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The role of CEO regulatory focus in increasing or reducing corporate carbon emissions

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Abstract

This article contributes to the emerging stream of corporate carbon emission research, which zooms in on CEOs' responsibility in organizations' strategic decision-making. This investigation offers new knowledge of how a CEO's regulatory focus can shape whether firms reduce their carbon footprints. Building on regulatory focus theory, this study proposes how the two distinct motivational dispositions (i.e., promotion or prevention focus) of a CEO relate to corporate carbon emissions. We empirically analyzed S&P 500 firms from 2007 to 2018. The findings indicate that CEOs with a high promotion focus are positively associated with corporate carbon emissions, whereas CEOs with a high prevention focus are negatively linked to corporate carbon emissions, with the latter relationship weakened by industry volatility. The findings reported in this study enrich carbon emission research by devoting attention to cognitive and motivational aspects of CEOs for corporate carbon management.

KEYWORDS

CEO characteristics, climate change, decarbonization, regulatory focus theory, upper echelons

1 | INTRODUCTION

Climate change entails an unprecedented change for companies (Howard-Grenville et al., 2014). Global warming has shifted from a mainly environmental interest addressed by regulation and societal groups to a relevant business concern (Hoffman, 2005). Decarbonization is transforming and creating markets, advancing technologies, and introducing new competitive environments (Hoffman, 2005). Carbon emissions have become a central strategic issue for companies (Labatt & White, 2007; Ott & Schiemann, 2023), and drafting decarbonization strategies as well as managing carbon dioxide (CO₂) emissions have become crucial for companies (Bendig et al., 2023;

Weinhofer & Hoffmann, 2010). Thus, CO₂ emissions represent a critical concern for companies (Tanthanongsakkun et al., 2023). The strategic relevance of carbon emissions is illustrated, for example, by the fact that more and more companies have corporate targets to reduce their carbon emissions. While in 2013 approximately only half of Standard and Poor's (S&P) 500 firms reported emission targets (CDP, 2013), in 2019, approximately 70% of S&P 500 index members implemented emission policies (Refinitiv, 2019). In addition, investors and regulators are increasingly demanding that companies put their CO₂ emissions on the strategic agenda.

As management of corporate carbon emissions largely depends on the decisions of firm leaders, it comes as a surprise that the literature has widely neglected executives' motivations and, thus, the behavioral side of strategic decision-making. Indeed, empirical management research on climate change and corporate carbon emissions has shortcomings in at least three respects (Chandy et al., 2019;

Abbreviations: CO₂, carbon dioxide; CEO, chief executive officer; CSR, corporate social responsibility; ESG, environmental, social, and governance; GHG, greenhouse gas; S&P, Standard and Poor's; TMT, top management team; VIF, variance inflation factors.

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Hartmann et al., 2013; Nyberg & Wright, 2020). First, the antecedents for corporate decarbonization and voluntary CO₂ emission reduction have not yet been comprehensively analyzed (e.g., Lemma et al., 2022). Second, as supreme decision-making authorities, chief executive officers (CEOs) are likely to play a central role in companies' management of CO₂ emissions. CEOs' conscious actions and unconscious behaviors significantly impact firms' carbon footprints. However, the role of CEOs in corporate CO₂ emissions and climate action is not well understood. Third, because research has found evidence that CEO attributes influence firms' environmental and corporate social responsibility (CSR) performance (e.g., Gamache et al., 2020; Petrenko et al., 2016; Shahab et al., 2020), CEO characteristics are equally expected to impact firms' climate strategies and the level of CO₂ emissions. However, the influence of CEO attributes on company carbon emissions is unclear. In an attempt to fill these voids, we propose CEO regulatory focus, the hedonic self-regulatory system for bringing oneself into alignment with one's standards and achieving desired end states or goals (Brockner et al., 2004; Brockner & Higgins, 2001; Higgins, 1998), as a key determinant of corporate carbon emissions.

