



Greening Corporate Innovation

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The Role of CVC in Europe's Transition

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Abstract

In recent years, Corporate Venture Capital (CVC) has attracted considerable attention as a mechanism for fostering innovation and recent US evidence links Green CVC to increases in parents' green patenting (Bendig et al., 2022; Chemmanur et al., 2014). Against the backdrop of Europe's decarbonization agenda, green innovation has become increasingly critical, yet little is known about how green CVC investment affects the innovation performance of incumbent firms. This study aims to close that gap. In a panel of European firms from 2012 to 2024, the impact of sustainable CVC investments on green innovation is analyzed, controlling for several absorptive capacities, green commitment and CVC experience as well as investment motivation. The models are estimated using negative binomial (NB) and Poisson-Pseudo Maximum Likelihood (PPML) regressions. The results show a significant positive effect under strict green patent definition. The effect is stronger for firms with higher absorptive capacities and CVCs with strategic investment motivation. The study provides empirical evidence on the contingent role of Green CVC in driving sustainable innovation. It specifically highlights that policy and corporate strategy should focus on enabling absorptive capacity and strategically aligned venturing and contributes to literature on CVC, sustainability transitions, and innovation measurement in Europe.

Keywords: Corporate Venture Capital, Green Innovation, Absorptive Capacity, Sustainability, Europe

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Abstrato

Nos últimos anos, o Capital de Risco Corporativo (CVC) tem atraído considerável atenção como um mecanismo para fomentar a inovação, e evidências recentes nos EUA associam o CVC verde ao aumento das patentes verdes das empresas-mãe (Bendig et al., 2022; Chemmanur et al., 2014). No contexto da agenda de descarbonização da Europa, a inovação verde tornou-se cada vez mais crítica, mas pouco se sabe sobre como o investimento em CVC verde afeta o desempenho em inovação das empresas estabelecidas. Este estudo visa preencher essa lacuna. Num painel de empresas europeias de 2012 a 2024, é analisado o impacto dos investimentos sustentáveis em CVC na inovação verde, controlando várias capacidades de absorção, compromisso verde e experiência em CVC, bem como a motivação para o investimento. Os modelos são estimados utilizando regressões binomiais negativas (NB) e Poisson-Pseudo Maximum Likelihood (PPML). Os resultados mostram um efeito positivo significativo sob uma definição rigorosa de patente verde. O efeito é mais forte para empresas com maior capacidade de absorção e CVCs com motivação de investimento estratégico. O estudo fornece evidências empíricas sobre o papel contingente do CVC verde na promoção da inovação sustentável. Ele destaca especificamente que as políticas e estratégias corporativas devem se concentrar em possibilitar a capacidade de absorção e empreendimentos estrategicamente alinhados, contribuindo para a literatura sobre CVC, transições de sustentabilidade e medição da inovação na Europa.

Palavras chaves: Capital de Risco Corporativo, Inovação Ecológica, Capacidade de Absorção, Sustentabilidade, Europa

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1. Introduction

In 2025, Europe stands at a critical inflection point: the European Central Bank estimates that annual green investment must reach 2.7% to 3.7% of GDP each year until 2030 to meet decarbonization targets, yet private capital remains insufficiently mobilized (Nerlich et al., 2025). Simultaneously, reports from the European Commission highlight that green startups face disproportionate financing hurdles – longer fundraising timelines and fewer exit opportunities – despite their potential to drive high-impact innovation and sustainability outcomes (Hottenrott, 2024). Corporate Venture Capital (CVC) offers a compelling mechanism to bridge these gaps. Empirical evidence from Chemmanur et al. (2014) demonstrates that firms backed by CVC engage in significantly more innovation than those supported by independent Venture Capitalists (VCs). Moreover, Bendig et al. (2022) specifically find that CVC investments in green startups are associated with increased green patent grants by the parent firm. Against this backdrop, green CVC emerges as a strategically critical tool that incumbent firms can deploy to accelerate sustainable innovation - making it not only relevant, but urgent in the current European decarbonization agenda.

While sustainable or ESG Investing has fallen out of favor with investors, especially in the US (Ross, 2025), the prospects of climate change keep being one of the most pressing challenges of our times. Only recently, Bevacqua et al. (2025) have shown that surpassing the declared temperature goal of 1.5°C is substantially closer than expected until just a few months ago. In Europe alone, a worst-case scenario of climate-change would result in an additional death toll of more than two million people until the end of the century (Masselot et al., 2025).

Innovating towards more sustainable or climate-neutral products, manufacturing processes or Business Models therefore becomes important. Not only from a business perspective in a profit-seeking Friedman manner, but out of responsibility for all. To innovate, companies have many ways to foster and develop their R&D departments. Many times, it is a mixture of internal and external sources to improve innovation (Anzola-Román et al., 2018). Engaging with start-ups can be relevant for companies and one form of engagement is CVC. Companies of most sizes and governance structures invest in startups, and their motivations are as diverse as the investors themselves.

Innovation rarely happens in isolation. Firms increasingly rely on innovation networks – collaborative constellations of diverse actors – that facilitate the exchange of knowledge and resources (Powell et al., 1996). These networks provide access to diverse capabilities, reduce uncertainty in R&D, and enable faster development cycles. It can come about internally (R&D) or acquired via external sources. These external sources can be of market-based (e.g. suppliers, customers and competitors) (Hippel, 1988; Laursen & Salter, 2006), institutional (e.g. universities, public research institutes and government programs) (Etzkowitz & Leydesdorff, 2000), as well as financial nature (e.g. VC or CVC) (Dushnitsky & Lenox, 2005). Green CVC fits directly into this framework: it embeds incumbents within sustainability-focused innovation networks, allowing them to source external green technologies, share risks, and signal commitment to climate goals.

Current research in CVC topics many times rely on qualitative study designs and often involve timeframe that do not mirror current topics. Additionally, quantitative research is mainly focused on US market, leaving a highly relevant research gap for the European VC and CVC environment (Bendig et al., 2022). Research has shown that start-up engagement can be an important catalyst for corporate innovation (Dushnitsky & Lenox, 2005). This paper aims to offer a quantitative approach to respond the question how and if investments in green start-ups leverage the green innovation capabilities of incumbent companies in the European Economic Area. This will provide European investors, start-ups and policymakers with a good overview over how to set out their strategies for future deals and policy.

Using LSEG Workspace (former Refinitiv Eikon), Compustat, and Google Big Query's Public Patent Dataset, as well as proprietary data from each companies' website, the author develops a quantitative model, analyzing the impact of Green CVC investments on the Green Innovation Capacity of incumbents. The study covers the timeframe from 01/01/2012 until 31/12/2024, structured in a panel dataset. Incumbent companies included in the sample are those that have made one or more CVC investments during the timeframe, are publicly listed and headquartered in the European Economic Area. To address survivorship bias, those companies that have seized operations or gone private are kept in the sample. Some variables requiring text analysis were generated by using an AI topic classifier. The resulting model is a Negative Binomial (NB) Model, counting absolute number of granted patents in dependence on the number of Green CVC investments during $t-3$. The study finds significant evidence for a positive impact of sustainable

corporate investments on green innovation in Europe. The findings are relevant for policy makers, R&D leaders and green entrepreneurs, helping with policy optimization, building innovation strategies and long-lasting business relationship.

First, this dissertation will guide the reader through the existing literature which will cover VC and CVC theories, green and cleantech VCs and link this to the topic of innovation and its measurement. Second, the European and US entrepreneurial ecosystem will be compared. Next, the methodology is explained from data collection processes to variable construction and the econometric approach taken. Afterwards, the descriptive statistics are introduced, the model results of the analysis are presented and their implications explained. Finally, the key takeaways and future research directions are synthesized.

2. Theoretical Framework

2.1. Resource- & Knowledge-Based Foundations of Innovation

Following (Schumpeter & Backhaus, 2003), innovation is a driver for economic change. VC is especially crucial in fostering innovation in high technology and nascent companies. Kortum and Lerner (2000) demonstrate with empirical evidence that venture-backed firms are more efficient than those relying on corporate R&D, as they yield a greater volume of patented innovations for each dollar invested. Hellmann and Puri (2000) noted that innovative entrepreneurs have better chances of receiving VC funding relative to imitators, and that VC greatly reduces time-to-market -especially for innovators - indicating VCs fund and shape the product development paths. Adding to this, Chemmanur et al. (2014) demonstrate that VC backing improves innovation quality and quantity, evident from enhanced patent citations, increasing firms' innovation output post-IPO. These studies, when combined, reinforce the assertion that VC provides early-stage innovation with transformative support to make them commercially viable technologies.

Absorption, introduced by Cohen and Levinthal (1990), is defined as the capacity as the ability to assimilate, and apply external information, assimilate it and apply it to commercial ends. Precisely, they argue that absorptive capacity builds on a firm's prior related knowledge, which enhances learning and integrations of new knowledge. Thus, incumbents with substantial R&D capabilities are better positioned to exploit external ideas. Zahra & George (2002), later refine the concept by distinguishing between potential absorptive capacity (acquisition and assimilation of external

knowledge) and realized absorptive capacity (transformation and exploitation). This dynamic capability enables firms to not only acquire external knowledge but also convert it into innovation outcomes that strengthen competitiveness. Empirical research confirms that CVC can act as a channel to build and leverage absorptive capacity. Dushnitsky & Lenox (2005) show that incumbents with greater R&D intensity benefit more from CVC investments in terms of subsequent innovation output, suggesting that, absorptive capacity moderates the learning effect from startups. Similarly, Wadhwa & Kotha (2006) demonstrate that CVC-backed firms enhance their ability to integrate external technologies, leading to superior innovation performance. In related alliance research Lane & Lubatkin (1998) argue that absorptive capacity is “relative”: incumbents learn more effectively when their knowledge bases overlap with those of their partners. In the context of Green CVC, absorptive capacity provides a clear rationale for incumbents to invest in startups. Such investments grant access to emerging green technologies and sustainability know-how, while incumbents’ prior R&D capabilities enhance the likelihood of effectively absorbing, transforming, and commercializing these external inputs. At the same time, CVC investments may expand the firm’s absorptive capacity by exposing it to new technological trajectories and sustainability-oriented markets.

