

Ambidextrous Corporate Venture Investing: A Governance Path to Sustainable ESG Outcomes

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Abstract:

This paper examines the influence of various ambidexterity tactics on green innovation among corporate investors. It explores how these investors might improve their environmental performance by acquiring green innovations through ambidextrous corporate venture capital (CVC) investments. The study demonstrates that 126 American corporate investors can successfully leverage green innovation by making ambidextrous investments in entrepreneurial enterprises. Although static ambidexterity has negative effects, corporate investors who pursue dynamic ambidexterity or a combination of dynamic and static ambidexterity show enhanced outcomes in green innovation. This research demonstrates a clear connection between the green innovation of corporate investors and their enhanced environmental performance, particularly in terms of reducing greenhouse gas (GHG) emissions. The study contends that ambidextrous CVC investments serve as a gateway for corporate investors to elevate their environmental performance through the strategic acquisition of green innovation. Crucially, the results highlight that companies can enhance their environmental, social, and governance (ESG) ratings by proactively adopting green innovation. This research provides significant insights for company managers, regulators, and government bodies, delivering practical knowledge for establishing environmentally friendly practices in corporate investment strategies.

Keywords: Corporate venture capital; static ambidexterity; dynamic ambidexterity; green innovation; environmental performance

1. Introduction

The impacts of climate change have emerged as one of the defining global challenges of the 21st century and are increasingly evident in ecosystems, economies, and societies (Shuwaikh, 2024). Human activities are still the main cause of environmental deterioration, mainly through the over-emitting of carbon, extravagancy of consumption, and industrial inutilities (Benkraiem et al., 2023). International organizations such as the Intergovernmental Panel on Climate Change (IPCC) (2023) have long highlighted the urgent necessity for firms to reduce greenhouse gas (GHG) emissions and change their environmental behaviors.

Green innovation has become necessary for organizations dealing with these challenges (Shuwaikh & Dubocage, 2024). Green innovation is described as the integration of environmental goals into product, process, and organizational innovations (Chen, 2008; Woo et al., 2014); green innovation provides not only ecological benefits but also economic opportunities. Empirical research indicates that it can increase environmental performance by up to 27% (Kraus et al., 2020) and promote a more sustainable economy (Yang et al., 2022). Moreover, green innovation is also linked to enhanced financial performance and competitive advantage (Benkraiem et al., 2023; Lin et al., 2021; Shuwaikh et al., 2023); thus, it is a pillar for a sustainable long-term business strategy.

The essence of strategically pursuing innovation is bounded by the concept of ambidexterity, that is, a firm's ability to simultaneously organize both exploratory and exploitative activities (Lavie et al., 2010; March, 1991). Exploration is concerned with experimentation, radical innovation, and the pursuit of new knowledge (Tushman & O'Reilly, 1996). Exploitation focuses on refining efficiency in incrementalistic improvement (Baum et al., 2000). This tension has led to alternative theoretical views on static and dynamic ambidexterity processes (Gupta et al., 2006; He & Wong, 2004; Raisch & Birkinshaw, 2008). Some researchers argue for a balanced (static) setup, while others favor the necessity of temporal or contextual dynamism (Jansen et al., 2006; Shuwaikh et al., 2022).

We examine how ambidexterity strategies embedded in corporate venture capital (CVC) programs influence firms' green innovation and environmental performance. CVC refers to the practice of established companies making long-term equity investments in start-ups (Shuwaikh et al., 2023). CVC provides companies with access to innovative technologies and startups

concentrating on sustainability and bridges the gap between internal capacities and the opportunities outside (Shuwaikh, 2018). CVC investments enable corporate investors to access and benefit from innovation (Maula et al., 2013; Shuwaikh & Dubocage, 2022; Wadhwa et al., 2016). Additionally, these investments “open the gates” and provide an opportunity for companies to enhance their environmental performance by reducing GHG emissions (Battisti et al., 2022; Benkraiem et al., 2023). Through the use of ambidextrous CVC strategies, firms can exploit existing and explore new environmental resources to improve their environmental and sustainability performance.

Despite increasing attention to the strategic value of CVC (Huang & Rind, 2017), the environmental implications of ambidextrous CVC investing remain underexamined. Additionally, although previous research has demonstrated that CVC ambidexterity is associated with financial performance (Shuwaikh et al., 2022), the potential green innovation and environmental consequences of CVC ambidexterity remain largely unexplored. This study is groundbreaking because it is the first to investigate the connections among ambidexterity, green innovation, and environmental performance in the context of CVC investments. The fundamental idea is based on the belief that corporations can utilize ambidexterity strategies to “acquire” green innovation by implementing CVC programs and making investments in entrepreneurial ventures. As a result, these “acquired” green innovations can be utilized to improve the environmental performance of parent companies, making them more sustainable, in line with customer expectations, and compliant with environmental and social regulations.

The potentially novel contribution of this study to the literature on ambidexterity, green innovation, and CVC is triple-faceted. First, although the natural resource-based view (NRBV) has been used to understand firms’ development of internal environmental capabilities (Hart, 1995; Hart & Dowell, 2011), little work connects NRBV to external innovation acquisition strategies such as CVC. We address this gap by identifying how ambidextrous CVC activities can be an engine with which firms can acquire valuable, rare, and inimitable green capabilities from external startups. This conceptual integration places CVC at the intersection of financial (and strategic) instruments and as the route to enduring environmental advantage.

Second, while the financial implications of ambidextrous CVC strategies have been examined in previous studies (e.g., Shuwaikh et al., 2022), their effects on environmental innovation and sustainability have been largely unexamined. Our study is the first to empirically explore the impacts of different types of ambidexterity—static, dynamic, and both static and dynamic CVC investment portfolios—on green innovation and environmental performance. By directing our attention to environmental outcomes, we extend the enquiry into the ambidexterity perspective to the field of corporate sustainability.

Third, the majority of current research has considered static and dynamic ambidexterity as separate phenomena or as competing phenomena (Gupta et al., 2006; Raisch & Birkinshaw, 2008). In contrast, we propose and verify a construct of combined ambidexterity to capture the synergistic effects of balance (static) and intensity (dynamic). This articulation leads to a more refined operationalization of ambidexterity and responds to recent calls in the literature (e.g., Shuwaikh et al., 2022; Jansen et al., 2006) to more accurately measure its multidimensionality. This means that firms can achieve better environmental performance by strategically combining the two dimensions.

This paper is divided into six sections. Following the introduction, Section 2 presents the literature review. Section 3 presents the data selection and methodology. Next, we describe and discuss the empirical results in Section 4. Finally, we present the conclusions, highlighting the opportunities for future research and our limitations in Section 5.

2. Theoretical Framework and Literature Review

2.1. Theoretical Framework

The resource-based view (RBV) suggests that the development of competitive advantages requires the possession of non-substitutable, imitable, rare, and valuable resources (Barney, 1991; Wernerfelt, 1984); however, it does not address the restrictions of the natural environment. As a result, NRBV theory was developed to complement it, arguing that there is a relationship among skills, resources, and a firm's natural environment.

According to NRBV theory, firms with unique heterogeneous resources have competitive advantages (Barney, 1991; Hart, 1995). This framework focuses on three dimensions with different environmental benefits: pollution prevention, product management, and sustainable development

(Hart & Dowell, 2011; Hart, 1995). This suggests that, while striving for long-term success, companies should also be concerned about preserving the natural environment using resources and skills with a longer-term view rather than focusing on short-term results. Hence, sustainable products and technologies are fundamental to the development of a firm's competitive advantage.

The market, customers, governments, and regulators are putting firms under pressure to develop technologies that create innovative products and processes to improve energy efficiency and reduce their environmental footprint (Dangelico & Pujari, 2010). According to “the Porter hypothesis,” regulators play a very important role, as environmental laws can contribute to the development of innovative environmental activities while promoting economic outcomes (Shuwaikh et al., 2023). With flexible laws, firms can reduce or even offset the additional costs of complying with environmental policies through the innovations they develop (Porter & van der Linde, 1995). According to NRBV theory, firms can develop competitive advantages and improve their financial performance as long as they are able to manage environmental issues effectively (Hart & Dowell, 2011). This theory provides a framework to analyze the different technological innovations that firms can use to mitigate the impact of environmental pressures, based on firms' relationships with the natural environment. Battisti et al. (2022) highlighted that this framework is suitable for assessing the relationship between firms' environmental activities and their climate change policies. We believe that this theoretical background is suitable for our research, as it opens a window for exploring the relationship between green innovation and firms' environmental performance.

Extending the logic of the NRBV, which posits that environmental capabilities—defined as organization-specific, path-dependent resources that facilitate pollution prevention and nature-congruent development (Hart, 1995; Hart & Dowell, 2011)—are key to sustained environmental advantage. CVC strategies may be established as a means to develop these capabilities by combining both radical (explorative) and incremental (exploitative) green innovations (Chen, 2008; Raisch & Birkinshaw, 2008). Firms gain access to new green technologies through explorative investments, and they refine and scale environmental solutions through exploitative investments. This integration develops dynamic capabilities (Teece, 2007) that enable corporate investors to reconfigure resources for environmental performance in ways that are valuable, rare, and difficult to imitate (Fernando et al., 2018). Thus, ambidextrous CVC activity advances the development of environmental abilities consistent with the NRBV rationale and logic.

These findings may be explained from the perspective of the NRBV. Ambidextrous CVC approaches help firms collaborate with existing and new entrepreneurial ventures that can make different green technologies and environmental practices available. This combined mechanism enriches the capacity of firms to recoupling external and internal resources (a form of dynamic capabilities; see Teece, 2007) to buttress their ecological capabilities (Fernando et al., 2018; Hart, 1995). Such capabilities are firm-specific, path-dependent, socially embedded, and consistent with the NRBV prescription for sustainable competitive advantage—they must be valuable, rare, and incapable of being imitated. Therefore, the complementary nature of ambidextrous CVC strategies not only enhances green innovation but also helps organizations develop sustainable environmental capabilities for a long-term competitive advantage.

The allocation of resources by firms is influenced by exploration and exploitation activities. Although fundamentally different, these activities are considered learning actions (March, 1991). As a result, the distinction between exploration and exploitation is our starting point for conceptualizing our research. Exploitation comprises activities that are related to “refinement, production, efficiency, selection, implementation, and execution,” while activities that include “search, variation, risk taking, experimentation, play, flexibility, discover, and innovation” are associated with exploration (March, 1991).

Gupta et al. (2006) added three important contributions to the literature on organizational learning. First, they explained how exploration and exploitation deal with the scarcity of resources. A trade-off in resource allocation between exploration and exploitation is inevitable, as both strategies require resources from the same pool (March, 1991). In addition, similar to other studies, we assume that exploration and exploitation are two ends of the same continuum (Gupta et al., 2006; Phelps, 2010). A distant search is seen as exploration, and a local search is deemed exploitation. Hence, at any given point in time, both activities will be influenced by the allocation of resources (Dushnitsky & Lenox, 2006). Therefore, the greater the amount of resources allocated to exploration, the smaller the amount of resources remaining for exploitation, and vice-versa (Shuwaikh et al., 2022).