The theory of regulatory focus explains the motivations and goal pursuits of individuals (Higgins, 1997, 1998). The concept states that people are motivated to achieve pleasure through accomplishments and aspirations (promotion focus) and to avoid pain, which individuals are able to do through safety and responsibilities (prevention focus; Higgins, 1997). Regulatory focus affects and includes a CEO's preferences (Gamache et al., 2015, 2020). This study's central contention is that a CEO's motivational disposition influences their firm's carbon footprint. We thus explore the following research question: How does a CEO's regulatory focus relate to a company's carbon emissions? We propose that CEO promotion focus positively relates to corporate CO₂ emissions, whereas CEO prevention focus is negatively related. These relationships are moderated by industry volatility in that high volatility weakens the influence of CEO regulatory focus on corporate CO₂ emissions. To test our theorization, we composed a unique longitudinal dataset comprising information on all permanent and temporary S&P 500 firms between 2007 and 2018.

Our investigation makes several important contributions. First, this study unearths an important piece of the puzzle on what the drivers of corporate carbon emissions are. We focus on the individual level of CEOs, introduce a key motivating factor (regulatory focus), and show how it affects corporate carbon emissions. In this way, this article recognizes how CEOs' promotion and prevention focus individually relate to corporate carbon emissions and why firms might differ in terms of their carbon footprints. We thus underline that CEO attributes influence a firm's environmental and climate performance. Second, we advance the growing empirical literature on CEOs' regulatory focus. An increasing body of management research has examined the regulatory focus of CEOs and its role in key strategic outcomes (Qian et al., 2023; Scoresby et al., 2021). Most recent strategy studies have applied regulatory focus theory to explain certain management outcomes (e.g., Gamache et al., 2020; Ma et al., 2021; Mount &

Baer, 2021). Moving beyond the research of Gamache et al. (2020) on stakeholder strategies, we add precision to the impact of CEO regulatory focus on the natural environment and climate change concerns. In addition to theoretical advancements, our study has practical implications as well. We shed light on the carbon management of CEOs by examining the relationship between CEO regulatory focus and corporate carbon emissions, and we provide evidence that CEOs and their motivational tendencies significantly relate to firms' CO₂ emissions.

2 | THEORETICAL BACKGROUND AND HYPOTHESES DEVELOPMENT

2.1 | Regulatory focus theory and corporate carbon emissions

Regulatory focus theory represents a widely used concept for explaining individuals' motivation and goal pursuit. Regulatory focus represents a self-regulation principle and originates from the discipline of psychology. The theory is based on the hedonic notion that "people are motivated to approach pleasure and avoid pain" (Higgins, 1997, p. 1280). People have two motivational systems of self-regulation available: promotion-focused and prevention-focused (Higgins & Spiegel, 2004). They vary in three aspects: (1) individuals' fundamental motives, (2) the type of objectives they try to achieve, and (3) the kind of results that are important to them (Brockner et al., 2004).

First, individuals high in promotion focus are motivated to achieve pleasure, while prevention-driven individuals aim to avoid pain (Higgins, 1998). While promotion-focused individuals are concerned about advancement, growth, and accomplishment, prevention-focused individuals are affected by security, safety, and a sense of responsibility (Crowe & Higgins, 1997). Second, promotion and prevention foci differ in the types of goals individuals pursue. People high in promotion focus "try to bring themselves into alignment with their ideal selves (based on their dreams and aspirations)" (Brockner et al., 2004, p. 204). In contrast, individuals high in prevention focus try to match their actual selves with their "ought" selves (based on felt duties and responsibilities; Brockner et al., 2004; Brockner & Higgins, 2001). Third, regulatory focus determines how individuals evaluate outcomes and goals. Highly promotion-focused individuals are sensitive to positive end states and gains, while those strong on prevention focus are attentive to averting negative end states and losses (Higgins & Pinelli, 2020). Correspondingly, people high in promotion focus tend "to insure hits and insure against errors of omission" (Crowe & Higgins, 1997, p. 120), while prevention-oriented individuals aim "to insure correct rejections and insure against errors of commission" (Crowe & Higgins, 1997, p. 120). Importantly, promotion and prevention foci result in divergent behaviors and perceptions of goal pursuit without changing the aim itself; in other words, according to their regulatory focus, "two individuals with the exact same goal will think, feel, and act differently" (Weber & Bauman, 2019, p. 363).