Firms can be seen as a bundle of tangible and intangible resources (Wernerfelt, 1984). Barney (1991) counts processes, experiences, capabilities, tangible assets managed by firms as resources and argues that VC backed companies produce especially high levels of innovation when their investors can provide them with resources. The resource-based view focuses on the value creation of a transaction through the pooling of resources and allocating them in an optimal way (Das & Teng, 2000). For CVC funds, this brings the innovative strengths of their investee in-house (Shuwaikh & Dubocage, 2022).

Open Innovation (OI) is an approach adopted by many CVCs to improve their knowledge management. First defined by Chesbrough et al. (2006), OI refers to the deliberate exchange of knowledge, both incoming and outgoing to enhance internal innovation processes and broaden market opportunities for external innovations. OI is highly relevant for a companies’ knowledge management and CVCs can play an important part as matchmakers, scouts, coordinators and communicators to the respective Business Units (Schlegel et al., 2023).

2.2. Innovation & its Measurement

Innovation is often measured quantitatively using proxies, with patents and R&D spending remaining central to the literature. Griliches (1990) pioneered the use of patent counts and citations as metrics of inventive output, arguing that forward citations denote an invention's impact or quality. This insight was refined by Hall et al. (2005), who demonstrated that firm market value aligns more closely with citation-weighted patent metrics implying stronger correlation between such metrics and a firm's value reinforcing their claim of being a proxy for innovation impact.

Lanjouw & Schankerman (2004) along with Acemoglu et al. (2016) built upon these techniques incorporating patent count, citation quality, and even stock-market-based patent valuation to capture innovation outputs more accurately. While citing gaps in advanced methodologies concerning innovation input, R&D intensity as a proxy criterion still endures (e.g., Cohen & Levinthal, 1989). More recently tried measures include the Research Quotient (Knott, 2009) focused on isolating productivity related to investment in R&D. Lastly, reflecting recent methodological innovation— Nousiainen et al. (2024) used textual analysis of 10-K filings to devise machine-learning based indicators signaling proprietary level innovation beyond patents offering granular metrics.

2.3. Information Asymmetry in the Context of VC

Signaling theory, first presented by Spence (1973), is commonly applied VC studies to show how businesses lessen unequal knowledge by sending trustworthy indicators to financiers. In the start-up field, getting money from a well-known VC firm acts as a good indication to outside parties (Hsu, 2004). In the emerging field of Green VC, this mechanism takes on a dual role. Initially, new businesses might seek investment from Green VC firms to demonstrate the authenticity and ecological commitment of their operations, especially when such environmental assertions are difficult to confirm (Cumming et al., 2016). Second, incumbent firms engaging in Green CVC activity can use these investments to signal their own sustainability orientation to external stakeholders - including regulators, consumers, and financial markets (Ghosh & Nanda, 2010). Nonetheless, the trustworthiness of these indicators might rely on the assumed strategic purpose of the investment - whether it's aimed at innovation or just a way of “green washing”.

Agency theory, articulated by Jensen & Meckling (1976) explains how conflicts arise when a principal (e.g., a corporate investor) delegates decision-making to an agent (e.g., a startup founder), generating costs from monitoring, bonding, and residual loss. In CVC, these conflicts often stem from misaligned goals: corporates frequently seek strategic benefits, such as ESG alignment or technology scouting, while founders prioritize financial returns and autonomy (Jeon & Maula, 2022). Chemmanur et al. (2014) identify typical tensions like divergent time horizons, conflicting control rights, and strategic vs. financial motivations.

These tensions are particularly acute in Green CVC, where investments are sometimes motivated more by reputational signaling or compliance than a shared innovation mission. This “tokenism” can lead firms to take small equity positions for appearance’s sake, minimizing bonding costs but imposing residual loss on startups. Furthermore, (Park & Steensma, 2012) show that excessive governance control - such as board veto powers - can erode founder autonomy, restrict access to external knowledge, and hinder truly disruptive innovation. In sum, agency theory illuminates how misaligned objectives, information asymmetries, and power imbalances in Green CVC can result in superficial investments, reduced entrepreneurial drive, and ultimately weaker innovation outcomes.

Pecking Order Theory (Myers & Majluf, 1984) posits that firms rank financing sources according to information asymmetry and transaction costs: they prefer internal funds first, then debt, and treat equity issuance as a last resort. Equity is costly under this model because issuing new shares signals undervaluation to the market, invoking adverse selection concerns.

Green startups, however, encounter pronounced barriers to all traditional financing forms. Their novel business models, extended R&D cycles, volatile policy regimes, and limited collateral challenge conventional debt capacity or bank lending (Mrkajic et al., 2019). Equity financing is similarly constrained, as venture investors demand strong commercialization evidence—a high bar for nascent green ventures.

In this context, Green VC plays an elevated role: while it may effectively act as a financing-of-last-resort, it also offers valuable non-financial assets - such as credible green branding, specialist networks, and legitimacy in sustainability ecosystems (Mrkajic et al., 2019). These attributes help mitigate information asymmetry and offset dilution concerns. Recent studies highlight that green-focused investors serve as important signalers of environmental commitment, which can attract

follow-on financing and partnerships even if their financial terms are less favorable than those of generalist VCs (Bendig et al., 2022).

Therefore, green startups may strategically opt for Green VC not merely due to capital scarcity, but because these investors align more closely with their mission and innovation trajectory, reducing adverse selection and enhancing legitimacy in sustainability-driven markets.

3. Literature Review & Hypothesis Development

3.1. Venture Capital & Corporate Venture Capital

VC investors are key players in the startup ecosystem (Kortum & Lerner, 2000; Samila & Sorenson, 2011). They invest in private companies with disruptive approaches to a problem, after a MVP product has been validated (Kaplan & Stromberg, 2003). Most VCs invest in specific industries, geographies and stages of their investees (Chen et al., 2010; Gompers et al., 2009). However, VCs bring much more to the table than only financing: They participate in advising, monitoring and providing expertise to entrepreneurial enterprises (Lerner, 1995). VCs receive substantial control rights over the portfolio companies and seek to guide management decisions by appointing board members (Amornsiripanitch et al., 2019).

VCS can be divided into two major types: Independent VCs (IVCs) and CVCs. While IVCs focus on the financial gain of their investments, CVCs have a broader set of strategic motivations to invest in start-ups (Hellmann, 2002). In his research, Hellmann (2002) explains that strategic investments are optimal if the investee offers a complement to their partner and that they seek synergies. The variety of reasons and types of synergies will be laid in the following paragraphs.

As March (1991) first described the concept of “ambidexterity”, the relation between exploiting old certainties and exploring new opportunities in organizational learning. Translated to the context of VC investments there are clear indications that CVCs are rather exploring, as incumbents try to accumulate new knowledge into their organizations, while IVCs focus on exploiting their assets with a focus on the financial gains (Rossi et al., 2020). Rossi et al. (2020, p. 2447) find that “ambidexterity seems more typical of VC investments with strategic Knowledge to explore (...) with respect to their core business”. The nature of the strategic investment can be exploiting and/or exploring.

To develop themselves in an ever more dynamic world, firms need to be well diversified (Ansoff, 1957). Research shows that corporate venturing is also done to fill gaps in the incumbent's portfolio (Narayanan et al., 2009). Investments in up-and-coming business ventures can therefore help to be better prepared for the future. These investments are substantial in the development of knowledge-intensive entrepreneurship as Rossi et al. (2022) find in their study on the most active CVC funds. They suggest that CVC funds can have an institution-like impact on enhancing startup ecosystems (Rossi et al., 2022). Rather than an addition to the existing portfolio, investments in other companies can be seen as a real option, as described by (Ceccagnoli et al., 2018).

Generally speaking, three major types of Corporate Venturing can be identified: equity-, debt-, and client-based (De Rassenfosse & Fischer, 2016; Dushnitsky & Lenox, 2005; Haarmann et al., 2023). This thesis focuses on equity-based Corporate Venturing, as this provides the best data availability. However, corporates have become more creative with the way they engage with start-ups and how they mitigate downside risk on their investments. As a Corporate Venture Debt provider for instance, loans will have seniority over other claims (De Rassenfosse & Fischer, 2016). These kinds of financings are especially interesting to later-stage start-ups as the investments will not have a diluting effect on pre-existing shareholders. Investors can still take advantage of their investments in a strategic way by implementing covenants, reserving exclusive rights, or sharing profits. The deal between Microsoft and OpenAI is a good example for these kind of investments (Bradshaw et al., 2023). Often, these kinds of financings entitle investors to profit-sharing rights (European Commission. Joint Research Centre., 2020). Venture Clienting is another model that some incumbents use to obtain the advantages of start-up interaction (Haarmann et al., 2023). One outstanding story is that of BMW's "Startup Garage", a venture client established in 2015. The program assesses more than 1.000 start-ups per year and offers start-ups a source of actual (recurring) revenue, growing the business sustainably, rather than investing in the company (BMW, 2025). The Bavarian car manufacturer can take advantage of a lower capital commitment, compared to a direct investment and of a higher grade of interaction with start-ups, as they are directly integrated into daily operations.

Recently, a report on VC investments by management consultancy "Bain & Company" finds that while VC investments are up globally, this growth is mainly driven by the US (+20% Q1 2025) and sustained by Europe (+9% Q1 2025) (Leonard et al., 2025). Main drivers for the growth are

biotechnology and AI firms. Funding rounds of both Anthropic and OpenAI made up huge chunks of the total amount invested in the first half of 2025, while industry-specific AI companies, for healthcare and manufacturing are gaining considerable traction. The number of CVC transactions seems to be cooling off, but the share of transactions has reached a four-year high in deal value, making up 47% of the space. The number of active CVC funds has also slid slightly, which shows a consolidation of the market and that, CVC funds tend to invest in larger ticket sizes and later-stage start-ups. Emerging markets and China have experienced a decrease in deal size and numbers (Leonard et al., 2025).