Second, there is a self-reinforcing effect of exploration and exploitation because a focus on exploration fosters further exploration, and a concentration on exploitation leads to additional exploitation. This self-reinforcing effect can significantly reduce the benefits of both activities. The focus on exploration makes firms more likely to underperform, as they reduce the focus on their

operations and focus solely on experimentation and discovery. On the other hand, by concentrating on exploitation, companies become obsolete because they do not follow technological innovation and lose competitiveness in the market.

Third, the structure, organizational routines, and mindsets required for the two activities are completely different (O'Reilly & Tushman, 2013). These differences create pressures from both sides that make it difficult to maintain a balance between the two activities.

As a result, ambidexterity has been conceptualized as the ability to manage the tension between exploration and exploitation activities (Raisch & Birkinshaw, 2008) and the ability to match or simultaneously pursue them (He & Wong, 2004; Lavie et al., 2010; Raisch & Birkinshaw, 2008). The optimal level of ambidexterity and comparison between companies depend on the definition of ambidexterity. If we define ambidexterity as the balance between exploitation and exploration, the more equal the levels of exploitation and exploration, the more ambidextrous the companies are. This form of ambidexterity can be computed as the absolute difference between exploitation and exploration (He & Wong, 2004). On the other hand, if we define ambidexterity as the combined degree of exploration and exploitation, the higher the degree of these activities, the more ambidextrous a firm is. This type of ambidexterity results from the sum or product between the degrees of exploration and exploitation (Gibson & Birkinshaw, 2004; He & Wong, 2004; Lubatkin et al., 2006). Marín-Idarraga et al. (2025) examined the impact of innovation as a mechanism that may influence the links among exploration, exploitation, ambidexterity, and performance; it is a meta-analytic investigation of the curvilinear interplay of exploration and exploitation on performance. It emphasizes the important moderating power of innovation for exploration–exploitation and firm performance. Interestingly, the ambidexterity-resolving role does not apply to it. This accumulated evidence attempts to reconcile the fragmentation of prior research due to conceptualizations and measures and provides a clearer picture of how innovation expectancy leads to performance outcomes.

2.2 Literature Review and Hypotheses Development

Balancing exploration and exploitation has been the main topic of discussion regarding ambidexterity. However, its benefits depend on their impact on firm performance (Hill & Birkinshaw, 2014). Previous research has highlighted the positive effect of balancing the two activities on a firm's financial performance (Levinthal & March, 1993). The positive contribution

will continue due to the self-reinforcing effect of ambidexterity because when companies achieve the balance between exploration and exploitation, they will easily achieve it in subsequent periods.

The way to achieve the balance between exploration and exploitation has been discussed in the literature, and the idea of striking the right balance has been widely used (Gupta et al., 2006; Raisch & Birkinshaw, 2008). Previous research has found that ambidextrous firms are able to enhance their performance using this mechanism to set ambidexterity (Boumgarden et al., 2012; Hill & Birkinshaw, 2014; Rossi et al., 2021). Therefore, with similar degrees of exploration and exploitation, firms can effectively improve their organizational performance (Cao et al., 2009). They should seek new knowledge and capabilities to develop innovative solutions and thereby maximize their future cash flows. On the other hand, they should use their current resources and capabilities to improve their current performance and increase their chances of continuity (Levinthal & March, 1993).

There is empirical evidence that a balanced ambidexterity has a greater impact on sales, revenues, and operating competence (Cao et al., 2009; He & Wong, 2004), while an imbalanced approach leads to additional risk to firms' performances (Levinthal & March, 1993). Despite the positive impact on short-term performance, firms should be aware that the exploitation of current resources and capabilities will not provide them with long-term sustainable competitive advantages because they will not capture innovative technologies (Tushman & Anderson, 1986), and their current resources and capabilities may become obsolete in the short-term (Christensen & Overdorf, 2000). With this argument, the authors do not exclude exploitative activities because if firms focus only on exploration, the failure rate is even higher due to the high costs of experimentation, research, or discovery, which in turn increases the risk of becoming unprofitable.

In our research, the balance between exploitation and exploration activities is conceptualized as static ambidexterity. We hypothesize that if firms decide to adopt a static approach of ambidexterity by striking a balance between explorative and exploitative CVC investments, they will capture green innovation. Therefore, our first hypothesis is as follows:

Hypothesis (1): Static ambidexterity positively impacts corporate investors' green innovation performance.

Previous research has conceptualized simultaneous ambidexterity as the concurrent pursuit of both exploration and exploitation in the same period (Gupta et al., 2006). This form of ambidexterity provides firms with the opportunity to strengthen current cash flows through productivity

improvements achieved with current skills and knowledge while enhancing future cash flows through experimentation and innovation (March, 1991). Firms should combine both activities; otherwise, they will face serious problems in taking a long-term view because resources may become obsolete if they focus only on specialization. On the other hand, they may risk becoming unprofitable and, thus, may fail if they focus exclusively on external activities and ignore their own operations (Levitt & March, 1988). Focusing solely on exploitation or exploration will certainly lead to poor performance (Belderbos et al., 2010; Uotila et al., 2009), and the survival of companies may be threatened due to the self-reinforcing effects of exploration and exploitation (March, 1991).

CVC investments are considered a mechanism for acquiring innovation. There is empirical evidence that CVC investment can and does improve a company's innovation performance (Dushnitsky & Lenox, 2005, 2006). In addition, previous research has also highlighted the possibility of using explorative and exploitative strategies when firms make their CVC investments (Hill & Birkinshaw, 2014; Wadhwa & Basu, 2013). Exploitative CVC investments are those made in companies with a high degree of similarity to the parent firm's business model (Wadhwa & Basu, 2013), while explorative CVC investments are those made in companies with completely different business models (Hill & Birkinshaw, 2014).

The positive effect of jointly pursuing explorative and exploitative CVC investments on firms' innovation results from the complementary use of both activities (Hill & Birkinshaw, 2014). By investing in companies with similar business models, corporate investors capture incremental innovation by using or combining the technologies owned by these companies. On the other hand, if they invest in completely different companies, they explore opportunities for new technologies that capture radical innovation.

In our research, we conceptualize dynamic ambidexterity as the ability to simultaneously pursue explorative and exploitative CVC investments. Based on this theoretical framework, we formulate our second hypothesis:

Hypothesis (2): Dynamic ambidexterity positively impacts corporate investors' green innovation performance.

Some authors have highlighted the benefits of the interaction between the two forms of ambidexterity, arguing that this interaction can yield a synergistic effect on organizational performance. Cao et al. (2009) introduced the view of measuring ambidexterity as an interaction model between different types of ambidexterity. Based on a survey of 122 technology

organizations, they argued that the simultaneous pursuit of combined (i.e., dynamic ambidexterity in our study) and balanced ambidexterity had synergistic effects on organizational performance. They emphasized that the benefits of high levels of combined ambidexterity (i.e., dynamic ambidexterity) can be enhanced by employing high levels of balanced ambidexterity. Using our definitions of ambidexterity, Cao et al. (2009) argued that high levels of both static and dynamic ambidexterity lead to a more effective allocation of current resources and knowledge to acquire new capabilities. In addition, the high levels of the two types of ambidexterity allow firms to better integrate new knowledge and resources into their existing set of competences. Cao et al. (2009) also highlighted that although used together, the lowest performance is achieved when high levels of combined ambidexterity (i.e., dynamic ambidexterity) and low levels of balanced ambidexterity are employed. Therefore, when firms combine static and dynamic ambidexterity, they should employ high levels of both forms of ambidexterity; otherwise, they risk getting worse performance.

Following the idea of measuring ambidexterity with an interaction model, Shuwaikh et al. (2022) found a synergistic improvement in firms' financial performance motivated by the interaction between simultaneous and balanced ambidexterity. Shuwaikh et al. (2022) found strong empirical evidence of the positive impact of simultaneously pursuing balanced and ambidextrous CVC investments on corporate investors' financial performance.

Capturing ambidexterity in an interaction model motivates insight into the impact of the interactions of different ambidexterity forms on organizational performance. Therefore, we hypothesize that when investing in entrepreneurial companies, corporate investors should simultaneously pursue static and dynamic ambidexterity to synergistically capture green innovation. As a result, our third hypothesis is as follows:

Hypothesis (3): The combined pursuit of static and dynamic ambidexterity synergistically affects corporate investors' green innovation performance.

The concept of green innovation is related to new technologies that conserve energy, reduce the consumption of fossil fuels and water, and reduce air pollution or waste of resources (Kraus et al., 2020). Companies' products, marketing, and organizational innovations have been conceptualized as firms' green innovation as long as it significantly reduces their environmental footprints (Chen, 2008; Woo et al., 2014) either by consuming less energy or fewer materials (Dangelico, 2016).

Using 297 large manufacturing firms, Kraus et al. (2020) suggested that green innovation can enhance firms' environmental performance by 27%. By integrating environmental practices

into corporate strategies through green innovation, firms can consolidate a competitive advantage (De Marchi et al., 2022). Previous research focused on CVC investments has found that improvements in green innovation lead to improvements in financial performance (Benkraiem et al., 2023), which may compensate for the high costs of becoming green. Furthermore, according to past literature, CVC programs have a positive impact on a firm's environmental and social performance (Battisti et al., 2022), and green innovation can be used to increase corporate investors' environmental performance (Benkraiem et al., 2023).

Other relevant studies have examined other tools that can effectively reduce firms' environmental impacts. Chang and Gotcher (2020) defined environmental innovation ambidexterity as the "capability to simultaneously achieve efficient exploitation and effective exploration to contribute to a reduction of environmental impacts" and argued that environmental innovation ambidexterity can bring firms' eco-innovation, strengthening the perspective of dynamic capabilities (O'Reilly & Tushman, 2008). There is also empirical evidence that green supplier integration improves not only financial performance but also environmental performance (Zhao et al., 2021).

Based on this background, we aim to test whether green innovation can drive corporate investors toward better environmental performance. If we succeed in finding this positive relationship, we will argue that ambidextrous CVC investments provide corporate investors with a gateway to enhancing their environmental performance through the "acquisition" of green innovation. As a result, the fourth hypothesis of this study is as follows:

Hypothesis (4): In the context of CVC investment, parent firms' green innovation performance contributes to enhancing their environmental performance.

Figure 1 presents the research model, illustrating the hypothesis and the research framework.

{Insert Figure 1 here}

3. Data and methodology

3.1. Data and variable description

The hypotheses discussed are tested under the empirical setting of CVC investments. Hence, to conduct this study, we analyzed U.S. firms that have made venture capital investments between 2000 and 2019 and have invested in green innovation from 2000–2021. U.S. firms are the most

active in terms of venture capital (VC) investments (Benkraiem et al., 2023), and we focus on 2002–2021, as Refinitiv Eikon only provides environmental data from 2002 onwards.

First, from Refinitiv Eikon, more specifically from the private equity screener, we downloaded firms that made at least one CVC investment. Second, from PATSTAT, we extracted firms with green innovation. When applicable, we considered the parent firm’s name. We then merged the two datasets, matching firms with CVC investments and green innovation. In the matching process, we assumed that each CVC investment would benefit from corporations’ green innovation in subsequent periods. Then, from Refinitiv Eikon, we extracted financial, accounting, and environmental data, which were added to the merged dataset. The final sample comprised 126 CVC firms, 638 CVC investments, and 7,780 observations.