Even though promotion and prevention foci are independent dimensions that can coexist, individuals have chronic promotion or prevention foci (Higgins, 2015). Such a dominant tendency toward either promotion or prevention is referred to as a dispositional trait, whereas regulatory focus also includes state-like elements (Chan, 2021; Lanaj et al., 2012). Momentary situational orientations or states are dependent on situations and can change according to them. One's dominant orientation, in contrast, is relatively stable across their lifespan (Higgins, 2005). Thus, many studies have focused on classifying individuals according to their dominant tendency toward either promotion or prevention (Chan, 2021; Tuncdogan et al., 2017). In recent years, regulatory focus theorization has attracted considerable attention in management research, evolving into a promising stream of management leadership and decision-making (Bilgili et al., 2020). Most recent empirical research uses regulatory focus theory to explain various strategy outcomes (e.g., Chung & Low, 2022; Ma et al., 2021; Mount & Baer, 2021).

Regulatory focus theory appears well-positioned to explain the impact of CEOs on corporate CO₂ emissions for two primary reasons. First, regulatory focus directly affects work outcomes and performance (Lanaj et al., 2012). It has a more immediate influence on behavior than self-concept constructs like narcissism and personality traits like extraversion (Gamache et al., 2020). As such, CEO regulatory focus has the potential to explain why CEOs attribute different levels of importance to CO₂ emissions and why the carbon footprints of similar companies differ. Moreover, since management decisions on climate matters are fraught with uncertainty (Henderson, 2020), CEO regulatory focus—which reflects an individual's strategic inclination toward achieving goals (Gamache et al., 2020)—holds great explanatory power for examining CO₂ emissions. Second, according to regulatory focus theory, individuals may have the same objective but differ substantially in their behavior and actions toward achieving the common goal (Weber & Bauman, 2019). An example of a common aim might be the fight against climate change, an objective upon which most people may agree. However, people's actions to limit and mitigate climate change differ broadly. Regulatory focus bears high explanatory power for these phenomena and is well-suited to exploring the role of CEOs in carbon emissions.

This study builds on and advances the prior work of Gamache et al. (2020) analyzing the effect of CEO regulatory focus on corporate stakeholder strategies. Gamache et al. (2020) hypothesized a positive association between CEO promotion focus and receptivity to and engagement in socially oriented initiatives and activism. We argue that CEOs' promotion and prevention foci affect the level of firms' carbon emissions. CEOs with a higher promotion focus tend to increase corporate CO₂ emissions, and CEOs with a higher prevention focus are inclined to reduce their firm's carbon footprint. Moving beyond the perspectives offered by Gamache et al. (2020), who did not include climate-related aspects in their study, we devote ourselves exclusively to CO₂ emissions and offer novel insights into the intersection of CEOs' regulatory focus and the natural environment. Climate change and CO₂ emissions require a

stand-alone examination given their increasingly high importance for society and businesses.

2.2 | CEO promotion focus and corporate carbon emissions

We hypothesize a positive relationship between CEOs with high promotion focus and corporate carbon emissions for the following three reasons. First, individuals high in promotion focus favor eagerness-related means appropriate for accomplishment, advancement, and aspiration (Crowe & Higgins, 1997). People high in promotion focus are mainly guided by needs for growth and development (Higgins, 1998). Thus, CEOs with a high promotion focus are more likely to strive for profits and pursue business growth and opportunities (Scoresby et al., 2021). Reducing CO₂ emissions requires significant investments by the company, which has the potential to jeopardize the short-term business aspirations of these CEOs. Consequently, CEOs with a pronounced promotion focus are probably unlikely to pursue actions to lower CO₂ emissions. They may perceive low-carbon strategies as potentially interfering with their capacity to pursue broader business aspirations. As such, the opportunity-seeking tendency of CEOs with high promotion focus may lead to an increased carbon footprint.

Second, people high in promotion focus are attracted to positive end states and gains (Higgins & Pinelli, 2020). They attempt to maximize prospects for gain (Crowe & Higgins, 1997). Because of their desire for gains and the higher importance they attribute to them, these CEOs are less likely to pursue CO₂ emission reductions as “potential gains carry a higher salience compared to possible losses” (Gamache et al., 2015, p. 1266). Thus, CEOs high in promotion focus are expected to attribute carbon emissions to a lower significance for their companies. Moreover, people high in promotion focus try to avert errors of omission, such as actions not taken and missed opportunities (Crowe & Higgins, 1997). CEOs high in promotion focus are likely to increase emissions-intensive activities to approach potential gains. They prefer *approach* rather than *avoidance* as a preferred instrument for achieving their objectives (Brockner & Higgins, 2001; Mount & Baer, 2021). Correspondingly, CO₂ avoidance and reduction are likely not a priority for them, and we therefore expect CEO high promotion focus to be positively related to firms' carbon emissions.