3.2. Transatlantic VC Differences & Innovation Consequences

The VC ecosystems in Europe and the US exhibit considerable disparities in scale, institutional foundations, and performance - factors that crucially shape Green VC and CVC outcomes. Academic comparisons consistently highlight that US venture funds outperform their European counterparts due to deeper syndication, more frequent stage financing, and a mature IPO market (Hege et al., 2008). For instance Hege et al. (2008), found that American VC firms generate significantly higher value per invested dollar, attributed to contract structuring and exit environment. This performance gap has real implications: the EU represents just 5% of global VC funding, compared to North America's 52% and China's 40% (European Investment Bank, 2024).

However, Europe's Green VC is rapidly advancing under robust regulatory guidance. Between 2021 and 2023, the EU experienced a 30% rise in Greentech VC, driven by frameworks like the European Green Deal, Taxonomy, and Sustainable Finance Disclosure Regulation (SFDR) (European Investment Bank, 2024). CVC has emerged as a strategic conduit for incumbent firms to internalize green innovation. Bendig et al. (2022) show that CVC investments in green startups significantly boost parent firms' green patenting activity in the US, underscoring CVC's role as a mechanism for knowledge absorption. Current regulatory insecurity around sustainability and green topics may create both risks and opportunities for venture investors, for incumbents Green CVC offers not only access to emerging technologies, but also a hedge against regulatory uncertainty by embedding them in innovation networks aligned with policy trajectories.

Sectoral emphases also diverge: Europe predominantly targets cleantech, circular economy, energy infrastructure, and green bonds, whereas the US pursues a broader climate-tech palette including

carbon-offset platforms, AI-based optimization tools, and fintech solutions (Khym & Vasquez, 2025). European consortia like the European Innovation Council back essential deep-tech ventures, addressing scaling barriers inherent in capital-heavy cleantech deployment (European Innovation Council and SMEs Executive Agency., 2025).

In brief, the US continues to lead in Green VC in absolute terms due to private capital depth and efficient market exits, while Europe's strength lies in structured, policy-driven strategy, public-private platforms, and CVC-facilitated innovation absorption by incumbents. This alignment of regulation and corporate engagement positions Europe to cultivate robust green innovation pathways, essential for effective CVC participation in incumbent firms.

3.3. The Rise of Green VC

This research focuses on the Green Innovation Output due to Green CVC investments. It is therefore central to have a clear understanding on what Green Innovation is and is not. To provide an exhaustive framework for the context of Green Transition in Europe, the definitions in the EU Green Deal are used. Under the Green Deal, the Commission introduced the EU Taxonomy, which offers a classification system in environmentally sustainable or not (European Commission, 2021). The initiative focuses on six key areas: Climate change mitigation, Climate change adaptation, Sustainable use of water and marine resources, Transition to a circular economy, Pollution prevention and control, as well as Protection and restoration of biodiversity and ecosystems. Additionally, the framework provides four conditions that must be met to be counted as a sustainable/ green business.

While the vision of a more sustainable future sounds promising, research has shown that there are far more attractive investment opportunities than cleantech and that large institutions are less likely to engage in these investments (Gaddy et al., 2017). The researchers analyzed returns on VC investments between 2006 and 2011 and found that less than half of the invested capital was returned. Additionally, research found that CVC activity was not seen as a way to green their business by investors (Hockerts & Wüstenhagen, 2010). At this point it might be helpful to note that current EU regulations do oblige banks to integrate ESG topics into their decision-making process since 2020 with the introduction of the EU Taxonomy and the Sustainable Finance Disclosure Regulation. While there are no long-term studies yet, studies about the impact of

regulation yet, ESG Performance is associated with higher risk-adjusted returns for investors (Hübel & Scholz, 2020).

In their Research, Hegeman & Sørheim (2021) further investigate why corporates invest in cleantech startups and give an overview over the reasons for a heterogeneous group of companies. The paper relies on an exploratory case study design involving a list of start-ups in Norway between 1999 and 2012. Large corporates especially value the sustainability factor of their investment, as well as the possibility to diversify their portfolio. For SME's Investments seem to not necessarily be part of a portfolio strategy but are rather unrelated to the industry. The main criteria seem to be how to create a symbiosis within the operations of the SME. Return is not sought through selling shares but rather growing the business organically. Becoming more sustainable by investing in start-ups does not appear to be a priority for corporates. An additional factor for government-owned companies is the economic development of the region they operate in.

Main hurdles for Green/ Cleantech Investments have found to be relatively high up-front capital investment (compared to Software-as-a-Service start-ups) and greater technology risks due to the functioning of the technology, scalability and exit prospects (Cumming et al., 2016). Additionally, not all benefit is captured in financial return as Cleantech start-ups benefit the society through the avoidance of CO_{2e} emissions; and thereby improving quality of life locally and mitigating climate change globally (Cumming et al., 2016). Bocken (2015) finds that strong incumbents in the industry and risk adverse VCs are possible factors for failure, while she identifies an innovative business model and collaboration (Corporate or NGO) as success factors. Finally, recent analysis by business magazine Financial Times has shown that Green VCs require very specific industry knowledge, just like for biotechnology or other highly complex sectors (Mundy, 2025). Additionally, while investment in climate-focused venture equity has slowed down, the decline was steeper in VC overall (Mundy, 2025). It might be because of that, that CVC's can be exactly the investor start-ups can profit from as they provide, the capital levy, network and deep knowledge needed in such entrepreneurships.

Research indicates that Green VCs) pursue a dual objective of generating financial returns while simultaneously achieving favorable environmental outcomes, setting them apart from conventional VCs. (Randjelovic et al., 2003) demonstrate that Green VCs integrate ecological criteria into their investment decision-making processes, assessing both the commercial viability and environmental

potential of startups. In contrast to traditional VCs, who typically prioritize quick returns and may shy away from regulatory or technological uncertainties, Green VCs are inclined to have longer investment horizons and strategic patience, accommodating the protracted development cycles that characterize green technologies (Randjelovic et al., 2003). This integrated investment approach - striking a balance between profitability and sustainability - is realized through adapted due diligence frameworks, comprehensive impact assessments, and targeted support for ventures capable of providing “double dividends” (Eckerle & Terzidis, 2024). Consequently, Green VCs fulfill a distinctive role in financing sustainable innovation by harmonizing economic incentives with ecological impact.

Lastly, Rizzitello et al. (2025) demonstrate that various types of VC exhibit differential responses to environmental policies in the context of investments in green startups. IVC tend to be hesitant due to uncertainty; however, they show a propensity to invest more when regulatory frameworks mitigate perceived risks. Conversely, CVCs react favorably to incentives that align with their strategic objectives, yet they may be hindered by constraints that limit external innovation. Government-backed VC consistently supports green startups, operating within the framework of policy mandates. This study underscores the necessity for policy mixes that are specifically designed to align with the logic of different investors.

3.4. Hypothesis Development

Prior research shows that CVC investments are positively associated with corporate innovation outcomes, particularly patenting (Chemmanur et al., 2014; Dushnitsky & Lenox, 2005). Extending this logic to the sustainability domain, green CVC investments should provide incumbents with privileged exposure to emerging environmental technologies and business models. This was confirmed by Bendig et al. (2022) for large US firms. Access to these resources, coupled with firms’ absorptive capacities, is expected to translate into higher levels of green innovation output.

Hypothesis 1: *Green CVC investment is positively associated with European incumbents’ green innovation output.*

Firms with strong sustainability commitments are already in a state of “green readiness.” They are more oriented toward identifying, valuing, and exploiting green opportunities – intensifying the

impact of upstream investments and absorptive mechanisms. In environmental innovation studies, resource and managerial commitment improved sustainability performance (Moss et al., 2018).

Hypothesis 2: *Green commitment strengthens the positive relationship between green CVC investments and incumbents' green innovation output.*

Additionally, CVC investments can lay upon different investment motivations (Röhm et al., 2018). Strategic CVC units are designed to create knowledge spillovers and synergies with the parent firm, while financial CVC units are primarily evaluated based on financial returns. Importantly, these orientations are not mutually exclusive; many CVC units combine both strategic and financial logics, with their relative emphasis shifting across investments. The open innovation perspective suggests that only the strategic orientation fully facilitates learning and integration with corporate R&D processes. Thus, strategic CVC should strengthen the effect of green CVC on innovation, while financial CVC may dilute it.

Hypothesis 3a: *A strategic CVC investment motivation strengthens the positive relationship between green CVC and incumbents' green innovation output.*

Hypothesis 3b: *A financial CVC orientation weakens the positive relationship between green CVC and incumbents' green innovation output.*

From a resource-based view perspective, larger firms typically control broader resource endowments and innovation infrastructures (Barney, 1991; Demirkan, 2018). Higher revenue provides more stable funding and reduces liquidity constraints, making it easier to exploit knowledge gained from green CVC investments. Financial slack represents discretionary, uncommitted resources that allow firms to pursue risky projects (Bourgeois, 1981). It can facilitate scaling and commercialization of green technologies acquired through CVC. Conversely, too much slack may encourage inefficiency or reduce managerial discipline. Absorptive capacity theory emphasizes prior knowledge and R&D as prerequisites for effective knowledge assimilation (Cohen & Levinthal, 1989). Firms with higher R&D intensity are better positioned to internalize and recombine the novel knowledge accessed through CVC.

Hypothesis 4a: *The positive relationship between green CVC and incumbents' green innovation output is stronger for firms with higher revenues.*

Hypothesis 4b: *The positive relationship between green CVC and incumbents' green innovation output is stronger when firms possess greater R&D stock.*

Hypothesis 4c: *The positive relationship between green CVC and incumbents' green innovation output is stronger when firms possess greater unabsorbed slack.*

In the context of CVC, accumulating a large portfolio or extensive experience does not always guarantee increased innovation output – the relationship can follow a diminishing returns or inverted U-shaped trajectory. Wadhwa et al. (2016a) for instance document an inverted U-shaped effect of portfolio diversity on corporate investor innovation performance, indicating that moderate levels of portfolio breadth enhance innovation, while excessive diversity ultimately overwhelms absorptive capacity. The breadth of a firm's CVC portfolio reflects its exposure to diverse external knowledge domains. From the perspective of absorptive capacity, a larger portfolio may provide richer learning opportunities and cross-fertilization effects, but it can also dilute managerial attention. On the question of CVC experience, lifecycle perspectives suggest that while early experience offers substantial learning benefits, its marginal value decays over time – firms often phase out CVC activity when incremental gains diminish (Ma, 2020). Together these findings support the idea that both portfolio size and experience can foster innovation up to a certain point after which additional gains become marginal or even counterproductive.