We considered GHG emissions to measure firms’ environmental performance because they have been the main driver of global warming (IPCC, 2023). Total CO₂ equivalent emissions (in tons) are considered to measure GHG emissions because they account for “79% of all U.S. greenhouse gas emissions from human activities” (US EPA, 2015). To measure environmental performance, we computed the natural logarithm of GHG emissions (GHG_{it}) to avoid a significant tail risk (Benkraiem et al., 2023) and the GHG per unit of revenue (GHG/rev_{it}) to reflect GHG emissions intensity (Bose et al., 2021; Busch & Hoffmann, 2011). In addition, to facilitate the interpretation of the results, the input variable was multiplied by (-1) (Busch & Hoffmann, 2011). This methodology is used to align the positive directions of the independent variables, as lower GHG emissions are associated with better environmental performance.

$$GHG_{it} = (-1) * \ln(CO2_{it}) \quad GHG/rev_{it} = (-1) * \frac{GHG_{it}}{Revenues_{it}}$$

The first set of variables measures a firm’s ambidexterity. Following previous studies (Lavie et al., 2010; March, 1991; Phelps, 2010; Shuwaikh et al., 2022), we began by computing the degrees of exploration and exploitation based on the SIC codes for pairs of firms and companies. Using this approach, we used the SIC code to assess the level of business relatedness between parent firms and funded companies.

The degrees of exploration and exploitation range from zero to one, and their sums must be equal to one. We considered pure exploitation when the four digits of the SIC code of the firm and the company were the same, which means that the degree of exploitation is 1 and the degree of exploration is 0. If the first three digits are the same, we have 0.75 of exploitation degree and 0.25

of exploration degree. The degrees of exploitation and exploration are equal to 0.5 when the first 2 digits are the same. We considered pure exploration when all four digits were completely different, which means that the exploration degree is 1 and the exploitation degree is 0. After computing the degrees of exploration and exploitation for each CVC investment, the share of explorative and exploitative CVC investments from the total CVC investment must be computed.

As a first step, we computed the explorative CVC investment performed by each firm at each point in time (*Explorative CVC_{it}*). It is computed as the sum of the products between the degrees of exploration and the CVC investment amounts at each point in time for each company. In other words, explorative CVC investment represents the sum of the different explorative CVC investments made by a firm in a certain year, which are computed as the product of the exploration share in that investment and its CVC investment amount.

$$Explorative\ CVC_{it} = Exploration\ degree_{it} * CVC\ investment\ amount_{it}$$

For the second step, we computed the exploration share (*CVC Exploration Share_{it}*) as the proportion of explorative CVC investments out of the total CVC investments for each firm at each point in time.

$$CVC\ Exploration\ share_{it} = \frac{Explorative\ CVC_{it}}{Total\ CVC\ investment_{it}}$$

At this point, we had the exploration share of the CVC investments performed by each firm at each point in time; therefore, computing the exploitation share of CVC investments was the final step. The exploitation share (*CVC Exploitation Share_{it}*) is easily computed because the sum of the exploitation and exploration shares must be equal to 1.

$$CVC\ Exploitation\ share_{it} = 1 - CVC\ Exploration\ share_{it}$$

With the CVC exploration and exploitation shares for each firm in each year, we were finally able to compute the ambidexterity variables. Following previous research, static ambidexterity (*Static_{it}*) may be computed as the absolute value of the difference between exploration and exploitation shares (He & Wong, 2004; Shuwaikh et al., 2022). This variable measures how a firm balances exploitative and explorative investments.

$$Static_{it} = |CVC\ Exploration\ Share_{it} - CVC\ Exploitation\ Share_{it}|$$

A static ambidexterity value of 0 occurs when the CVC investment amount is allocated equally to explorative and exploitative investments. This requires that CVC exploration and

exploitation shares be 0.5. The opposite, a value for static ambidexterity equal to 1, occurs when the CVC investment amount is allocated entirely to explorative or exploitative investments.

Dynamic ambidexterity ($Dynamic_{it}$) is the interaction of explorative and exploitative shares (Gibson & Birkinshaw, 2004; He & Wong, 2004; Shuwaikh et al., 2022). This variable measures how firms simultaneously pursue explorative and exploitative investments.

$$Dynamic_{it} = CVC \text{ Exploration Share}_{it} * CVC \text{ Exploitation Share}_{it}$$

Dynamic ambidexterity ranges from 0 to 0.25. It is 0 when the total CVC investment amount is allocated for explorative or exploitative investments and 0.25 when the CVC investment amount is equally distributed over the two types of CVC investment.

The combination of the two types of ambidexterity ($Combined_{it}$) measures the interaction between static and dynamic ambidexterity (Cao et al., 2009; Shuwaikh et al., 2022). This variable aims to study how firms try to balance their exploitative and explorative CVC investments while simultaneously investing in explorative and exploitative investments.

$$Combined_{it} = Static_{it} * Dynamic_{it}$$

To ensure that our findings are not dependent on the specific coding of the combined variable ($Static \times Dynamic$), we conducted a robustness check by re-coding the static variable. Specifically, we defined a new interaction term, $Combined_adj = (1 - Static) \times Dynamic$, where $Static = 0$ represents the balanced configuration and aligns better with the theoretical optimal configuration for green innovation. This alternative formulation allows us to validate whether the observed positive synergistic effect is robust to different operational definitions of the interaction term.

The second set of independent variables measures green innovation. Although some scholars use research and development (R&D) expenditures to measure companies' innovation, recent literature has used patent-based variables (Kogan et al., 2017; Seru, 2014), arguing that they are a better proxy because “they capture the actual innovation output and capture how effectively a firm has used its innovation inputs” (Chemmanur et al., 2014; Shuwaikh & Dubocage, 2022). To measure green innovation, we considered the number of green patent applications ($Count_{it}$) in each year as well as the subsequent number of citations ($Citations_{it}$) (Kogan et al., 2017; Yang et al., 2022), allowing either a quantitative or qualitative analysis. Then, before taking the natural logarithm of these patent-based variables, we added 1 to avoid losing firm-year observations with 0 patents or 0 citations per patent (Chemmanur et al., 2014; Ma, 2020).

$$Count_{it} = \ln(1 + count_{it}) \quad Citations_{it} = \ln(1 + citations_{it})$$

As control variables, we included a set of nine control variables that may affect green innovation and environmental performance. Additionally, we controlled for firm-fixed effects to control for non-observed changes in the macroeconomic environment, which are not related to green innovation or environmental performance. Moreover, to allow for the comparison of firms in the same years, we added year-fixed effects to the models, ensuring that in a certain year, all firms were affected by the same macroeconomic effects.

Previous research has suggested firm size ($SIZE_{it}$), computed as the logarithm of total assets, and number of employees (EMP_{it}) (Dang et al., 2018; Ioannou & Serafeim, 2012; Miska et al., 2018) because larger firms tend to have a better environmental performance than smaller ones. Moreover, we controlled for R&D intensity (INV_{it}) using the ratio of R&D expenses to total sales because some scholars have used R&D expenditures as a measure of firms' innovativeness (Becker-Blease, 2011). We also controlled for capital intensity (CAP_{it}) using the CAPEX ratio to total assets. In addition, we controlled for net profit (NPT_{it}) and leverage (LEV_{it}) using the debt-to-asset ratio (Campbell, 2007; Ioannou & Serafeim, 2012). We also controlled for absorbed slack resources (ABS_{it}), computed as the ratio between SGA expenses and total sales, which are administrative resources that remain from short-term transactions (Singh, 1986). Unabsorbed slack resources ($UABS_{it}$), measured as the current ratio of the firm, are also included as a control variable, representing the financial resources that the firm needs to run its daily operations (Singh, 1986). Finally, we controlled for potential slack resources (POT_{it}), computed as the ratio between total liabilities and book value, since it demonstrates a firm's ability to raise new financial resources (Bourgeois, 1981).

3.2. Estimation Approach

The methodological mindset of this research attempts to analyze the dynamic interactions among CVC investment strategies, green innovation, and environmental performance. We use panel data regressions with firm and year-fixed effects to address unobserved heterogeneity across firms and time. This enables us to disentangle the ambidexterity strategies' effects on green innovation and environmental performance using within-firm variation. We also create ambidexterity measures where similarity (based on SIC) between parent companies and corporate VC recipients is created in the same manner detailed in past studies (e.g., He & Wong, 2004; Shuwaikh et al., 2022). This

allowed us to quantitatively measure the degree to which one preference dominates the other, which served as a necessary first step to empirically evaluate our model. The use of both the number and quality of patents (measured as citations), and of several environmental indicators, reinforces the robustness and the practical significance of the analysis.

The estimation approach is based on panel linear regression models with firm and year-fixed effects. First, we tested our hypothesis, and then we performed some additional analyses to assess the robustness of our results. We used alternative dependent variables, lagged the dependent variables into three periods, and studied how the results changed over different subsamples—before, during, and after the global financial crisis.

To assess the impact of ambidexterity on green innovation, we used the empirical model presented below, where GI_{it} represents green innovation, measured by $Count_{it}$ and $Citations_{it}$, and AMB_{it} represents ambidexterity, which is measured by $Static_{it}$, $Dynamic_{it}$, and $Combined_{it}$.

$$\text{Equation (1): } GI_{it} = AMB_{it} + SIZE_{it} + LEV_{it} + ABS_{it} + UABS_{it} + POT_{it} + EMP_{it} + NPT_{it} + CAP_{it} + INV_{it} + \sum FIRM_i + \sum YEAR_t$$

In addition, to address the impact of green innovation on environmental performance, we used the following empirical model, where the dependent variable ENV_{it} represents environmental performance measured by GHG/rev_{it} and GHG_{it} , and the independent variable GI_{it} represents green innovation, which is measured by $Count_{it}$ and $Citations_{it}$.

$$\text{Equation (2): } ENV_{it} = GI_{it} + SIZE_{it} + LEV_{it} + ABS_{it} + UNA_{it} + POT_{it} + EMP_{it} + NPR_{it} + CAP_{it} + INN_{it} + FIRM_{it} + YEAR_{it}$$

4. Empirical Estimations

4.1. Results and discussion

Based on the descriptive statistics presented in Table 1, we highlight that most of the firms selected do not invest the same proportions in explorative and exploitative CVC investments since the median for static and dynamic ambidexterity is 0.89 and 0.05, respectively. We also observe that the majority of firms' green patents were granted after 2011, as shown by the first quartile. This is consistent with what we were expecting because concerns about climate change have started to gain more importance over the last decade.

{Insert Table 1 here}

The correlation matrix presented in Table 2 does not report significant positive correlations higher than 0.7, which reduces the probability of facing multicollinearity problems (Tabachnick & Fidell, 2019). Additionally, Variance Inflation Factors (VIFs) is computed for all independent variables. The VIF values are below the commonly accepted threshold of 10, indicating no serious multicollinearity concerns as shown in Table 3.