Third, people high in promotion focus are inclined to evaluate situations in terms of opportunities and are generally more risk-friendly (Scholer & Higgins, 2012). CEOs high in promotion focus are risk-seekers (Zou et al., 2014) and engage in riskier strategic activities (Mount & Baer, 2021). Notably, CO₂ emissions create significant risks for companies (Flammer et al., 2021). The larger a company's carbon footprint, the higher its exposure to transitional climate risks from increased carbon regulation, pricing, and reporting obligations (CDP, 2019). Nonetheless, individuals high in promotion focus are prone to evaluating situations positively (Lanaj et al., 2012). In alignment with regulatory focus theory, we expect a positive relationship

between CEO high promotion focus and firm CO₂ emissions. We thus formally hypothesize the following:

Hypothesis 1. *CEO promotion focus is positively associated with corporate carbon emissions.*

2.3 | CEO prevention focus and corporate carbon emissions

In contrast to Hypothesis 1, we assume a negative relationship between CEOs high in prevention focus and corporate carbon emissions based on three primary reasons. First, individuals high in prevention focus are motivated to align themselves with their “ought” selves, demonstrating a profound feeling of responsibility and a sense of duty (Brockner et al., 2004; Brockner & Higgins, 2001). Public sentiment to reduce carbon footprints is growing, so stakeholders are increasingly urging companies to reduce their carbon footprints (Gillespie et al., 2020). CEOs with a high prevention focus may perceive an obligation to respond to environmental concerns (Gamache et al., 2020) and to conserve resources (Scoresby et al., 2021) so that the reduction of carbon emissions meets obligations toward investors and stakeholders. By reducing carbon emissions, CEOs who are strong on prevention focus meet their duties, obligations, and responsibilities (Higgins, 1998).

Second, people high in prevention focus try to avoid errors of omission, meaning they focus on avoiding mistakes (Crowe & Higgins, 1997) as a means of pursuing their goals (Zou et al., 2014). Moreover, individuals high in prevention focus are concerned with avoiding losses (Higgins & Pinelli, 2020) to minimize the possibility of negative end states (Crowe & Higgins, 1997). Firms with high carbon exposure risk divestment from institutional investors (Krueger et al., 2020). Additionally, companies with large CO₂ footprints may have a less impressive stock market performance than companies with low CO₂ emissions (Mellor, 2021), and CEOs with a high prevention focus are thus expected to reduce CO₂ emissions to minimize the possibility of such negative end states for the company. Therefore, CEOs with a high focus on prevention tend to hedge their strategic bets by reducing their carbon footprint. Given their pronounced aversion to negative end states and mistakes, CEOs with a high prevention focus are likely to work toward low-carbon emissions.

Third, individuals high in prevention focus favor vigilance-related means suitable for satisfying the needs of safety, protection, and security (Crowe & Higgins, 1997). Correspondingly, CEOs high in prevention focus are prone to risk awareness and prefer defensive and security-oriented goals (Mount & Baer, 2021). CO₂ emissions expose companies to significant risks regarding climate change and financing. On the one hand, firms face increasing pressure to manage their climate change risks (Flammer et al., 2021; Krueger et al., 2020). A rising carbon footprint may increase companies' risk exposure (Pacthod & Pinner, 2021). On the other hand, a considerable level of corporate CO₂ emissions jeopardizes a firm's financing and may result in worse refinancing conditions. Many investors increasingly engage with

companies based on CO₂ emission levels (Crooks & Mooney, 2017). Thus, lowering CO₂ emissions may improve risk management, tap new sources of capital, and reduce financial risks (Hoffman, 2005). A low level of CO₂ emissions is relevant for risk-aware and security-oriented CEOs. Therefore, CEOs with a strong prevention focus are inclined to work toward reducing CO₂ emissions. Hence regulatory focus theory suggests the following hypothesis:

Hypothesis 2. *CEO prevention focus is negatively associated with corporate carbon emissions.*