Hypothesis 5a: *Portfolio size weakens the positive effect between green CVC investments and incumbents' green innovation output*

Hypothesis 5b: *With higher CVC experience, innovation output will exhibit diminishing marginal returns – initial experience boosts innovation, but further experience yields progressively smaller gains.*

Figure 1 presents the theoretical model underlying this study. It integrates the resource-based view, absorptive capacity, and open innovation perspectives to illustrate how green CVC investments are expected to influence the incumbents' green innovation output. The model also depicts hypothesized moderating effects of firm characteristics, CVC-specific factors and organizational sustainability orientation. Together, these elements provide a visual summary of the hypotheses developed in the preceding section and guide the empirical analysis that follows.

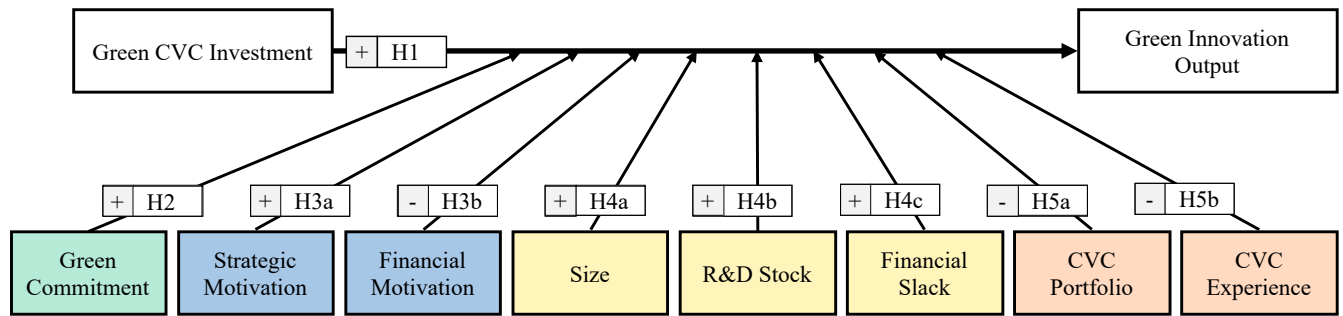


Figure 1. Conceptual model illustrating that hypothesized effects of green CVC investment on incumbents' green innovation output, moderated by green commitment, firm characteristics, CVC investment motivation and activity.

4. Methodology

4.1. Research Design & Approach

The main objective of this research is to provide insight into the impacts of Green CVC investments on the green innovation of their parent companies. To properly assess the questions posed, a panel dataset is best suited as it provides an in-depth view across time and different companies, industries and geographies.

4.2. Data & Sample Selection

The dataset is put together from four main data sources and covers the time frame from 01/01/2012 until 31/12/2024. This period is chosen to ensure both sufficient temporal coverage and data reliability: First, green patenting classifications and climate-related taxonomies have become more consistent only after the introduction of shared CPC codes in 2013. Second, corporate venturing activity has grown significantly in Europe during the last decade. Third, extending the data horizon up until 2024 captures the most recent wave of Green CVC investments and their impact under the European Green Deal and related policy frameworks.

The primary data source is the *Dealscreener* of LSEG Workspace. Applying the data-cleaning steps proposed by Röhm et al. (2020), the CVC firms are extracted in the following way: First, under *VentureSource* CVC, was defined as “Corporate PE/ Venture”. Then, all countries that are included in the European Economic Area as of February 2025 were chosen as the in-scope CVC firms. Next,

undisclosed investments and unknown investors are filtered out. Additionally, only the first-time investment were extracted as research has shown these are the ones, where corporate gain the highest degree of organizational learning (Wadhwa et al., 2016). All funds that have one or more (co-)owner, publicly listed and headquartered in the EEA was matched to that firm resulting in a total of 98 companies that are in-scope. As for the geographic distribution, 22 firms are headquartered in Germany, 20 in France, 8 in each, the Netherlands and Spain, and 40 in the Rest of Europe

The second data source is the *Advanced Filings Search* of LSEG Workspace. As this analysis' method relies on text analysis, the annual reports for all 98 companies were first downloaded and then the management report and analysis part was extracted manually resulting in a total of 955 firm-years.

The third data source is *Compustat*. This study relies on accounting data to control for factors such as Size (Revenue), R&D Intensity (R&D Expense), and Unabsorbed Slack (Current Ratio). Compustat is the most complete data source available to the author for accounting data for European companies.

Finally, Google's BigQuery Public Patent Dataset is used to extract patent grants worldwide by the companies in-scope. This was done using a SQL Query and filtering by sustainable patent categories, and the firm names without their suffixes (e.g. SA, AG, SE). All variables and their respective operators and sources can be checked in the Table 7 (Appendix).

For this study, all companies that were active for at least one year during the study were included. As it is based upon the data available in *Datastream*, some deals are not shown as they are marked as not disclosed. This can potentially distort the picture the data ultimately shows.

4.3. Variables & Measurement

Dependent Variable: Green Innovation Output

Green Innovation Output is measured as the number of granted patents during the period from 01/01/2014 until 31/12/2014, all other variables but CVC Experience are lagged t-2 years. The count of granted patents rather than the number of citations is used as this is on the one hand the most common measure used in research on innovation (comparability) and on the other hand is the

most reliable source to measure innovation across countries, and continents. The data was extracted from Google Big Queries *Patents Public* dataset, as it is the world's largest databank for patent registrations and considers data from the entire world rather than just specific regions, resulting in a completer and more reliable dataset. The extraction was made using a SQL query. To properly extract all in-scope patents the data was organized as follows: Only granted patents were considered, then the dataset was filtered by only Cooperative Patent Codes (CPC) that can be considered green in the wider sense. This approach is different from prior research (Bendig et al., 2022) as it includes broader categories that might not be directly included in the *Y0** categories, which are patents associated with climate change mitigation and adaptation, but still relevant in some part of the Green Transition, as well as leverages text classifier models and investigates Europe rather than the US. No restrictions were made on the country of the grant of the patent as it can very well be that a Europe-based company registers some of their patents in the USA. A comprehensive list of all codes and their category can be seen in Table 8 (Appendix). Google's tool provides researchers with a harmonized list of company names, making it easier to use them in quantitative research as this one. The author used the names of direct subsidiaries of the parent companies to provide for a more accurate count of patents. This process resulted in a total of 263,045 patents that can be considered green/ sustainable. The company with most granted patents was Siemens (55,136), followed by Vesta (29,528) and BASF (21,035).

Independent Variable: Green CVC

The independent variable is the Green CVC Count per year. Only first-time investment is considered due to associated learning effects. It was created by first cleaning the data set for CVCs with listed parent companies. Different from alternative approaches, such as the selection of categorizations provided by LSEG Workspace in Investee Company VE Primary Industry Sub-Group 3 or Investee Company Technology Application the author decided to rather classify Ventures as a binary variable: either Green (1) or not (0) with the help of ClimateBERT, an open source large-language model (LLM) based on Google's BERT model and refined and trained by Bingler et al. (2022).The authors provide five task specific models, one of which is the "distilroberta-base-climate-detector", which is fine-tuned for Green topic detection. The classifier categorized each deal and the sum of green deals per year per company was taken as the final variable.

Control Variables

Environmental Value Orientation

The Environmental Value Orientation is created by using the management reports of all companies. Once again, ClimateBERT's green commitment model (Bingler et al., 2022) is used to gauge the environmental value orientation of the companies and create a score between 0 and 1. The model can handle 512 tokens at once which is why a rolling window was used to consider the entire text and its context. This method improves upon the traditional text analysis, which uses dictionaries with words and word stems by using contextual embeddings from transformer-based language models. Unlike traditional dictionary approaches that rely on fixed word lists and ignore context, ClimateBERT leverages deep neural networks trained on financial and environmental texts to understand the semantic meaning and sentiment of sentences in context. This allows for more accurate detection of environmental commitment even when companies use varied or indirect language. As a result, the Environmental Value Orientation score better captures the depth and nuance of a firm's environmental positioning in its strategic communication. As this process was computing-heavy external GPUs were used.

Strategic vs. Financial Investment Motivation

To calculate this variable, the author extracted all text available, describing the funds activity from their respective websites, following Bendig et al. (2022). In those cases that the fund ceased to function, *web.archive.org* was used to extract this data. As observations are made on the firm level, if a firm has/ had several funds these texts were united. The investment motivation of the CVC is used in the model to control for the motivations of the firm to invest in a startup. In this case the dictionaries provided in Röhms (2018) are used to conduct a text analysis counting the words and word stems in the dictionary and dividing them by the total word count.

Firm Size

To control for the size of the firm and as this study is about the European market which is not yet fully integrated and market capitalization varies widely between country markets, revenue is used as a proxy for size. The size of a company is disproportionally associated with higher innovation output (count of patents granted) (O'Neale & Hendy, 2012). For this variable, the natural logarithm is applied to address heteroskedasticity inherent in such data.

R&D Expenditure

Innovation output is associated with the R&D activity of a company (Arora & Ceccagnoli, 2006). R&D expenditure is therefore the indicator that will be used to conduct the study. The variable is built as the sum of t-2, t-3, and t-4 to account for the long-term impact of R&D activity (Dushnitsky & Lenox, 2005).

Unabsorbed Financial Slack

Unabsorbed Financial Slack is defined as the readily available financial resources, not committed to specific uses which makes them available for discretionary initiatives such as corporate investments. Iyer & Miller (2008) found that unabsorbed slack can lead to higher innovation, as this capacity must be either distributed among shareholders or reinvested into growing the business. The current ratio is used to operationalize the variable. A positive effect is expected for this variable.