{Insert Table 2 here}

{Insert Table 3 here}

The results that illustrate the relationship between static ambidextrous CVC investments and green innovation (Hypothesis 1) are presented in Table 4. Coefficients disclosed are negative and significant when we measure green innovation using $Count_{it}$ ($b = -0.0784$; $p < 0.05$) or $Citations_{it}$ ($b = -0.0724$; $p < 0.1$). The negative coefficients indicate that static ambidextrous CVC investments reduce either the number of green patent applications or the number of green patent citations. Therefore, we do not find empirical evidence to support the positive contribution of static ambidextrous CVC investments to corporate investors' green innovation. Thus, we reject Hypothesis 1. These results underline that a negative impact on green innovation is achieved when corporate investors strike a balance between explorative and exploitative CVC investments. By investing equally in entrepreneurial companies with similar and completely different business models, corporate investors fail to capture green innovation.

Previous ambidexterity theories have highlighted that firms should attempt to achieve a static equilibrium between exploitation and exploration activities (Boumgarden et al., 2012) to maximize their performances (Uotila et al., 2009). Our results state the opposite. The midpoint between exploitation and exploration (He & Wong, 2004) should not be considered when investing in CVC to increase corporate investors' green innovation. These results are in line with recent studies that reject a static view of ambidexterity (Farjoun, 2010; Shuwaikh et al., 2022; Simsek et al., 2009) as a mechanism for dealing with dynamic environments, as it may lead to misalignments with firms' environments (Miller, 1992; Venkatraman & Prescott, 1990).

In contrast to static ambidexterity, dynamic ambidexterity plays a different role in green innovation. Table 4 presents the results that explain the relationship between dynamic CVC investments and corporate investors' green innovation (Hypothesis 2). Coefficients reported are positive and significant when the variables $Count_{it}$ ($b = 0.3119$; $p < 0.05$) and $Citations_{it}$ ($b = 0.2695$; $p < 0.05$) are used to measure corporate investors' green innovation. The positive coefficients highlight that dynamic ambidextrous CVC investments increase both the number of green patent applications and the number of green patent citations. As a result, there is evidence of the positive contribution of dynamic CVC investments to corporate investors' green innovation, supporting Hypothesis 2. The simultaneous pursuit of both explorative and exploitative CVC investments enhances corporate investors' green innovation. Therefore, by simultaneously investing in entrepreneurial companies with a high degree of business similarity and completely different core businesses, corporate investors are able to “acquire” green innovation. They should combine explorative and exploitative CVC investments to face dynamic environments with innovative green solutions.

We used dynamic ambidexterity following Shuwaikh et al. (2022), who introduced this perspective in CVC investments. Our finding is consistent with Siggelkow and Levinthal (2003), who suggested that firms can take advantage of environmental dynamism through exploratory activities and switch to exploitative activities when the environment becomes more stable. Firms need to be able to adapt what they are doing internally to the demands of the external environment; otherwise, they risk being misaligned, which can damage their performances (Miller, 1992; Venkatraman & Prescott, 1990). This dynamic view of investing in CVC allows firms to adapt their balance to different environmental conditions instead of striking the right balance, enhancing their resource allocation when external opportunities appear (Jansen et al., 2006). Moreover, it avoids tensions between exploration and exploitation, as it allows firms to allocate their resources according to their current needs rather than being stuck at the defined midpoint (Jansen et al., 2006). With these results, our study reinforces the argument introduced by Shuwaikh et al. (2022), who stated that firms should fluctuate between explorative and exploitative CVC investments by adopting dynamic ambidexterity. These findings are visually represented in Figure 2, which illustrates the positive relationship between dynamic ambidextrous CVC investments and corporate investors' green innovation performance.

{Insert Table 4 here}

{Insert Figure 2 here}

Significant improvements are achieved when corporate investors combine static and dynamic ambidexterity. The impact of combining static and dynamic ambidextrous CVC investments on corporate investors' green innovation (Hypothesis 3) is reported in Table 5. The coefficients are significant, positive, and stronger than those displayed for dynamic ambidexterity when green innovation is measured through $Count_{it}$ ($b = 0.7905$; $p < 0.01$) or $Citations_{it}$ ($b = 0.5424$; $p < 0.1$), which supports Hypothesis 3. These coefficients suggest that when corporate investors combine dynamic and static ambidextrous CVC investments, they can not only boost their green innovation but also achieve synergistic outcomes. As a result, we conclude that the interaction between balancing and combining explorative and exploitative CVC investments is the best practice for maximizing corporate investors' green innovation.

Achieving high levels of balanced and simultaneous ambidexterity has a synergistic effect on firms' green innovation. This finding is similar to previous research that pointed out the importance of the interactions between a balanced and combined use of exploration and exploitation activities (Cao et al., 2009; Shuwaikh et al., 2022). No previous research has studied the direct impact of ambidexterity on firms' green innovation under the empirical setting of CVC investments. Therefore, our results extend the CVC literature (Rossi et al., 2021; Shuwaikh et al., 2022; Shuwaikh & Dubocage, 2022), revealing a positive contribution of ambidextrous CVC investments on green innovation.

The results that present the effect of green innovation on environmental performance (Hypothesis 4) are presented in Table 5. These results are similar when we use both measures of green innovation. For the independent variable $Count_{it}$, we find positive coefficients when regressing on GHG/rev_{it} ($b = 0.0027$; $p < 0.01$) or GHG_{it} ($b = 0.0310$; $p < 0.01$). For the independent variable $Citations_{it}$, the results also present positive coefficients when regressing on GHG/rev_{it} ($b = 0.0032$; $p < 0.01$) or GHG_{it} ($b = 0.0636$; $p < 0.01$). The coefficients suggest that either GHG emissions or GHG intensity are reduced by the number of green patent applications and green patent citations. Therefore, there is a positive relationship between green innovation and environmental performance, even when the dependent and independent variables are switched.

Hence, enhancements in corporate investors' green innovation allow firms to improve their environmental performances.

While the best theoretical configuration for green innovation is that static ambidexterity is equal (Static = 0) and dynamic ambidexterity is maximal (Dynamic = 0.25), our measurement of the combined variable is based on the empirical coexistence of both ambidexterity dimensions. Thus, larger combined values correspond to situations in which both static (whether balanced or imbalanced) and dynamic ambidexterity are high, suggesting a context in which firms actively pursue both types of ambidexterity without following the theoretically optimal pattern. This enables us to explore whether there is a positive interaction effect of the combined presence of the two types of ambidexterity on green innovation outcomes (i.e., simultaneously detecting whether it is the mere existence of both types of ambidexterity together and not in a particular configuration).

Although ambidextrous CVC approaches offer a promising relaxation toward the acquisition of green innovation, it is challenging for firms to attain and maintain the proper balance of exploration and exploitation (Dushnitsky & Lenox, 2005; Weiblen & Chesbrough, 2015). Tensions associated with a lack of organizational inertia and cultural rigidity and with the different risk-reward characteristics emerging through exploratory, as opposed to exploitative, investment may frequently contradict the need to direct attention, resources, and processes to the two forms of learning orientation. These tensions are exacerbated within the context of environmental innovation, where exploitative investments must be made to fit with existing routines and regulatory regimes and explorative investments could disrupt established ways of doing things. To manage these tensions, organizations need to implement adaptive governance structures, clearly state the plural innovation goals, and place learning loops across CVC units and core business units; synergizing the benefits of both innovations. A dynamic rebalancing of exploration and exploitation can be further facilitated by periodic re-evaluation of portfolio composition and strategic fit. These practices may be useful for firms to break ambidexterity barriers and obtain enduring value from green CVC initiatives.

Combining this result with the findings presented in the previous sections, we conclude that by investing in entrepreneurial companies, corporate investors can use ambidexterity as a gateway

to improve their environmental performances through the acquired green innovation. By making ambidextrous CVC investments, they acquire green innovation, which, in turn, is used to reduce their GHG emissions, thereby improving their environmental performances.

According to previous studies, green innovation requires significant investment in clean technologies to reduce firms' GHG emissions (Benkraiem et al., 2023). In addition, CVC investments provide firms with privileged access to social and ecological aspects, allowing them to reduce their environmental footprint while improving their environmental performances (Battisti et al., 2022). Based on a sample that comprises 297 large manufacturing firms in Malaysia, Kraus et al. (2020) identified green innovation as a driver of environmental performance; more specifically, they found that firms' environmental performances improved by 27%. Du et al. (2019) analyzed 71 economies and found that the negative relationship between firms' green technology innovation and CO2 emissions depends on the income levels of each economy. Xu et al. (2021) divided green innovation into subcategories and found that either green innovation as a whole or its subcategories can effectively reduce carbon emissions. Carbon emissions have a negative effect on a firm's value, and the market tends to react negatively in a more consistent way compared to positive performances (Lee et al., 2015).

Little is known about the effect of green innovation on firms' environmental performances under the CVC empirical setting. There is only one paper that addresses green innovation and environmental performance in this empirical setting (Benkraiem et al., 2023). The results presented in this paper are consistent with our results. (Benkraiem et al., 2023) found a positive relationship between green innovation and environmental performance based on GHG emission intensity. However, they did not find any results when the logarithm of firms' GHG emissions was used. Therefore, we confirm their findings on GHG emissions intensity and extend their analysis with a positive and significant impact on the logarithm of firms' GHG emissions. Using either the number of green patent applications or citations, we argue that green innovation can effectively improve firms' environmental performance. Moreover, the synergistic effect of simultaneously pursuing static and dynamic ambidexterity on green innovation is highlighted in Figure 3, confirming the strength of combined CVC strategies.

{Insert Table 5 here}

{Insert Figure 3 here}

4.2. Robustness Checks

The impact of ambidexterity may require some time to produce effects on a firm's green innovation, depending on the time needed to integrate the company into the firm's portfolio (Shuwaikh & Dubocage, 2022). In addition, the impact of green innovation may take some time to reflect in environmental performance metrics. Consequently, it is of interest to analyze how the results change when we lag the dependent variables.

The results presented in Tables 6, 7, and 8 illustrate the relationship between the different forms of ambidexterity and the lagged green innovation variables. We find similar relationships because no change in the signs of the coefficients was reported. Even when we lag the dependent variables $Count_{it}$ and $Citations_{it}$ one, two, and three years, static ambidexterity has negative coefficients, dynamic ambidexterity has positive coefficients, and the combined use of static and dynamic has positive and greatest coefficients. Moreover, we find a downward trend for static ambidexterity coefficients, highlighting a worsening effect over time. In contrast, we found a strengthening effect over time for dynamic and combined ambidexterity due to an upward trend in their coefficients. This result is in line with Miller (1992) and Venkatraman and Prescott (1990), who stated that a static approach is not suitable for dynamic environment requirements because companies repeat misalignments with their environments, leading to even worse environmental performance over time.

{Insert Table 6 here}

{Insert Table 7 here}

{Insert Table 8 here}

The results for the lagged environmental variables are presented in Tables 9 and 10. We find a positive relationship between green innovation and lagged environmental performance. The coefficients for the variable $Count_{it}$ are significant and positive when we lag the environmental variables GHG_{it} and GHG/rev_{it} one, two, and three years. Similarly, the coefficients for the variable $Citations_{it}$ are also positive for the lagged environmental variables. As a result, we conclude that

green innovation captured with ambidextrous CVC investments can effectively increase corporate environmental performance, and this effect persists over time.