2.4 | Moderating influence of industry volatility

The influence of regulatory focus is emphasized when people use goal pursuit means that conform to their regulatory focus, a phenomenon called regulatory fit (Higgins, 2000). If promotion and prevention foci are congruent with the contextual environment, individuals feel right about what they do (Higgins, 2005). However, in cases of incongruence, the effect of regulatory focus is attenuated. Thus, CEO regulatory focus “does not operate in a vacuum” (Gamache et al., 2015, p. 1267); the impact of promotion and prevention foci are affected by the situation facing CEOs. When CEO regulatory focus is congruent with the situational environment, regulatory focus effects are emphasized (Gamache et al., 2015). As such, consistent with prior studies, we consider situational stimuli when analyzing CEO regulatory focus (e.g., Gamache et al., 2015; Kammerlander et al., 2015).

Environmental characteristics represent an important situational factor for CEO regulatory focus (Jiang et al., 2020; Kashmiri et al., 2019; Wallace et al., 2010). We define industry volatility as the level of demand volatility, instability, and insecurity in an industry. Volatile industries are characterized by a high level of change and uncertainty, whereas stable industries have a low rate of change for technologies, customer preferences, and competitive dynamics (Wallace et al., 2010). Since market volatility and insecurity may influence achievement, failure, and the reward–risk structure of the industry as perceived by CEOs, industry volatility is likely to interact with CEO regulatory focus. Therefore, we assume that industry volatility moderates the relationship between CEO regulatory focus and corporate CO₂ emissions.

Regulatory fit results from congruence between CEO promotion and prevention foci and situational characteristics. Regulatory fit is expected to affect how CEOs act about carbon emissions in volatile industries. Overall, we hypothesize that strong industry volatility weakens the CEO regulatory focus and carbon emissions relationship. Individuals high in promotion focus are attentive to advancement, growth, and accomplishments and are motivated to seek new achievements and gains (Hmieleski & Baron, 2008). For CEOs high in promotion focus, demand-unstable industries have the potential to provide novel opportunities to obtain more gains (Wallace et al., 2010). Promotion-focused CEOs in volatile industries are likely to pursue strategic alternatives that turn out to be effective and promising (Jiang et al., 2020). Thus, reducing CO₂ emissions may result in

significant low-carbon opportunities for companies, especially for securing a company's competitive advantage in times of high industry volatility (CDP, 2019). In volatile industries, CEOs with a high promotion focus are expected to pay more attention to low-carbon opportunities and thus be more inclined to pursue low-carbon gains and profit from win-win scenarios. Hence, we expect the positive relationship between CEO regulatory focus and carbon emissions to be attenuated by growing industry volatility.

In contrast, the instability and insecurity of volatile industries are at odds with a security-oriented prevention focus. While demand-unstable industries exhibit a high rate of change and unpredictability, individuals with a high prevention focus are interested in protection, security, and stability. Therefore, industry volatility countervails the responsibility of CEOs with a high focus on prevention concerning carbon emissions. Industry volatility results in a mismatch in regulatory fit, causing an attenuated impact on the regulatory focus and CO₂ relationship. Hence, we expect the influence of CEO prevention focus on carbon emissions to be less pronounced in volatile industries. We therefore hypothesize the following:

Hypothesis 3. *The positive relationship between CEO promotion focus and corporate carbon emissions is moderated by industry volatility such that the relationship becomes weaker with a greater level of industry volatility.*

Hypothesis 4. *The negative relationship between CEO prevention focus and corporate carbon emissions is moderated by industry volatility such that the relationship becomes weaker with a greater level of industry volatility.*

Figure 1 illustrates the research model graphically.

3 | METHODS

3.1 | Data and sample

The empirical analysis included all companies in the U.S. S&P 500 index over an 11-year period between 2007 and 2018. We

examined the largest publicly traded companies in the largest economy for two principal reasons. First, S&P 500 firms are significant CO₂ emitters that increasingly pursue voluntary emission reductions (CDP, 2013, 2014, 2015; Ernst & Young, 2022). For example, in 2015 the direct emissions of S&P 500 firms amounted to the combined emissions of Germany, the United Kingdom, and France (Edwards & Lazzara, 2016). Second, S&P 500 companies cover approximately 80% of U.S. market capitalization across different industries (S&P Global, 2022). We chose 2007 as the initial year for the analysis because CDP (formerly the Carbon Disclosure Project) publicly called on S&P 500 companies to disclose climate-related matters and CO₂ emissions for the first time in 2006 (CDP, 2014). We included 2018 as the last year of inquiry because the United States formally announced its withdrawal from the Paris Climate Agreement in 2019.