Portfolio Size

Following Bendig et al. (2022), Portfolio Size is used as a higher number of investments should indicate a higher innovation output or at least the opportunity therefore. For all parent companies in the sample, the total count of active investments is summed, assuming a four-year holding period (Wadhwa et al., 2016).

CVC Experience

Finally, CVC experience is introduced. This follows the hypothesis that learning is highest after the first investment and from thereon after follows a declining marginal utility function. The variable is calculated by taking into account all prior investments of the funds in-scope and weighing them over time, that is dividing number of investments in year t-1 by 1 and dividing the number of investments in year t-4 by 4 (Wadhwa et al., 2016).

4.4. Empirical Model & Statistical Techniques

First, and to find the optimal lag for Green CVC Investments, Spearman correlation tables are presented to compare lags, winsorized factors and a broad and strict definition of patents. Only then will the models be specified. The statistical models implemented in this thesis are the Zero-

Inflated Negative Binomial (ZINB) model, the Negative Binomial (NB) model, and the Poisson Pseudo Maximum Likelihood (PPML) estimator. The choice of models reflects both the statistical properties of the data and established practice in innovation research.

The dependent variable in this study is the number of granted patents per firm-year, which is a count variable (non-negative integer). Using linear regression would be inappropriate, since it assumes a continuous dependent variable and can predict negative values. Instead, count data models are required. Such models (i) respect the non-negative, discrete nature of the data; (ii) allow for skewed distributions; and (iii) can incorporate industry- and time-level covariates (Cameron & Trivedi, 2013).

The PPML model represents the most basic form of count modeling, assuming equidispersion – that is, the mean equals the variance. However, patent data almost always exhibit overdispersion (variance > mean), since innovation is highly uneven across firms: some firms patent heavily, while many do not (Cameron & Trivedi, 2013; Hausman et al., 1984). The NB model introduces an additional parameter that relaxes the equidispersion assumption, thereby allowing the variance to exceed the mean. This makes it particularly suitable for real-world innovation data.

Nevertheless, a further challenge is the possibly high incidence of zero patent counts. These zeros can arise for different reasons: They can either be structural zeros, where firms simply never engage in patenting or sampling zeros, where innovative firms do not produce a patent each year. The ZINB model accounts for this dual data-generating process by combining a binary model for the excess zeros with a count model for the positive outcomes (Lambert, 1992). This aligns well with the empirical setting of this thesis, as it is expected that some European incumbents may not engage in green patenting at all, while others innovate at varying intensities. Both, the NB and ZINB model properly address overdispersion, while only ZINB handles excess zeros. A Vuong test will be used to verify whether the ZINB model significantly improves model fit over the NB specification. In addition, the PPML estimator is applied as a robustness check. PPML is consistent under weaker distributional assumptions and remains robust to heteroskedasticity, making it widely used in applied economics (Silva & Tenreyro, 2006). All models are computed with heteroskedasticity-robust covariance matrices to adjust for the observed data. Additionally, Year and Industry Fixed Effects (FE) are introduced to control for macroeconomic and sectoral trends.

5. Empirical Analysis & Results

5.1. Descriptive Statistics & Data Overview

In this subchapter descriptive statistics of all variables will be discussed as well as correlation coefficients and further modifications for the final model.

Table 1. Descriptive statistics of the variables.

Statistic	N	Mean	Median	Std Dev	Min	Max
Patents	1,078	244.012	0.000	733.250	0.000	7,225.000
Patents (strict)	1,078	82.680	0.000	265.530	0.000	2,820.000
Investment	165	0.187	0.000	0.568	0.000	6.000
Green Commitment	865	0.347	0.291	0.247	0.006	0.969
Strategic	98	5.642	5.660	2.183	1.600	13.240
Financial	98	2.698	2.440	1.769	0.000	9.220
In Reve	1,062	9.303	9.619	1.555	4.447	12.786
In R&D total	1,058	4.582	5.384	3.337	0.000	10.658
Current	870	1.189	1.156	0.658	0.000	6.318
Portfolio	882	16.550	2.000	51.064	0.000	475.000
CVC Experience	980	3.869	1.000	9.451	0.000	73.199

Green Innovation Output

In the sample of 263.045 patents, roughly one third (33.88%) related to the Y02* category. 24.32% were accounted by the categories connected to electrics and semiconductors and 14.51% with any sort of non-combustion engines for mobility or energy generation.

On a firm-aggregate level, an average of 2,684.13 patents were granted during the observation period, with a Standard deviation over 7,000, which indicates relatively high skew towards the right. Most patents were given to companies in the Manufacturing business. There was no green innovation by financial institutions. From 2014, patents started out at roughly 21.500 grants and went up constantly until 2019. Thereafter, they fell considerably by 19.5% and bottoming out just beneath 17.000 in 2023.

As the sample presents a relatively high skew, winsorizing will be used to contain extreme values and to prevent errors with the model fitting. This will handle only extreme values on the right of

the distribution. Additionally, the sample is divided into two definitions: strict, only including *Y02** patents, and broad including all patent categories that can be considered sustainable.

Green CVC

There is a total of 165 Green CVC Investments in the sample, with an average of 1.684 investments per firm and 15 per year. The maximum of Green CVC Investments was made by Equinor ASA, the Norwegian energy conglomerate. To prevent bias, all companies that were CVC active during this period are kept in the sample. Most transactions were again made by companies active in the manufacturing industry. CVC investment was constant from 2012 to and 2017 (7-8 investments per year) and went on growing rapidly up to 46 investments in 2022. Causes for this might be the general market frenzy during the post-Covid years or a better coverage of the European Market by Dealscreener.

Finally, a preliminary Spearman correlation is calculated. To generate the best possible model fit several combinations of winsorizing the patents variable (70, 80, 90, and 95) and lagging investments (-1, -2, -3, -4 and -5) is created. In further analysis, patents are highest correlated on lag -3 and with winsorizing on the right tail of the distribution to 95%.

Environmental Value Orientation

After analyzing 865 Management Reports in the sample, the green commitment model calculated scores on a rolling 512 token window. On average, the score was 0.347 the standard deviation was 0.247. Score varied between values of 0.006 and 0.969. By Industry, the highest scores were achieved in “Other” Industries, with the Financial and Services sectors being the laggards. Over time (2012-2022), Environmental Value Orientation has grown to 0.44 (2022), up from 0.30 in 2012. On one hand, this can relate to a more complex reporting need and the rise of integrated reporting. However, as management reports have been extracted with a high attention to detail, it most likely shows a real increase in green commitment.

Strategic vs Financial Investment Motivation

The strategic and financial motivation variables are time-stable and give weights in percentage of. Descriptive statistics show that CVCs in Europe have a mean of 5.642 in strategic and 2.698 in financial investment motivation. Values for strategic motivation varied between 1.600 and 13.240, with a standard deviation of 2.183. For financial motivation on the other hand, values fluctuate

between 0.000 and 9.220, with a standard deviation of 1.769. As to be expected, the highest values were presented in the financial sector. In the case of strategic investment motivation, those companies in Manufacturing were those with the highest values.

Firm Size

Revenues are measured in millions of Euros and vary between 84 and 357.287, with an average of 27.116. To handle heteroscedasticity the natural logarithm is applied, leaving values between 2.1 and 12.8. Revenues are highest with the Manufacturing and Transport & Utilities Sectors with the lowest in Services.

R&D Expenditure

R&D Expenditure is measured in millions of euros and due to heteroscedasticity, the natural logarithm is applied. Additionally, the sum of the past 4 years of investment in R&D is taken. R&D investment therefore averaged 4.51. In the case of financial institutions, R&D investment data is missing. These missing values are reassigned a 0 to provide a complete set of data. Standard deviation is 3.35 with values varying between 0 and 10.65.

Unabsorbed Financial Slack

Unabsorbed slack is a measure of the current ratio, which was 1.189 on average. This shows a relatively healthy financial position, albeit without much liquidity. An intelligent capital allocation is therefore necessary. Values varied between 0 up to 6.318 and had a standard deviation of 0.658. Firms in manufacturing had the highest unabsorbed slack in the sample (1.345), while firms in construction had the lowest (0.983). This shows inherent differences across industries and makes it clear why using fixed effects in late modeling is important.

Portfolio Size

Portfolio size measures the total CVC portfolio of each of the companies. On average, companies held 15.57 investments with a standard deviation of 49.78. The number of investments held by any individual company vary between 0 and 475. Novo Nordisk is one of the most active CVC investors in Europe, consistently reaching more than 400 investments in their supposed active portfolio. The sectors with the highest investment activity are Manufacturing (Avg. 19.64) and Transport & Utilities (Avg. 16.25). Notably, investment activity started going up during and after the COVID

pandemic. Between 2017 and 2019 investments averaged 15.37 per firm and year and rose to an average of 19.56 between 2020 and 2022.

CVC Experience

CVC Experience measures the learning curve of a corporate when investing in a start-up. Values average 3.76 with a standard deviation of 9.53, varying between 0 and 87.72. The value correlate highly with those of the total portfolio size. Due to more CVC investments during the past few years the average CVC experience score improve from 2.922 in 2014 to 5.072 in 2023. It is important to note that this variable considers all CVC investments ever made by a fund. The fact that it is highly correlated with Portfolio size might indicate that most firms only recently started investing in startups.

To improve the interpretability and offer model convergence of coefficients in the final model all continuous variables were standardized. This process allows to directly compare the resulting coefficients. Additionally, NB models are prone to variable scales due to overdispersion and many zero counts (as in the present dataset). Without standardizing the model would result non-convergent or in NaN errors. Additionally, as the count variable “Green Patents” resulted to be heteroscedastic it was winsorized to offer an optimal model fit. To check for general robustness a “strict” version of Green Patens using only the $Y0^*$ Specification is added. Especially as there are many kinds of firms in the sample that do not only include large but also small market capitalizations, winsorizing helps to properly assess the signal. Lastly, numerous lags from one through five were applied to look for an optimal fit between CVC investments and the issuance of green patents.