{Insert Table 9 here}

{Insert Table 10 here}

We performed additional sensitivity tests to ensure that our findings are robust using alternative dependent variables. Measuring green innovation requires patent-based variables; therefore, we have not used alternative dependent variables to test the robustness of the results regarding the relationship between ambidexterity and green innovation.

To evaluate the robustness of the relationship between green innovation and corporate investors' environmental performance, we use the environmental, social, and governance (ESG) and environmental pillar scores as alternative dependent variables to measure environmental performance. The ESG score was developed to measure firms' environmental, social, and governance performance in response to the increasing investor demand for a measure that provides this kind of information. Nowadays, investors consider the ESG score an indispensable metric for conducting their investment analyses and for making their investment decisions, as well as the environmental pillar, which measures a company's performance in terms of environmental and climate risks (Apergis et al., 2022). Therefore, we use the environmental pillar score ($E Pillar_{it}$) as a measure of environmental performance as well as the ESG score (ESG_{it}), which was computed by averaging the pillars' scores.

Wen et al. (2024) examined ESG performance and financial structure. The study considers how ESG performance impacts firms' financial policies, particularly with respect to reconciling investment and financing maturities. Wen et al. (2024) focused on the role of social and governance in mitigating maturity mismatches. Lee et al. (2024) studied the regulatory influence on risk management. They analyzed the impact of mandatory ESG disclosure on the extreme risk exposure of firms and found improved risk management through ESG disclosures and the issuing of green bonds.

The results presented in Table 11 reveal a positive contribution of green innovation to ESG and environmental pillar scores. When analyzing the effect on the ESG score, the reported results show a positive and significant relationship when $Count_{it}$ ($b = 0.3429$; $p < 0.01$) is used to measure

green innovation. Therefore, firms' ESG scores are improved with additional green patent applications. Moreover, a similar result is achieved when the same analysis is conducted for the environmental pillar. The coefficients for both $Count_{it}$ ($b = 0.8189$; $p < 0.01$) and $Citations_{it}$ ($b = 0.4276$; $p < 0.05$) are positive and significant, which illustrate the positive contribution of additional green patents and green patent citations to the environmental pillar score. As a result, there is robust evidence that improvements in green innovation lead to improvements in environmental performance. To validate the robustness of our results, we tested the alternative formulation of the interaction term, $Combined = (1 - Static) \times Dynamic$. The results as demonstrated in Table 12 were consistent with our original findings, suggesting that the positive synergistic effect between static and dynamic ambidexterity is robust to different operational definitions of the interaction term.

{Insert Table 11 here}

{Insert Table 12 here}

4.3. Additional Analysis

There is no doubt about the tremendous effect of the global financial crisis (GFC) on the world economy, especially the financing conditions in the United States. Due to its importance, we split our sample into three periods—before, during, and after the GFC—to assess the differences and impacts in our findings. Moreover, it is fair to expect differences between these three subsamples, as GHG emissions have increased dramatically in importance in recent years.

The coefficients for analyzing the relationship between ambidexterity and green innovation are presented in Tables 13, 14, and 15. We do not find significant results for the periods before and during the GFC, even when different measures of green innovation are used as dependent variables. However, for the post-GFC period, we find significant results. These results show the robustness of our findings, as the effects of the different types of ambidexterity on green innovation are consistent with those reported for the main sample.

The pursuit of static ambidexterity in CVC investments has a negative impact on green innovation, whereas dynamic ambidexterity and a combination of both have a positive impact. The absence of results for the prior and during-GFC periods may be related to the smaller number of observations. Despite the long history of traditional VC investment, CVC investment has only begun to grow in importance over the last decade.

{Insert Table 13 here}

{Insert Table 14 here}

{Insert Table 15 here}

Tables 16 and 17 show the results of the analysis of green innovation and environmental performance within the three periods. Although we do not find results for the pre-GFC period, we do find significant results for the periods during and after the GFC. Overall, green innovation harmed environmental performance during the GFC. This result is highlighted by the negative coefficients of both green innovation variables, even when the dependent variables change. In addition, we also find that after the GFC, green innovation started to have a positive role in improving firms' environmental performance under the CVC investments empirical setting. $Count_{it}$ and $Citations_{it}$ present positive and significant coefficients with a 1% significance level, which ensures the robustness of our results.

{Insert Table 16 here}

{Insert Table 17 here}

5. Conclusion and Policy Implications

This paper examines three crucial concepts—ambidexterity, green innovation, and environmental performance—with the objective of providing valuable insights to address current difficulties. The study is motivated by the urgent necessity of tackling present problems and the lack of empirical research on the integrated examination of these ideas in the context of CVC investments. Our research reveals the significant role that ambidextrous CVC investments play in helping corporate investors acquire green innovations. Dynamic ambidextrous CVC investments are particularly successful in boosting organizations' ability to capture green innovation. The study recommends maximizing investments in both exploratory and exploitative CVC activities simultaneously. This investment strategy has been shown to have a consistently favorable effect on green innovation over the following three years.

In contrast, a fixed ambidextrous strategy is observed to have an adverse influence on green innovation, reinforced by a declining trend that indicates a worsening effect over the subsequent

three years. The study advises corporations against adopting a rigid perspective of ambidexterity alone, highlighting the negative impact of maintaining a balance between exploratory and exploitative CVC investments. A significant contribution arises when companies integrate both static and dynamic approaches to ambidexterity, resulting in synergistic effects that exceed the favorable impact of dynamic ambidexterity alone. This highlights the suggestion that companies should utilize both types of ambidexterity in their CVC investments, with a focus on the importance of a comprehensive strategy.

The study expands its analysis to several economic periods, investigating the consequences prior to, during, and subsequent to the GFC. The exact results are only available for the post-GFC period, and they are consistent with the general findings of the overall sample. This investigation into the passage of time offers vital insights into the lasting significance and practicality of the identified connections.

Environmental performance is now considered a vital measure that demonstrates companies' commitment to reducing their ecological footprints. Our study further supports the findings of Shuwaikh et al. (2023) and Benkraiem et al. (2023) by confirming a strong association between green innovation and environmental performance. We have utilized many indicators to validate this correlation. We show that corporate investors can improve their environmental performance by efficiently utilizing the green innovation resulting from their ambidextrous CVC investments. Moreover, our analysis demonstrates that the influence of present green innovation on environmental performance persists over a period of time.

By broadening our analysis to encompass several economic periods, including those before, during, and after the GFC, we discover fascinating revelations. During the GFC, we find a detrimental impact of green innovation on enterprises' environmental performance, in contrast to the favorable benefits reported post-GFC. Furthermore, our research encompasses particular aspects, such as the environmental pillar and ESG ratings, demonstrating a favorable impact.

The findings of our research have significant consequences in the fields of management, government, and regulation. We promote the importance of including ambidexterity in CVC investments, highlighting its ability to capture innovation, especially in the green sector, and ultimately guiding companies toward enhanced environmental performance. The basis of our advice is built around three fundamental principles. First, enterprises can respond to customer and regulatory demands and avoid market penalization by reducing their ecological footprints (Lee et

al., 2015). Furthermore, the incorporation of green innovation and environmental performance into corporate plans improves company profitability (Benkraiem et al., 2023). Finally, these measures enable companies to achieve a competitive advantage in the market, thus enhancing their long-term viability (Nidumolu et al., 2009).

The implications for regulators and governments are diverse and critical to building a business environment that can be maintained over time. Prioritizing the acceleration and optimization of acquisition procedures is essential to stimulating the growth of CVC investments. Identifying CVC as a means of promoting green innovation among companies establishes it as a crucial entry point. Regulators can actively encourage enterprises to adopt environmental sustainability by facilitating these processes. Furthermore, it is advisable for governments to contemplate implementing rewards for companies that actively participate in CVC and ambidextrous practices to obtain environmentally friendly innovations. These incentives play a crucial role in pushing companies to decrease their GHG emissions and effectively tackle environmental concerns. This assistance is particularly vital in mitigating the supplementary expenses linked to companies' efforts to embrace eco-friendly practices, as emphasized in the study conducted by Benkraiem et al. (2023).

In the future, other paths can be pursued for additional investigation. Subsequent studies could concentrate on unravelling the factors that determine the inclination toward one type of ambidexterity over another. Although we have analyzed the GFC, further occurrences or circumstances may provide a more detailed comprehension of the complex correlation between ambidexterity and green innovation.

An intriguing avenue for future research entails conducting a thorough cost-benefit analysis of investing in CVC to harness green innovation and subsequently diminish a company's environmental impact. Gaining a comprehensive understanding of the economic consequences of these investments will offer useful knowledge for companies considering strategic initiatives that are in line with environmental goals.

Moreover, conducting a comparison examination of the performance of CVC and institutional VC will provide a useful contribution to the continuing discussion on the optimal form of VC. This comparison analysis has the potential to reveal unique benefits and drawbacks, providing stakeholders with a more lucid understanding of the strategic options at hand. Ultimately, extending the range of this study outside the boundaries of the United States to include other

geographic regions shows potential. Examining the topic from a wider viewpoint would offer a valuable understanding of the specific characteristics and differences in the interactions among CVC, organizational ambidexterity, and environmentally friendly innovation across different regions. Ultimately, it is crucial for enterprises, regulators, and governments to work together to effectively navigate the complex connections among CVC, ambidexterity, and green innovation. By following the recommended strategies and exploring these proposed research paths, stakeholders can contribute to a sustainable and inventive future.

The results provide managers in all sectors with tangible direction. In the energy sector, companies should be able to use ambidextrous CVC to exploit improvements in company product efficiency (e.g., expert evaluations by engineers in petroleum job assignments that identify how to improve oil production) while exploring new technologies, such as carbon capture or green hydrogen. Manufacturing companies can invest in startups that are working to develop sustainable materials or reduce waste and can use newly developed technologies to improve their own supply chains and production practices. Exploring the efficiencies of their current digital architectures, companies could also pursue exploratory CVC in green data infrastructure and low-power hardware in technology. These two cases illustrate that ambidextrous CVC can be adapted to sectorial challenges so that companies can leverage green innovation and contribute to the enhancement of their core competences.

There are several limitations in this study. First, the analysis focuses only on firms in the United States, and the results may thus not be generalizable across alternative institutional and regulatory settings. Second, our green innovation measure is based on patent counts and citations, which, while often used, may not completely reflect the scope and efficiency of the environmental innovations undertaken by firms. Third, ESG performance is derived from third-party scoring systems, which might introduce biases or methodological inconsistencies that compromise comparability across companies and over time. Future research can investigate such limitations by broadening the geographical coverage, employing more fine-grained measures of innovation (e.g., innovation as perceived by survey or impact-weighted innovation) and matching the ESG evaluations simultaneously in several data sources.

Beyond managerial implications, the results carry an important message for policymakers seeking to foster sustainable innovation. Governments can help by promoting ambidextrous CVC strategies with a variety of interventions. For example, subsidies or matching finance for green start-ups can lower the financial risk on exploratory investments. Tax concessions or credits linked to corporate environmentally friendly investments can give firms the incentive to specialize not only in exploitation but also in exploration. In addition, innovation procurement and regulatory sandboxes can provide companies with the necessary leeway to experiment with green technologies in the field. Publicly funded institutions can promote a more dynamic and responsive green innovation ecosystem by framing their policies to accommodate the particular risks and synergies of ambidextrous investment strategies.