We used manually compiled letters to shareholders of all permanent and temporarily listed S&P 500 companies to derive CEO regulatory focus. We collected financial and company data from S&P Compustat North America and CEO variables from the Execucomp database. We gathered CO₂ emission data from the Refinitiv ESG (environmental, social, and governance) database, formerly known as Thomson Reuters ESG or Asset4.

We chose Refinitiv ESG for emission data for three primary reasons. First, the database features the most extensive data coverage among the leading providers of emission data (Busch et al., 2020). Second, Refinitiv ESG is widely used in empirical research on corporate environmental performance and CSR (Semenova & Hassel, 2015; Wernicke et al., 2022). Third, in addition to company-disclosed carbon data, Refinitiv uses third-party data and its own CO₂ estimations (Busch et al., 2020). Including the estimations—where available—represents a robust approach as Busch et al. (2020) found that combining reported and estimated CO₂ data improves the consistency of corporate carbon data. Refinitiv determines firms' CO₂ emissions by drawing on one of four sources, depending on data availability, in the following sequence: firm-reported emissions, previous company-disclosed emissions, energy consumption, and the median emissions of the industry or business segment (Refinitiv, 2022). The CO₂ estimations are based on transparent, patented calculation models (Refinitiv, 2022).

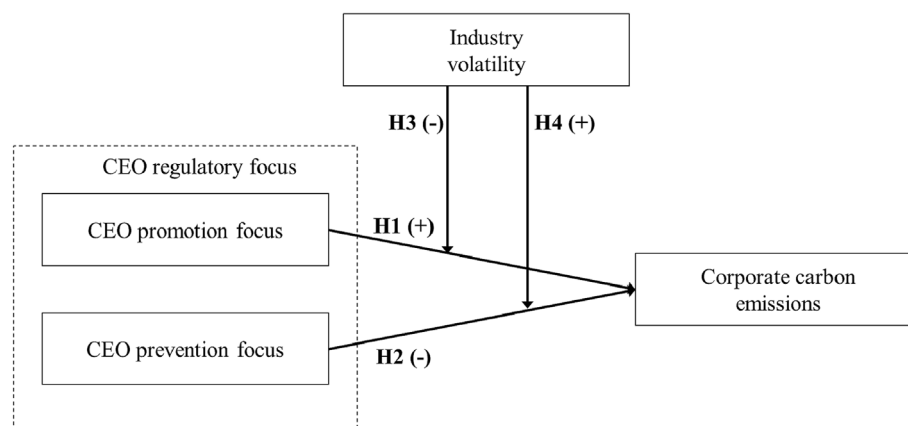


FIGURE 1 Research model.

Although the number of CO₂-disclosing firms has increased significantly in recent years, many companies still do not report their CO₂ emissions (Busch et al., 2020). For the focal S&P 500 companies, 44% disclosed their CO₂ emissions in 2007 (Reid & Toffel, 2009), while 70% of S&P 500 members reported carbon data through CDP in 2017 (CDP, 2017), rising to 80% in 2021 (CDP, 2022). Consequently, missing carbon data represents a limiting factor in the sample. Moreover, we excluded observations if there was no estimated or reported CO₂ value available or if we could not construct all measures. This exclusion resulted in an unbalanced data panel of 4009 firm-year observations of 512 S&P 500 firms. Due to missing values of the moderator industry volatility, the sample in the moderated models consisted of 3518 observations from 492 companies. A detailed description of the sample and its selection process can be found in the Online Appendix.

3.2 | Measures

3.2.1 | Dependent variable: Corporate carbon emissions

Firms' Scope 1 and 2 emissions were the dependent construct in the study. The Greenhouse Gas Protocol, the most established CO₂ accounting standard for businesses, defines three emission categories according to a company's operational control. Scope 1 emissions comprise all direct greenhouse gas (GHG) emissions originating from facilities controlled or owned by the firm (WBCSD & WRI, 2004). Indirect company emissions resulting from purchased energy (Scope 2) and the value chain (Scope 3) materialize from sources not controlled or owned by the firm (WBCSD & WRI, 2004). We chose Scope 1 and 2 emissions for analysis because Scope 1 emissions are under the direct operational control of the firm, and Scope 2 emissions result from the company's energy purchases. The company can exert significant managerial influence on both, so CEOs may actively influence these emission categories. In contrast, companies do not exercise direct control over value chain emissions (Busch et al., 2020), so Scope 3 emissions are less suitable for exploring the impact of CEOs on firms' carbon emissions.