Next, correlation between the variables is investigated to understand the relationships between the dependent, independent and control variables. As the innovation variable patents is a count variable, as is the independent variable, the spearman correlation is used. Neither of the variable is normally distributed; therefore, this is the correct choice.

Table 2. Spearman Correlation between the dependent (Patents) and independent (Investment) variables. Broad definition.

Variables	Patents	Patents win 95	Patents win 90	Patents win 80	Patents win 70	Investment lag 2	Investment lag 3	Investment lag 4	Investment lag 5
Patents	1								
Patents win 95	1.000 ***	1							
Patents win 90	0.999 ***	0.999***	1						
Patents win 80	0.995 ***	0.995***	0.996***	1					
Patents win 70	0.983***	0.983***	0.984***	0.988***	1				
Investment lag 2	0.099***	0.099***	0.102***	0.098***	0.100***	1			
Investment lag 3	0.136***	0.136***	0.138***	0.138***	0.144***	0.193***	1		
Investment lag 4	0.114***	0.114***	0.116***	0.116***	0.117***	0.127***	0.118***	1	
Investment lag 5	0.117***	0.117***	0.116***	0.117***	0.129***	0.213***	0.114***	0.120***	1

The correlation table shows that the correlation between investments with lag-3 and patents winsorized at 70% highest. Lag -3 is the factor with the highest correlation overall, while lag-2 has a weaker correlation. Using lag-3 as the final independent variable might therefore make sense. The spearman coefficient is on the weaker side but still considerable and interesting. A more in-depth correlation table is provided in the appendix. Another interesting correlation is the one between investment and commitment. They are positively correlated, and a generally more green-focused company might be more likely to invest in a green start-up. Next, all controls show relatively higher correlation factors, especially R&D investment, as is to be expected with this variable. As portfolio and CVC experience are highly correlated with each other one of the variables will be dropped to handle multicollinearity. Specifically, CVC portfolio will be dropped as it seemed to have the lowest spearman correlation with green innovation output. The variables on the investment motivation of each of the investor correlate negatively with each other. Additionally, CVC's who invest more strategically seem to have smaller portfolios and less experience in the CVC space. What is especially striking is that there does not seem to be any connection between a green CVC investment and an investors motivation be it financial or strategic.

When only comparing Patents with a strict filter and investments lags, the correlation seems to be slightly weaker, than before. This could indicate that choosing additional patent categories did add explanatory power for a statistical model on green innovation.

Table 3. Spearman Correlation between the dependent (Patents) and independent (Investment) variables. Strict definition.

Variables	Patents (strict)	Patents (strict) win 95	Patents (strict) win 90	Patents (strict) win 80	Patents (strict) win 70	Investment lag 2	Investment lag 3	Investment lag 4	Investment lag 5
Patents (strict)	1								
Patents (strict) win 95	1.000***	1							
Patents (strict) win 90	0.999***	0.999***	1						
Patents (strict) win 80	0.995***	0.995***	0.996***	1					
Patents (strict) win 70	0.983***	0.983***	0.983***	0.987***	1				
Investment lag 2	0.090***	0.090***	0.093***	0.091***	0.088***	1			
Investment lag 3	0.112***	0.112***	0.114***	0.116***	0.114***	0.193***	1		
Investment lag 4	0.094**	0.093**	0.096**	0.098**	0.091**	0.127***	0.118***	1	
Investment lag 5	0.102**	0.102**	0.103**	0.101**	0.100**	0.213***	0.114***	0.120***	1

5.2. Results

Before fitting the final models, a Vuong test was conducted, between NB and ZINB models to test whether structural zeros, one of the hypotheses of a ZINB model, are present. The test resulted to be not significant ($p > 0.05$). Therefore, in the further modeling process ZINB models are not used as they don't fit the observed distribution of the data. In the following, several model variations are presented to show possible impacts of green CVC investments on green innovation. To all, model year- and industry-fixed effects are applied to control for specific trends inside of these categories. First, NB models with a broad and strict definition are taken.

Analyzing green innovation output with the broad specification did not result in significative results on the independent variable at a reasonable 95% winsorizing. However, winsorizing the innovation variable even further, resulted in coefficients around 0.2, significant at a p-value < 0.1 level (Table 10). As to be expected, Firm Size and R&D Stock had the strongest coefficients. Strategic

investment motivation also had a substantial impact on Green Innovation, while financial investment motivation resulted to have a slightly negative impact on innovation. CVC experience decreased the number of patents slightly in a model setting. The computed models show that incumbents do learn from green startups via CVC investments and that absorptive capacity is valid for green innovation too. However, the impact might take longer to show effects than in the US, where Bendig et al. (2022) used a lag of -2 years.

Models 1.1 – 1.3 (Table 4) test the effect of Green CVC on the broader definition of green innovation output. Across these models the coefficient is positive but statistically insignificant, suggesting that, when considering a wider set of green patents, CVC investments in green startups do not systematically translate into a higher number of patent output at the firm level. Instead, control variables drive the results. Firm Size and current R&D Stock are consistently positive and significant, indicating that larger incumbents with stronger knowledge bases are the main contributors to green innovation. Strategic Investment Motivation also exerts a strong positive effect, while financially motivated CVC units are less conducive to knowledge spillovers. Interestingly, CVC experience is negatively significant, indicating diminishing returns to repeated CVC activity. Overall, the broad definition of green patents appears to be noisy to gauge a clear signal on the impact of green CVC investments.

Models 2.1 – 2.3 (Table 5) narrow the dependent variable to patents classified under stricter patent codes ($Y0^*$). Here, the results differ: the Green CVC coefficient is positive and significant in both the full and optimized specifications. This provides evidence that corporate investments into green startups are associated with stronger innovation outcomes in narrowly defined and sustainability-related domains. Again, Firm Size and R&D Stock remain powerful predictors, reflecting incumbents' absorptive capacity. Strategic motivation continues to be strongly positive, while financial orientation remains insignificant in the stricter definition. These findings suggest that the link between Green CVC and innovation emerges only when innovation is measured narrowly, e.g., when excluding peripheral or potentially less radical patents. This is in line with findings from the US (Bendig et al., 2022).

Comparing the results to the stricter specification of green innovation resulted in a coefficient of 0.295, significant at a p -value < 0.05 level. This shows that investing in a green startup does seem to correlate with a higher green innovation output, even when controlling several other relevant

factors. The Akaike Information Criterion (AIC), a goodness of fit measure for non-nested models, resulted to be substantially lower for the strict green innovation output measure. This points towards the strict measure being the optimal specification. There are no sign changes in any of the coefficients, and they do have similar weights variable by variable, which can be read as an indication of robustness.

The empirical findings in this thesis corroborate several theories and not only point towards the relevant impact green CVC investment has on green innovation, but also give indications to best practices when choosing the innovation ecosystem, a European company chooses to operate in.

Table 4. Models 1.1 - 1.3. Model specification for Green Innovation Output under broad definition. Standard errors in parentheses. The NB model uses robust standard errors. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

<i>Dependent Variable</i>	<i>Green Innovation Output - broad – win 95%</i>		
	Model 1.1: Control-only model (NB)	Model 1.2: Full model (NB)	Model 1.3: Optimized model (NB)
<i>Independent Variable</i>			
Green CVC		0.199 (0.169)	0.184 (0.145)
<i>Controls</i>			
Green Commitment	0.196 ** (0.100)	0.171 * (0.096)	0.226 *** (0.085)
Financial Slack	0.139 * (0.083)	0.129 (0.085)	0.172 ** (0.084)
Firm Size	1.030 *** (0.131)	1.003 *** (0.134)	1.107 *** (0.128)
R&D stock	1.040 *** (0.180)	1.025 *** (0.178)	0.930 *** (0.161)
CVC experience	-0.170 ** (0.072)	-0.187 *** (0.070)	
Strategic	0.469 *** (0.068)	0.467 *** (0.067)	0.485 *** (0.065)
Financial	-0.148 * (0.080)	-0.155 * (0.080)	
Constant	2.668 *** (0.445)	2.607 *** (0.442)	2.502 *** (0.426)
Year-Fixed	Yes	Yes	Yes
Industry-Fixed	Yes	Yes	Yes
Observations	869	869	869
Log-likelihood	-3,360.60	-3,360.30	-3,353.70
AIC	6,763.21	6,764.66	6,747.43

Cov. Type	robust	robust	robust
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Table 5. Models 2.1 - 2.3. Model specification for Green Innovation Output under strict definition. Standard errors in parentheses. The NB model uses robust standard errors. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Dependent Variable	Green Innovation Output – strict - win 95%		
	Model 2.1: Control-only model (NB)	Model 2.2: Full model (NB)	Model 2.3: Optimized model (NB)
<i>Independent Variable</i>			
Green CVC		0.295 ** (0.150)	0.277 * (0.149)
<i>Controls</i>			
Green Commitment	0.197 ** (0.100)	0.160 (0.099)	0.200 ** (0.089)
Financial Slack	0.056 (0.085)	0.040 (0.084)	0.038 (0.084)
Firm Size	0.846 *** (0.124)	0.800 *** (0.125)	0.763 *** (0.120)
R&D stock	1.164 *** (0.150)	1.172 *** (0.149)	1.192 *** (0.137)
CVC experience	-0.048 (0.059)	-0.066 (0.057)	
Strategic	0.480 *** (0.065)	0.478 *** (0.065)	0.480 *** (0.067)
Financial	-0.056 (0.078)	-0.063 (0.078)	
Constant	2.244 *** (0.420)	2.148 *** (0.418)	2.273 *** (0.408)
Year-Fixed	Yes	Yes	Yes
Industry-Fixed	Yes	Yes	Yes
Observations	869	869	869
Log-likelihood	-2,842.80	-2,841.40	-2,841.80
AIC	5,727.69	5,726.71	5,723.66
Cov. Type	robust	robust	robust

5.3. Robustness Tests

Three robustness analyses were conducted (Table 6). First, the models were re-estimated using a Poisson Pseudo Maximum Likelihood (PPML) to account for excess zeros in patent data (Model 3.1). The coefficient of Green CVC remained positive but insignificant, suggesting that the main results are not sensitive to the distributional assumptions. Namely, NB models assume that the dependent variable follows a count distribution where the variance exceeds the mean (overdispersion). This extends the PPML model by introducing an unobserved heterogeneity term.