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Table 1. Descriptive Statistics

Variables	Count	Mean	Std	Min	25%	50%	75%	Max
Static	7870	0.77	0.27	0.00	0.61	0.89	1.00	1.00
Dynamic	7870	0.08	0.08	0.00	0.00	0.05	0.16	0.25
Combined	7870	0.04	0.037	0.00	0.00	0.034	0.078	0.096
Patent year	7962	2014	5	2000	2011	2015	2019	2021
Count	7965	6	2	1	5	6	8	10
Citations	6967	7	3	1	5	7	9	12
GHG	7175	-14	2	-18	-15	-14	-12	-7
GHG/rev	7174	-0.06	0.15	-4.17	-0.04	-0.03	-0.02	0.00
LEV	7403	37	37	-181	20	31	50	1228
NPT	7431	6.7	7.2	-22.6	1.0	4.6	11.0	61.3
ABS	7392	0.3	0.1	0.0	0.2	0.3	0.4	1.0
UABS	7321	2.0	1.0	0.3	1.3	1.7	2.4	12.6
POT	7394	-0.7	54.2	-3025.1	0.6	0.9	1.9	51.3
CAP	7389	0.1	0.0	0.0	0.0	0.0	0.1	0.8
SIZE	7403	18	1	12	17	18	19	22
EMP	7332	91170	136927	370	24000	68000	107300	1608000
INV	7104	0.1	0.1	0.0	0.1	0.2	0.2	0.5

Notes: This table presents the descriptive statistics for the dependent, independent, and control variables used in the model.

Table 2. Correlation Matrix

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1. Static	1.00															
2. Dynamic	-0.98***	1.00														
3. Patent year	-0.01***	0.01***	1.00													
4. Count	-0.08***	0.12	-0.09***	1.00												
5. Citations	-0.04***	0.08*	-0.37***	0.81	1.00											
6. GHG	-0.23***	0.21	0.03**	-0.23***	-0.17***	1.00										
7. GHG/rev	-0.12***	0.12	0.06*	0.10	0.10*	0.40	1.00									
8. LEV	-0.02***	0.02**	0.20	-0.19***	-0.27***	0.10*	0.02**	1.00								
9. NPT	0.13	-0.11***	0.28	0.31	0.19	-0.54***	0.02**	-0.16***	1.00							
10. ABS	-0.21***	0.18	0.05*	0.05**	0.01**	0.50	0.24	-0.07***	-0.20***	1.00						
11. UABS	-0.09***	0.11	-0.23***	0.15	0.23	0.26	0.11	-0.23***	-0.06***	0.01**	1.00					
12. POT	0.02**	-0.02***	-0.03***	0.07*	0.02**	-0.03***	0.01***	-0.06***	0.04**	0.05**	0.02**	1.00				
13. CAP	0.15	-0.12***	-0.05***	0.35	0.36	-0.52***	-0.14***	-0.23***	0.54	-0.21***	-0.04***	0.03**	1.00			
14. SIZE	0.14	-0.13***	0.24	0.21	0.10	-0.76***	-0.06***	-0.02***	0.63	-0.31***	-0.28***	0.04**	0.32	1.00		
15. EMP	0.11	-0.11***	0.07*	0.07*	0.07*	-0.41***	0.05**	0.05*	0.35	-0.15***	-0.24***	0.02**	0.22	0.44	1.00	
16. INV	-0.08***	0.10	0.12	0.33	0.25	0.38	0.41	-0.16***	0.12	0.53	0.35	0.06*	0.11	-0.17***	-0.20***	1.00

Notes: This table presents the Pearson-correlation coefficients. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

TABLE 3. Variance inflation factor

	VIF	VIF	VIF	VIF	VIF	VIF	VIF	VIF	VIF	VIF
Static	1.063	1.860	1.708	1.585	1.694	1.592	1.694	1.592	1.656	1.594
Dynamic	1.696	1.559	1.756	1.546	1.693	1.596	1.699	1.795	1.563	1.524
Combined	1.669	1.762	1.142	1.163	1.152	1.164	1.633	1.163	1.463	1.613
Patent year	1.109	1.902	1.265	1.904	1.125	1.889	1.088	1.919	1.094	1.914
Count	1.095	1.913	1.695	1.913	1.095	1.372	1.261	1.381	1.152	1.162
Citations	1.068	1.212	1.213	1.941	1.066	1.938	1.047	1.962	1.527	1.974
GHG	1.053	1.950	1.047	1.955	1.069	1.936	1.371	0.391	1.317	0.381
GHG/rev	1.281	0.193	1.987	0.221	1.564	0.234	1.261	0.152	1.273	0.314
LEV	1.697	0.381	1.709	1.585	1.203	0.142	1.301	0.135	1.321	0.273
NPT	1.669	1.593	1.381	1.892	1.271	1.598	1.633	1.612	1.381	1.610
ABS	1.183	0.173	1.391	1.361	1.183	1.381	1.349	1.939	1.371	1.134
UABS	1.163	1.371	1.283	1.913	1.173	1.371	1.094	1.914	1.116	0.901
POT	1.362	0.173	1.063	0.391	1.193	0.938	1.040	0.962	1.027	0.974
CAP	1.033	1.950	1.047	1.955	1.069	0.936	1.047	1.955	1.116	1.895
SIZE	1.153	1.112	1.313	1.934	1.101	1.192	1.119	1.112	1.132	0.912
EMP	1.623	0.133	1.013	0.312	1.133	0.312	1.012	0.162	1.273	0.923
INV	1.113	1.101	1.021	1.922	1.061	0.162	1.317	1.162	1.631	1.345

Notes: This table presents the results of the multicollinearity test. It is used with the intention of measuring whether these regression models present multicollinearity issues or not. The test considers the value of 10 as the threshold over which it is possible to talk about multicollinearity. No variable in this table presents multicollinearity.

Table 4. Ambidexterity and corporate investors' green innovation

Variable	Count			Citations		
Static	-0.0784**			-0.0724*		
Dynamic		0.3119**			0.2695**	
Combined			0.7905***			0.5424*
LEV	0.0006*	0.0006*	0.0006*	-0.0004	-0.0004	-0.0004
ABS	-1.8260***	-1.8257***	-1.8338***	-1.5075***	-1.5074***	-1.5165***
UABS	-0.0917***	-0.0917***	-0.0911***	-0.0690***	-0.0689***	-0.0685***
POT	-0.0001	-0.0000	-0.0000	0.0003	0.0003	0.0003
SIZE	0.1976***	0.1974***	0.1985***	0.0529*	0.0528*	0.0538*
CAP	-0.6646	-0.6669	-0.6531	0.9584	0.9577	0.9685
NPT	0.0063**	0.0063**	0.0063**	0.0060**	0.0060**	0.0060**
EMP	-0.0000**	-0.0000**	-0.0000**	-0.0000	-0.0000	-0.0000
INV	8.4277***	8.4210***	8.4320***	7.3222***	7.3183***	7.3367***
Constant	2.7030***	2.6210***	2.5937***	5.9125***	5.8364***	5.8185***
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
R-squared	0.0637	0.0640	0.0642	0.0477	0.0478	0.0477
Observations	6913	6913	6913	6149	6149	6149

Notes: This table examines the effect of the different types of ambidexterity on corporate investors' green innovation performance. T-statistics are shown in parentheses and *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 5. Green innovation and corporate investors' environmental performance

Variable	GHG/rev		GHG	
Count	0.0027***		0.0310***	
Citations		0.0032***		0.0636***
LEV	0.0001***	0.0001***	0.0003*	0.0004***
ABS	0.0256*	0.0184	1.8963***	1.7539***
UABS	-0.0012*	-0.0012*	0.0336***	0.0236***
POT	0.0000	0.0001***	-0.0001*	0.0004*
SIZE	0.0152***	0.0184***	-0.4954***	-0.4596***
CAP	0.1487***	0.2048***	-2.1484***	-1.8687***
NPT	0.0029***	0.0031***	0.0042***	0.0057***
EMP	-0.0000***	-0.0000***	-0.0000***	-0.0000***
INV	0.1906***	0.2055***	-1.6225***	-1.6847***
Constant	-0.3934***	-0.4588***	-5.3520***	-6.2017***
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
R-squared	0.2114	0.2507	0.3762	0.3808
Observations	6830	6066	6830	6066

Notes: This table examines the effect of green innovation on corporate investors' environmental performance. T-statistics are shown in parentheses and *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 6. Static ambidexterity and corporate investors' green innovation: lagged variables

Variable	Count			Citations		
	T+1	T+2	T+3	T+1	T+2	T+3
Static	-0.0738*	-0.0730*	-0.0883**	-0.0760*	-0.0876*	-0.1119*
LEV	-0.0001	-0.0001	-0.0008**	-0.0005	-0.0007	-0.0014***
ABS	-0.9421***	-0.7797**	-0.1187	-1.0257***	-0.5860	-0.8479*
UABS	-0.0507***	-0.0050	0.0320*	0.0058	0.0212	0.0430*
POT	0.0004*	-0.0000	0.0005*	0.0008***	0.0002	-0.0009
SIZE	0.1149***	0.0631**	0.0414	0.0103	-0.0289	-0.0693*
CAP	-0.0522	0.9694	1.1213	1.7314**	0.4332	0.7534
NPT	0.0049*	-0.0029	-0.0069**	0.0030	0.0016	-0.0064
EMP	-0.0000***	-0.0000**	-0.0000***	-0.0000***	-0.0000***	-0.0000***
INV	5.3680***	2.7037***	0.1569	6.4120***	3.8391***	2.6423***
Constant	4.2493***	5.3920***	5.9168***	6.5239***	7.5149***	8.5203***
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
R-squared	0.0262	0.0061	0.0059	0.0310	0.0185	0.0206
Observations	6841	6769	6698	6075	5997	5920

Notes: This table examines the effect of static ambidexterity on corporate investors' green innovation performance lagged 1, 2 and 3 years. T-statistics are shown in parentheses and *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 7. Dynamic ambidexterity and corporate investors' green innovation: lagged variables

Variable	Count			Citations		
	T+1	T+2	T+3	T+1	T+2	T+3
Dynamic	0.2906**	0.2897**	0.3482**	0.2871**	0.3224*	0.4276**
LEV	-0.0001	-0.0001	-0.0008**	-0.0005	-0.0007	-0.0014***
ABS	-0.9417***	-0.7794**	-0.1184	-1.0249***	-0.5853	-0.8489*
UABS	-0.0507***	-0.0050	0.0321*	0.0059	0.0213	0.0430*
POT	0.0004*	-0.0000	0.0005**	0.0008***	0.0002	-0.0009
SIZE	0.1147***	0.0628**	0.0411	0.0102	-0.0290	-0.0695*
CAP	-0.0540	0.9668	1.1185	1.7303**	0.4318	0.7508
NPT	0.0049*	-0.0028	-0.0069**	0.0030	0.0016	-0.0063
EMP	-0.0000***	-0.0000**	-0.0000***	-0.0000***	-0.0000***	-0.0000***
INV	5.3620***	2.6980***	0.1501	6.4060***	3.8330***	2.6368***
Constant	4.1721***	5.3161***	5.8250***	6.4443***	7.4226***	8.4027***
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
R-squared	0.0265	0.0064	0.0061	0.0311	0.0186	0.0208
Observations	6841	6769	6698	6075	5997	5920

