. Firstly, my sample consists exclusively of U.S. firms, the results should be replicated for other countries to account for varying market dynamics and regulatory environments. Future studies should

moreover cover other investor types, such as independent venture capitalists. In addition, for robustness's sake, including more countries in future research can help improve the accuracy of results, as the sample size is smaller than ideally desired. This study is focused on environmental outcomes as a measure for environmental performance; as previously mentioned, the direction of the relationship may vary if process management measures are used instead (Busch & Hoffmann, 2011). Replicating the results using process management measures is also a possible future research path. Finally, including a way to detect investor motivation would improve the quality of the analysis. Bendig et al. (2022) control for investment motivation (as it is expected that CVCs with a financial motivation will have less absorptive capacity and learn less than CVCs with a strategic motivation) as well as environmental value motivation , as per Moss et al. (2018). It is plausible that environmentally oriented firms are more likely to have both green investments and higher environmental pillar scores. In this paper, I account for this factor by controlling for firms' governance scores.

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