Second, a subsample analysis of the largest 50% of firms (Model 4.1) revealed a positive and significant effect of Green CVC on green innovation output. This indicates that the innovation-enhancing role of Green CVC is concentrated in larger incumbents, consistent with arguments on absorptive capacity. The model resulted in two surprising outcomes: The green commitment and financial investment motivation variables both changed signs, possibly indicating that larger firms invest in R&D for green innovation not because they want to be “good citizens”, but simply because it makes strategic and financial sense. Model 4.2 however, a subsample of the 50% smallest firms did result in a model that did not completely converge, this might be due to the low patenting activity (17.25% of all patents in strict definition).

Lastly, a placebo test is conducted to further verify the results. The main model was re-estimated, replacing Green CVC Investment with overall CVC investment per firm-year (Model 5.1). The logic is to test whether the estimated effect merely captures a firm’s general venturing intensity or openness to external innovation, rather than the green, technology-specific channel theorized. If the mechanism is indeed exposure to environmental technologies and green strategic alignment, general CVC should not increase green patenting once controls are held constant. Consistent with this expectation, the coefficient on overall CVC is statistically indistinguishable from zero and near-zero in magnitude, indicating that general venturing does not raise green patenting. This placebo findings are in line with prior work showing that thematically aligned CVC – not general venturing intensity – drive domain-specific innovation outcomes. In summary, the robustness checks confirm that the positive impact of Green CVC is contingent on firm size, is most notable under stricter innovation definitions and domain specific.

Table 6. Models 3.1 - 5.1. Model specification for robustness. Standard errors in parentheses. The NB and PPML model use robust standard errors. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

<i>Dependent Variable</i>	<i>Green Innovation Output – strict -win 95</i>			
	Model 3.1: Full model (PPML)	Model 4.1: Top 50% largest firms (NB)	Model 4.2: Top 50% smallest firms (NB)	Model 5.1: Placebo test (NB)
<i>Independent Variable</i>				
Green CVC	0.086 (0.093)	0.183 *** (0.070)	-0.127 (0.096)	
General CVC				-0.00 (0.015)
<i>Controls</i>				
Green Commitment	0.212 *** (0.077)	-0.273 *** (0.095)	0.433 ** (0.193)	0.196 * (0.102)
Financial Slack	-0.102 (0.101)	0.179 ** (0.084)	-0.126 (0.121)	0.056 (0.086)
Firm Size	0.406 *** (0.120)	0.370 *** (0.068)	0.443 * (0.232)	0.847 *** (0.125)
R&D stock	1.439 *** (0.164)	1.178 *** (0.169)	1.823 *** (0.204)	1.163 *** (0.151)
CVC experience	0.014 (0.040)	-0.162 ** (0.065)	-0.387 *** (0.131)	-0.045 (0.116)
Strategic	0.559 *** (0.062)	0.474 *** (0.075)	0.717 *** (0.162)	0.480 *** (0.066)
Financial	0.096 (0.073)	0.232 *** (0.080)	-0.167 (0.147)	-0.056 (0.080)
Constant	3.131 *** (0.401)	4.484 *** (0.440)	-45.821 (3.01*10 ⁶)	2.247 *** (0.429)
Year-Fixed	Yes	Yes	Yes	Yes
Industry-Fixed	Yes	Yes	Yes	Yes
Observations	869	441	428	869
Log-likelihood	-32,581.00	-1,865.10	-909.81	-2,842.80
AIC	65,205.09	3,774.21	1,863.63	5,729.67
Cov. Type	robust	robust	robust	robust

6. Discussion

6.1. Theoretical Implications

The purpose of this study was to verify positive effects first measure on the US market of green CVC investments on green innovation output. Thereby, the thesis adds to current topics in CVC and innovation research. Empirical analysis indicates that this effect does exist in Europe too and that rather than being the main contributor to green innovation, it is a component that has shown to be helpful in fostering patent output. Notably, it takes a year longer than in the US to take effect.

Across the model specifications, the following insights emerge. Firstly, green CVC investments do have a significant and positive effect on green innovation output confirming the main Hypothesis and delivering evidence for the effect described by Bendig et al.(2022) being true in Europe too. The effect of green corporate investments only matters when measured narrowly. On one hand, this could indicate an unspecific choice of patent categories; on the other hand, it points toward a specialization effect as described by Gompers et al. (2009), where incumbents' venture investments are channeled into focused technological topics rather than diffused innovation activities. Additionally, organizational commitment to green topics was a relevant moderator for green innovation, with that H2 can be accepted. This verifies (Moss et al., 2018) findings and shows how a coherent sustainability strategy helps fostering green innovation output. The stronger effect for strategically oriented CVC units suggests that organizational context moderates the effectiveness of CVC investments on innovation output, confirming H3a. Surprisingly, financial investment motivation was not consistent within the models. It changed signs throughout the models and was not significant. Interestingly, for large firms it was positive and significant. H3b can therefore be rejected. This finding can indicate that a green investment is on that must make business sense too for large firms. Size and R&D stock showed results within what was expected and H4a and H4b can be confirmed. Financial Slack did not appear to have a relevant impact on green innovation output however, although adding the variable improved overall model fit. The consistent significance of a firm's capabilities underlines that Green CVC complements, rather than substitutes, incumbents' internal resources. Lastly, variables connected to CVC activity (experience and portfolio) did not show relevant effects on green innovation output and did neither significantly strengthen nor weaken the impact of CVC investments, although having controlled for diminishing incremental gains (Ma, 2020). Therefore, H5a and H5b will be rejected.

6.2. Practical Implications

For policymakers, this suggests that supporting Green CVC may strengthen clean-tech development particularly with large incumbents, reinforcing the EU's sustainability agenda. From a policy point of view subsidizing green corporate investments, be it through tax incentives or grants could be a good practice to improve green innovation in count and quality. This could play an important role in decarbonizing the European economy as well as create new jobs.

While green CVC investments are correlated with green commitment and might have some signaling function attached to it, the coefficient in models controlling for this possibility show a higher weight for the investment activity than for the commitment score. This also highlights that, again, an investment in green start-ups makes strategic and financial sense, especially for larger corporates.

Companies that actively invested in green startups also tended to have higher commitment to sustainability than peers that were not investing in the same way. This offers some additional support to signaling theory. Companies with higher absorptive capabilities size and R&D stock showed to be able to take advantage of their investments more effectively. The study bridges an important gap on CVC research in Europe.

Especially in Europe, CVCs can take advantage of public initiatives and public funding for green innovation. The investigation has shown that operating a CVC is a vital part of an incumbent's green innovation ecosystem, besides a regular corporate R&D program. However, other methods such as Venture Clienting or Venture Debt could also be of interest, and impact of CVC investments does depend on the industry. Manufacturing and Transportation companies showed the highest impact of investments on green innovation. As most green start-ups do have tangible assets, in contrast to Software-as-a-Service companies' downside risk can be lower for investors. Lastly, investors will appreciate the absorption of entrepreneurial culture start-ups are known for. This could result in more innovation and ownership within the employees.

For green start-ups, having a corporate investor will help with time to market, add financial stability and support product innovations. It would be interesting to see how green innovation hubs can be fostered by policy makers and what models of cooperation result in the highest innovation impact. A corporate investor should be picked carefully so that the proper conditions are given to keep growing and disrupting.

6.3. Limitations & Future Research Directions

The most relevant limitations for this research are the data sources. Many times, CVC funding deals are not made publicly available, due to strategic reasons by the investors and/ or start-ups. In recent years alternatives to equity funding, such as venture debt or venture clienting have become more popular with corporates as it mitigates risk and does not bind as much capital as equity. Additionally, the European market is not covered in the same way as the USA. However, *Dealscreener* was the only tool available to the author and is a respected source in research.

Additionally, there are many different types of innovation and start-up engagement. Many of which are not available in databases. The scope for this research is therefore limited to only the impact of equity-based corporate venture activities that have been disclosed in available databases.

While all possible actions have been taken to reduce limitations of this research, data and its availability have been one of the major issues. The databases used to investigate CVC investments tend to be incomplete and therefore several and major European companies that were not included in the analysis although it is public knowledge that they took part in start-up transactions since 2012. It would have been interesting to investigate a specific sector or stock index further. Additionally, the definition of what a “green” start-up really is, is somewhat unclear. However, using a topic classifier like ClimateBERT helped improving the classification of green investments. It is plausible that there are several other unobserved factors influencing results such as informal knowledge spillovers. Lastly, it is important to note, that companies active in CVC might be more innovative in general due to internal innovation capabilities not observed in this study.

Possible directions for research in the future can be investigating the long- and short-term effects of green CVC investments on incumbents, investigating carbon heavy industries (e.g. construction or agriculture) or focusing on other markets such as Asia, Africa or South America. Furthermore, not part of this study has been alternative venturing models such as debt and clienting. Innovation ecosystems are far more complex with different roles that an incumbent company can take on. There is no one size fits all model, and the roles should be chosen strategically with key financial measures in place. Furthermore, investigating the implications of certain policies on green innovation might improve the understanding of the impact of venturing involvement of incumbents. Additionally, research into the efficiency of CVC investments for innovation on a commercialization level rather than purely research can be interesting. Lastly, most literature

focuses on public companies with separate funds to invest in start-ups, rather than private companies (Schildt et al., 2005). This is especially important to note, as this shows a bias in results. For instance, 96% of companies with more than 100 million US-dollars in revenue in 2023 were held privately, following Private Equity firm Apollo (Sløk, 2024). Investigating privately held companies too would help to paint the bigger picture.

6.4. Conclusion

This thesis set out to investigate whether green CVC investments contribute to incumbents' green innovation output in Europe. By applying count data models to a novel dataset of CVC deals and patents, the study provides empirical evidence that green CVC investments have a positive and significant effect on green patent output. The findings extend prior research conducted in the U.S. to the European context and highlight both the potential and boundaries of CVC as a strategic tool for fostering sustainability-oriented innovation.