Notes: This table examines the effect of dynamic ambidexterity on corporate investors' green innovation performance lagged 1, 2 and 3 years. T-statistics are shown in parentheses and *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 8. Combined ambidexterity and corporate investors' green innovation: lagged variables

Variable	Count			Citations		
	T+1	T+2	T+3	T+1	T+2	T+3
Combined	0.7081**	0.7146**	0.8074**	0.5687*	0.5486	0.8370*
LEV	-0.0001	-0.0001	-0.0008**	-0.0005	-0.0007*	-0.0014***
ABS	-0.9499***	-0.7887**	-0.1297	-1.0314***	-0.5950	-0.8660*
UABS	-0.0501***	-0.0044	0.0328*	0.0064	0.0219	0.0440**
POT	0.0004*	0.0000	0.0005**	0.0008***	0.0002	-0.0009
SIZE	0.1159***	0.0640**	0.0427	0.0113	-0.0276	-0.0675
CAP	-0.0409	0.9772	1.1314	1.7460**	0.4432	0.7658
NPT	0.0049*	-0.0028	-0.0069**	0.0030	0.0016	-0.0064
EMP	-0.0000***	-0.0000**	-0.0000***	-0.0000***	-0.0000***	-0.0000***
INV	5.3743***	2.7127***	0.1699	6.4234***	3.8548***	2.6732***
Constant	4.1466***	5.2899***	5.7927***	6.4230***	7.4007***	8.3671***
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
R-squared	0.0265	0.0065	0.0061	0.0309	0.0183	0.0205
Observations	6841	6769	6698	6075	5997	5920

Notes: This table examines the effect of combining static and dynamic ambidexterity on corporate investors' green innovation performance lagged 1, 2 and 3 years. T-statistics are shown in parentheses and *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 9. Green patent applications and corporate investors' environmental performance: lagged variables

Variables	GHG/rev			GHG		
	T+1	T+2	T+3	T+1	T+2	T+3
Count	0.0017***	0.0018***	0.0009*	0.0228***	0.0334***	0.0203***
LEV	0.0001***	0.0000	-0.0000***	0.0004**	-0.0001	0.0001
ABS	0.0263*	0.0035	0.0040	1.0210***	-0.0201	-0.9920***
UABS	-0.0016**	-0.0030***	-0.0020***	0.0654***	0.0487***	0.0481***
POT	-0.0000	-0.0000	0.0000	0.0006***	0.0003***	0.0002*
SIZE	0.0119***	0.0094***	0.0040***	-0.4580***	-0.3784***	-0.3068***
CAP	-0.0394	0.0230	-0.1150***	-0.1111	2.2599***	0.7507**
NPT	0.0019***	0.0001	-0.0004***	0.0002	-0.0022	-0.0027*
EMP	-0.0000***	-0.0000***	-0.0000	-0.0000***	0.0000	0.0000***
INV	0.2233***	0.1896***	0.1647***	0.0154	-0.2121	0.8602**
Constant	-0.3192***	-0.2525***	-0.1377***	-6.1386***	-7.3620***	-8.3262***
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
R-squared	0.1157	0.0406	0.0271	0.2092	0.1140	0.0687
Observations	6726	6628	6525	6726	6628	6525

Notes: This table examines the effect of green innovation, measured by the number of green patents, on corporate investors' environmental performance lagged 1, 2 and 3 years. T-statistics are shown in parentheses and *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 10. Green patent citations and corporate investors' environmental performance: lagged variables

Variable	GHG/rev			GHG		
	T+1	T+2	T+3	T+1	T+2	T+3
Citations	0.0024***	0.0017***	0.0009	0.0415***	0.0225***	0.0158*
LEV	0.0001***	0.0000*	-0.0000	0.0003**	-0.0001	0.0001
ABS	0.0149	-0.0049	-0.0045	1.2129***	0.6060***	-0.6806***
UABS	-0.0011	-0.0025***	-0.0017**	0.0570***	0.0477***	0.0515***
POT	-0.0000	-0.0000	0.0000	0.0001	-0.0007***	-0.0007**
SIZE	0.0160***	0.0145***	0.0086***	-0.4565***	-0.4121***	-0.3471***
CAP	0.0503*	0.1530***	-0.0089	-0.6319*	2.4925***	0.9510**
NPT	0.0018***	-0.0000	-0.0006***	-0.0015	-0.0020	-0.0026*
EMP	-0.0000***	-0.0000***	-0.0000**	-0.0000***	-0.0000***	0.0000**
INV	0.2661***	0.2301***	0.2007***	0.0155	-0.7675**	0.6550*
Constant	-0.4053***	-0.3517***	-0.2277***	-6.2730***	-6.8432***	-7.7097***
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
R-squared	0.1456	0.0621	0.0335	0.3509	0.1793	0.0965
Observations	6054	5972	5870	6054	5972	5870

Notes: This table examines the effect of green innovation, measured by green patent citations, on corporate investors' environmental performance lagged 1, 2 and 3 years. T-statistics are shown in parentheses and *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 11. Green innovation and corporate investors' environmental performance: alternative variables

Variable	ESG		E Pillar	
Count	0.3429***		0.8189***	
Citations		-0.0726		0.4276**
LEV	0.0014	0.0025	-0.0084**	-0.0043
ABS	40.4157***	45.9508***	52.8124***	68.5254***
UABS	-0.0730	0.3621**	0.3394*	0.5527***
POT	-0.0033**	-0.0042	0.0019	0.0074
SIZE	5.1157***	5.3938***	6.4909***	6.3771***
CAP	20.0594***	36.8872***	42.7398***	46.9056***
NPT	-0.2567***	-0.1962***	-0.3011***	-0.1983***
EMP	0.0000***	0.0000***	0.0000***	0.0000***
INV	-104.5718***	-105.9969***	-105.7202***	-125.6235***
Constant	-19.1322***	-26.2588***	-54.5517***	-55.5194***
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
R-squared	0.1887	0.2217	0.2626	0.2783
Observations	6830	6066	6830	6066

Notes: This table examines the effect of green innovation on corporate investors' environmental performance using ESG and Environmental Pillar scores as alternative dependent variables. T-statistics are shown in parentheses and *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 12. Ambidexterity and corporate investors' green innovation

Variable	Count			Citations		
Static	-0.0751**			-0.1023*		
Dynamic		0.3124**			0.2781**	
Combined			0.6792***			0.6725*
LEV	0.0015*	0.0003*	0.0004*	-0.0005	-0.0005	-0.0005
ABS	-1.4212***	-1.3125***	-1.5423***	-1.4612***	-1.3142***	-1.5162***
UABS	-0.0942***	-0.0817***	-0.0978***	-0.0671***	-0.0665***	-0.0664***
POT	-0.0003	-0.0002	-0.0003	0.0002	0.0002	0.0002
SIZE	0.1956***	0.1952***	0.1967***	0.0578*	0.0534*	0.0578*
CAP	-0.3345	-0.4529	-0.2611	0.3124	0.8777	0.8715
NPT	0.0011**	0.0012**	0.0056**	0.0067**	0.0079**	0.0087**
EMP	-0.0000**	-0.0000**	-0.0000**	-0.0000	-0.0000	-0.0000
INV	5.4277***	5.4211***	5.4321***	5.3224***	5.3184***	5.3361***
Constant	2.7031***	2.6211***	2.5936***	5.9121***	5.8361***	5.8181***
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
R-squared	0.0637	0.0640	0.0642	0.0477	0.0478	0.0477
Observations	6913	6913	6913	6149	6149	6149

Notes: This table examines the effect of the different types of ambidexterity on corporate investors' green innovation performance while using an alternative formulation of the interaction term (reversing Static as 1 - Static). T-statistics are shown in parentheses and *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 13. Static ambidexterity and corporate investors' green innovation: sample breakdown

Variable	Count			Citations		
	Before GFC	During GFC	After GFC	Before GFC	During GFC	After GFC
Static	-0.0457	-0.0019	-0.1021***	-0.1296	-0.0308	-0.0484*
LEV	0.0204***	0.0052***	0.0000	0.0113*	-0.0023	-0.0006***
ABS	1.1384	0.1487	-1.4659***	2.2956**	1.2902	-1.1107***
UABS	-0.0771	0.0352	-0.1989***	-0.1487**	-0.0258	-0.1639***
POT	-0.0004	0.0030***	-0.0000	-0.0042	-0.0002	0.0003
SIZE	0.6635***	0.4599***	0.4042***	0.7982***	-0.0884	0.2817***
CAP	1.1017	-1.1404	-3.5911***	0.7823	-0.7378	-1.9055***
NPT	0.0718***	0.0108**	0.0132***	0.1253***	0.0022	0.0126***
EMP	-0.0000***	-0.0000	-0.0000***	-0.0000***	0.0000	-0.0000***
INV	-1.5946	3.0968*	6.5274***	-3.7352	-2.4354	4.8763***
Constant	-4.2802	-1.8566	-0.4870	-3.7175	9.9761***	2.0416***
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
R-squared	0.0940	0.0868	0.0785	0.1033	0.0071	0.0955
Observations	595	724	5594	592	717	4840

Notes: This table examines the effect of static ambidexterity on corporate investors' green innovation performance before, during and after GFC. T-statistics are shown in parentheses and *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 14. Dynamic ambidexterity and corporate investors' green innovation: sample breakdown

Variable	Count			Citations		
	Before GFC	During GFC	After GFC	Before GFC	During GFC	After GFC
Dynamic	0.1429	0.0711	0.3841***	0.3969	0.1361	0.1922**
LEV	0.0204***	0.0052***	0.0000	0.0112*	-0.0023	-0.0006***
ABS	1.1376	0.1262	-1.4677***	2.2933**	1.2776	-1.1123***
UABS	-0.0771	0.0353	-0.1991***	-0.1488**	-0.0256	-0.1640***
POT	-0.0004	0.0030***	-0.0000	-0.0042	-0.0002	0.0003
SIZE	0.6637***	0.4599***	0.4039***	0.7991***	-0.0880	0.2815***
CAP	1.1112	-1.1416	-3.5975***	0.8094	-0.7366	-1.9098***
NPT	0.0719***	0.0108**	0.0132***	0.1256***	0.0022	0.0127***
EMP	-0.0000***	-0.0000	-0.0000***	-0.0000***	0.0000	-0.0000***
INV	-1.5918	3.1311*	6.5202***	-3.7281	-2.4142	4.8728***
Constant	-4.3311	-1.8612	-0.5904	-3.8633	9.9342***	1.9931***
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
R-squared	0.0940	0.0871	0.0789	0.1032	0.0076	0.0958
Observations	595	724	5594	592	717	4840

Notes: This table examines the effect of dynamic ambidexterity on corporate investors' green innovation performance before, during and after GFC. T-statistics are shown in parentheses and *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 15. Combined ambidexterity and corporate investors' green innovation: sample breakdown

Variable	Count			Citations		
	Before GFC	During GFC	After GFC	Before GFC	During GFC	After GFC
Combined	0.2253	0.4762	0.8197***	0.4819	0.3917	0.4601**
LEV	0.0204***	0.0052***	0.0000	0.0112	-0.0022	-0.0006***
ABS	1.1361	0.1100	-1.4636***	2.2903**	1.2912	-1.1148***
UABS	-0.0771	0.0362	-0.1991***	-0.1485**	-0.0251	-0.1642***
POT	-0.0004	0.0030***	-0.0000	-0.0042	-0.0002	0.0003
SIZE	0.6656***	0.4634***	0.4050***	0.8048***	-0.0850	0.2818***
CAP	1.1298	-1.1290	-3.5823***	0.8493	-0.7254	-1.9070***
NPT	0.0720***	0.0107**	0.0132***	0.1258***	0.0021	0.0127***
EMP	-0.0000***	-0.0000	-0.0000***	-0.0000***	0.0000	-0.0000***
INV	-1.5961	3.1697*	6.5219***	-3.7497	-2.4231	4.8790***
Constant	-4.3564	-1.9378	-0.6139	-3.9352	9.8722***	1.9846***
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
R-squared	0.0939	0.0898	0.0786	0.1028	0.0085	0.0958
Observations	595	724	5594	592	717	4840

Notes: This table examines the effect of combining static and dynamic ambidexterity on corporate investors' green innovation performance before, during and after GFC. T-statistics are shown in parentheses and *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 16. Green patents applications and environmental performance: sample breakdown

Variable	GHG/rev			GHG		
	Before GFC	During GFC	After GFC	Before GFC	During GFC	After GFC
Count	-0.0003	-0.0100***	0.0017***	0.0404*	-0.0742***	0.0036
LEV	0.0001	-0.0001	0.0001***	-0.0018	0.0006	0.0001
ABS	-0.1137***	0.1879***	0.1435***	-0.0133	-0.4290	2.2786***
UABS	0.0054	-0.0064***	0.0013**	0.0731*	0.0085	0.0404**
POT	-0.0019***	0.0001***	0.0000	-0.0194***	0.0014***	-0.0001**
SIZE	0.0495***	-0.0046	0.0043***	0.3942***	-0.7473***	-0.4739***
CAP	-0.0167	-0.2029***	0.1042***	1.5225	-2.0470**	-3.1834***
NPT	0.0121***	0.0046***	0.0034***	0.0983***	0.0004	0.0025**
EMP	-0.0000**	-0.0000	-0.0000***	-0.0000	-0.0000*	-0.0000***
INV	-0.0621	-0.2181**	0.0901***	-6.9913***	-0.0334	-2.0109***
Constant	-0.8910***	0.0653	-0.2278***	-20.2373***	-0.1382	-5.5240***
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
R-squared	0.2847	0.3551	0.2341	0.3531	0.3099	0.3665
Observations	518	712	5600	518	712	5600

Notes: This table examines the effect of green innovation, using the number of green patents, on corporate investors' environmental performance before, during and after GFC. T-statistics are shown in parentheses and *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 17. Green patents citations and environmental performance: sample breakdown

Variable	GHG/rev			GHG		
	Before	During	After	Before	During	After
Citations	-0.0029*	-0.0045**	0.0021***	0.0046	-0.0613***	0.0337***
LEV	0.0001	-0.0002**	0.0001***	-0.0010	-0.0000	0.0002
ABS	-0.1077***	0.1885***	0.1467***	0.0324	-0.4153	2.0986***
UABS	0.0053	-0.0071***	0.0015**	0.0731*	0.0034	0.0369***
POT	-0.0020***	0.0001**	0.0001***	-0.0195***	0.0012***	-0.0001
SIZE	0.0511***	-0.0077	0.0065***	0.4130***	-0.8072***	-0.4576***
CAP	-0.0226	-0.2192***	0.2096***	1.5150	-1.9619**	-2.5470***
NPT	0.0124***	0.0046***	0.0037***	0.1009***	-0.0011	0.0026**
EMP	-0.0000**	-0.0000*	-0.0000***	-0.0000	-0.0000	-0.0000***
INV	-0.0668	-0.2457***	0.1251***	-7.1012***	-0.4021	-1.9868***
Constant	-0.8934***	0.0991	-0.2863***	-20.3310***	0.9715	-6.0147***
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
R-squared	0.2886	0.3457	0.2843	0.3488	0.3084	0.3915
Observations	515	705	4846	515	705	4846

Notes: This table examines the effect of green innovation, using citations of green patents, on corporate investors' environmental performance before, during and after GFC. T-statistics are shown in parentheses and *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

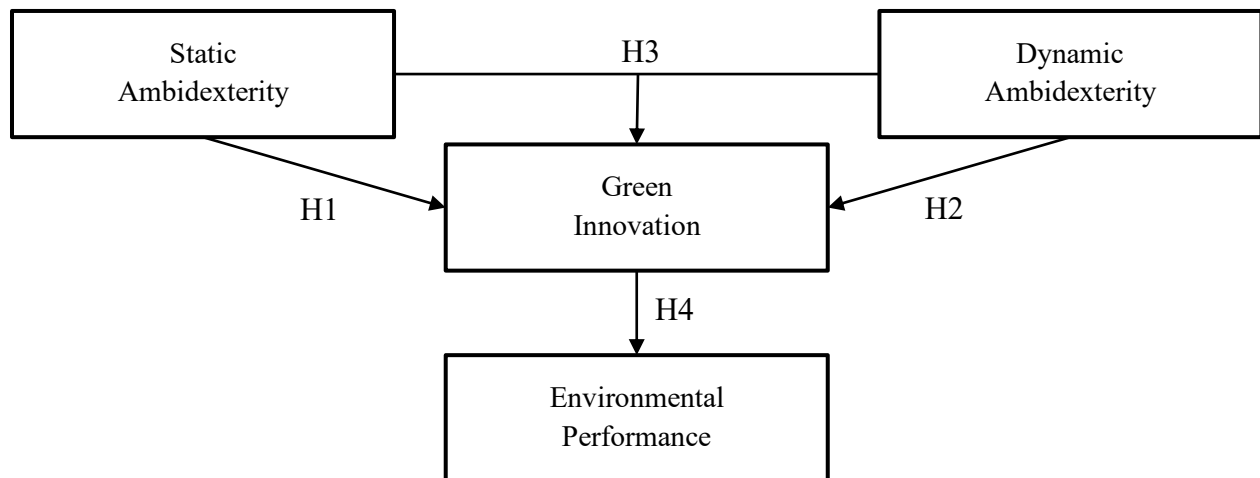


Figure 1. Research framework. This figure presents our research model, illustrating our hypothesis.

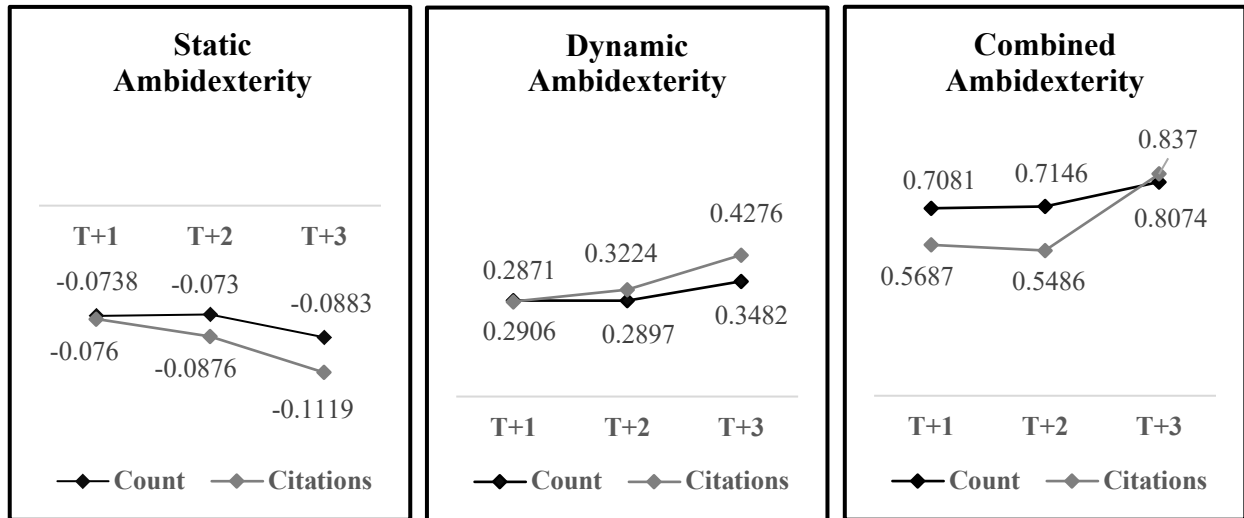


Figure 2. Evolution of the effects of ambidexterity on green innovation. These figures present the t-statistics of the different types of ambidexterity on corporate investors' green innovation performance lagged 1, 2 and 3 years.

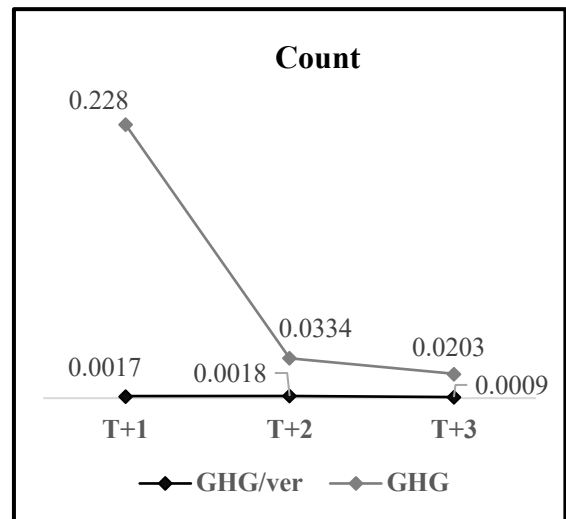
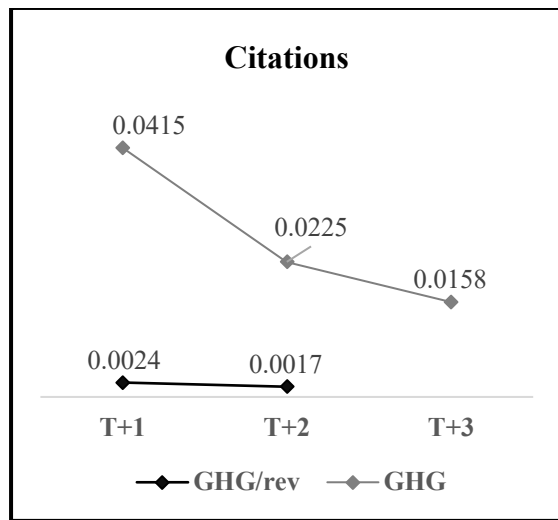


Figure 3. Evolution of the effects of green innovation on environmental performance. These figures present the t-statistics of the different variables that measure green innovation on corporate investors' environmental performance lagged 1, 2 and 3 years.