The results suggest that green CVC is not the sole driver of green a key building stone for sustainability innovation networks that interacts with incumbents' absorptive capacities. Organizational commitment further strengthens the effectiveness of such investments, emphasizing the interplay between financial capital, strategic orientation, and corporate culture- While strategically motivated CVC units appear to deliver stronger results, the role of financial investment motivation is inconclusive. This underscores the importance of aligning corporate venturing activities with broader sustainability strategies to ensure innovation outcomes.

Overall, the study confirms that green CVC investments can support Europe's transition towards a more sustainable economy by enabling knowledge transfer from start-ups to incumbents and by accelerating across industries and firms, suggesting that CVC is most effective when combined with other instruments of corporate innovation and supported by enabling policy frameworks.

Appendix

Table 7. Overview over variables, their operators and respective sources.

Variable	Operator	Source
Green Innovation Output	Granted Patents	Google BigQuery - Patents Public Data
Green CVC Investments	CVC Investments (modified with ClimateBERT)	LSEG Workplace - Dealscreener
Green Commitment	Topic classifier score of the management report with ClimateBERT	LSEG Workspace - Filings
Investment Motivation	About us and similar texts on the website. Text analysis with dictionary provided by (Röhm et al., 2018)	Respective website of the CVC fund
Size	Revenue	Compustat
R&D Stock	Sum of R&D expenses during the last 4 years	Compustat
Unabsorbed financial slack	Current ratio	Compustat
CVC Portfolio	CVC Investments in current holdings	LSEG Workplace - Dealscreener
CVC Experience	All Investments made by an Incumbent	LSEG Workplace - Dealscreener

Table 8. CPC Groups relating to the Green Transition in all its aspects.

CPC Group	Description
A01G 25	Irrigation and fertilizing technologies.
A01H 5	New plants or processes for obtaining them; reproduction by tissue technology.
A01N 63	Biocides/ Pest repellants/ Plant growth regulators
B01D 53	Recovery of gases, separation of gases and vapors.
B09B	Disposal of solid waste not otherwise provided for.
B29B 17	Recovery of plastics or other constituents of waste material containing plastics.
B60K 6	Hybrid propulsion systems, e.g. comprised of electric and internal combustion engines.
B60L	All technologies related with the propulsion of electrically propelled vehicles.
B62M 6	Rider propulsion with additional motor for single-track cycles.
B63B 35	Purpose-specific Vessels or floating systems, e.g. wind-propelled ships, platforms for offshore wind parks
C01B 3	Hydrogen and processes related to its production storage or combustion.
C02F	Water treatment, wastewater etc.
C07C 29	Organic Chemistry, Synthetic fuels and processes related to their production.
C08L 101	Compositions of unspecified macromolecular compounds, e.g. biodegradable bags and other starch-based packaging materials.
E04B 1	General Building Constructions, includes Energy Efficiency, Sustainable Building Materials (e.g. Cork), etc.
E04H 1	Purpose-specific Building-constructions, e.g. passive office building.
F01K 23	Steam engines not otherwise provided for, e.g. micro-turbines running on process-generated steam.
F03B	Machines or engines for liquids, e.g. water wheels, turbines, etc.
F03D	Wind motors and related technologies, e.g. turbines, rotors, etc.
F24F 11	Safety and control systems for Air Conditioning, Ventilation, e.g. Smart Thermostats, HVAC control systems
F24S	Thermal Solar Energy
F25B 30	Heat pumps and related technologies
H01G 11	Electrochemical Capacitors, used in EVs etc.
H01M	Batteries and related Technologies and Processes
H01L	Semiconductors. Filtered to include PV related and electricity grid semiconductor categories.
H02J 7	Circuit arrangements or systems supplying and distributing electric power. Charging equipment.
H02S	Generation of electric power by conversion of light, e.g. PV modules.

Y0* All Subgroups are Technologies or Applications for Climate Change Mitigation or Adaptation and Grid Connectivity

Table 9. Spearman correlation between all variables included in analysis. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Variables	Patents	Patents win 95	Patents win 90	Patents win 80	Patents win 70	Patents (strict)	Patents (strict) win 95	Patents (strict) win 90	Patents (strict) win 80	Patents (strict) win 70
Patents	1									
Patents win 95	1.000***	1								
Patents win 90	0.999***	0.999***	1							
Patents win 80	0.995***	0.995***	0.996***	1						
Patents win 70	0.983***	0.983***	0.984***	0.988***	1					
Patents (strict)	0.980***	0.980***	0.980***	0.975***	0.962***	1				
Patents (strict) win 95	0.980***	0.980***	0.980***	0.976***	0.962***	1.000***	1			
Patents (strict) win 90	0.980***	0.980***	0.980***	0.976***	0.963***	0.999***	0.999***	1		
Patents (strict) win 80	0.976***	0.976***	0.976***	0.978***	0.967***	0.995***	0.995***	0.996***	1	
Patents (strict) win 70	0.962***	0.962***	0.963***	0.966***	0.970***	0.983***	0.983***	0.983***	0.987***	1
Investment lag 2	0.099***	0.099***	0.102***	0.098***	0.100***	0.090***	0.090***	0.093***	0.091***	0.088***
Investment lag 3	0.136***	0.136***	0.138***	0.138***	0.144***	0.112***	0.112***	0.114***	0.116***	0.114***
Investment lag 4	0.114***	0.114***	0.116***	0.116***	0.117***	0.094**	0.093**	0.096**	0.098**	0.091**
Investment lag 5	0.117***	0.117***	0.116***	0.117***	0.129***	0.102**	0.102**	0.103**	0.101**	0.100**
Green Commitment	0.162***	0.162***	0.161***	0.164***	0.150***	0.158***	0.158***	0.159***	0.156***	0.146***
Financial Slack	0.185***	0.186***	0.185***	0.184***	0.184***	0.160***	0.160***	0.160***	0.163***	0.160***
Firm Size	0.424***	0.424***	0.423***	0.424***	0.430***	0.430***	0.430***	0.431***	0.433***	0.428***
R&D Stock	0.645***	0.645***	0.646***	0.642***	0.629***	0.641***	0.641***	0.642***	0.643***	0.622***
CVC Experience	0.181***	0.181***	0.181***	0.176***	0.190***	0.188***	0.187***	0.187***	0.194***	0.191***
CVC Portfolio	0.195***	0.195***	0.195***	0.193***	0.207***	0.200***	0.199***	0.200***	0.207***	0.202***
Strategic	0.296***	0.296***	0.296***	0.292***	0.278***	0.278***	0.278***	0.276***	0.267***	0.263***
Financial	-0.092***	-0.092***	-0.093***	-0.105***	-0.098***	-0.098***	-0.098***	-0.099***	-0.107***	-0.100**

	Investment lag 3	Investment lag 4	Investment lag 5	Green Commitment	Financial Slack	Firm Size	R&D Stock	CVC Experience	CVC Portfolio	Strategic
Investment lag 3	1									
Investment lag 4	0.118***	1								

Investment lag 5	0.114***	0.120***		1						
Green Commitment	0.229***	0.238***	0.251***		1					
Financial Slack	0.03	0.035	0.062	0.169***		1				
Firm Size	0.209***	0.198***	0.192***	0.240***	-0.136***		1			
R&D Stock	0.119***	0.105***	0.091**	0.094**	0.187***	0.472***		1		
CVC Experience	0.265***	0.213***	0.197***	-0.057*	-0.072**	0.315***	0.260***		1	
CVC Portfolio	0.309***	0.278***	0.262***	-0.092***	-0.086**	0.329***	0.255***	0.861***		1
Strategic	0.006	0.019	0.014	0.258***	0.148***	-0.021	0.241***	-0.148***	-0.117***	
Financial	-0.032	-0.054	-0.054	-0.171***	0.015	-0.048	-0.083**	0.111***	0.070**	-0.205**

Table 10. Additional Model specifications included for completeness. Standard errors in parentheses. The negative binomial model uses robust standard errors. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

<i>Dependent Variable</i>	<i>broad</i>	<i>broad – win 80%</i>	<i>strict – win 70%</i>
<i>Green Innovation</i>	Model 6.1: Full model (NB)	Model 6.2: Full model (NB)	Model 6.3: Full model (NB)
<i>Output</i>			
<i>Independent Variable</i>			
Green CVC	0.175 (0.174)	0.216 * (0.131)	0.152 (0.102)
<i>Controls</i>			
Green Commitment	0.271 ** (0.107)	0.070 (0.072)	-0.008 (0.057)
Financial Slack	0.062 (0.088)	0.230 *** (0.073)	0.161 *** (0.061)
Firm Size	1.083 *** (0.140)	0.744 *** (0.117)	0.460 *** (0.087)
R&D stock	1.059 *** (0.183)	0.823 *** (0.137)	0.596 *** (0.100)
CVC experience	-0.200 *** (0.072)	-0.068 (0.046)	0.015 (0.034)
Strategic	0.526 *** (0.071)	0.313 *** (0.055)	0.225 *** (0.051)
Financial	-0.088 (0.084)	-0.074 (0.070)	-0.096 (0.102)
Constant	2.502 *** (0.344)	1.804 *** (0.344)	0.451 * (0.257)
Year-Fixed	Yes	Yes	Yes
Industry-Fixed	Yes	Yes	Yes
Observations	869	869	869

Log-likelihood	-3,417.60	-2,922.00	-2,020.90
AIC	6,879.18	5,887.93	4,085.89
Cov. Type	robust	robust	robust

List of Abbreviations

AIC.....	Akaike Information Criteria
CPC.....	Cooperative Patent Codes
CVC.....	Corporate Venture Capital
IVC.....	Independent Venture Capital
NB.	Negative Binomial
PPML.....	Poisson-Pseudo Maximum Likelihood
SFDR.....	Sustainable Finance Disclosure Regulation
SME.....	Small Medium Enterprise
VC.....	Venture Capital
ZINB.....	Zero-Inflated Negative Binomial

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