We use the reported and estimated Scope 1 and 2 emissions of companies in metric tons. Like all GHG emission data, Scope 1 and 2 emissions are expressed in CO₂ equivalents, which comprise all GHG that cause anthropogenic climate change (Busch et al., 2018). Due to their pronounced skewness, we transformed Scope 1 and 2 emissions by their natural logarithm. Since corporate carbon data is often subject to outliers (Busch et al., 2018), we avoided distortions due to extreme observations by winsorizing the logarithmized Scope 1 and 2 emissions at the 1% level.

In addition to the outlined thematic differences, the study differs methodologically from Gamache et al. (2020). Gamache et al. (2020) measured socially oriented initiatives as the aggregate total score of firms' strengths in the ESG segments of human rights, employee relations, community, diversity, and environment, and their figures

were derived from the KLD database for 2005 to 2013. Environmental concerns represent only a fraction of the composite score of socially oriented stakeholder strategies. Additionally, the KLD database first introduced a climate change and carbon emissions performance indicator in 2012–2013 (MSCI ESG Research, 2015), so climate-related concerns are unlikely to be adequately covered by Gamache et al. (2020). In contrast, our study did not use an aggregate CSR measure from the KLD database as a dependent variable but relied on companies' actual and estimated CO₂ emissions from 2007 to 2018.

3.2.2 | Independent variable: CEO regulatory focus

CEO promotion and CEO prevention foci served as independent variables. We derived these measures from CEOs' annual letters to shareholders because shareholder letters represent vital communications for CEOs with their principals. CEOs use this investor communication to convey the firm's annual operations, performance, priorities, and overall strategy (McKenny et al., 2018).

We followed prior research and used CEOs' letters to shareholders for content analysis to estimate CEO promotion and prevention focus (e.g., Gamache et al., 2015, 2020; Mount & Baer, 2021). Shareholder letters are highly suitable for measuring CEO regulatory focus (Gamache et al., 2015, 2020). We relied on letters to shareholders to determine CEOs' regulatory focus for two principal reasons. First, letters to shareholders are written, or at least carefully edited, by CEOs (Eggers & Kaplan, 2009), and they tend to reflect CEOs' preferences (McKenny et al., 2018). Thus, letters to shareholders offer a consistent, comparable, non-intrusive, and annual means of communication (Gamache et al., 2015, 2020). Second, non-situational shareholder letters are ideal for determining CEOs' regulatory focus, because regulatory focus can be influenced and primed by situations (Förster et al., 1998) or specific promotion- or prevention-focused questions (Kanze et al., 2018). Shareholder letters represent such non-situational means of communication.

To determine CEOs' regulatory focus, we manually collected letters to shareholders of all permanently and temporarily listed S&P 500 companies between 2007 and 2018. We aggregated them from [AnnualReports.com](https://www.annualreports.com), an online provider of annual reports, individual company websites, and Google (Gamache et al., 2015, 2020). We used the regulatory focus dictionaries drafted and verified by Gamache et al. (2015) for content analysis to determine CEOs' promotion or prevention focus. We conducted the content analysis of regulatory focus words in shareholder letters (Gamache et al., 2015) using the computer-aided text analysis software of McKenny et al. (2012). The word list appears in Table 1.

Like Gamache et al. (2015, 2020), we divided the number of regulatory focus words by the total number of words for each letter to shareholders. The percentage of promotion or prevention words in each annual CEO letter represented the explanatory variables. Similar to prior research, we lagged both independent variables by 1 year (Gamache et al., 2015, 2020).

TABLE 1 Regulatory focus words according to Gamache et al. (2015).

Promotion words	Prevention words
Accomplish, achieve, advancement, aspiration, aspire, attain, desire, earn, expand, gain, grow, hope, hoping, ideal, improve, increase, momentum, obtain, optimistic, Progress, promoting, promotion, speed, swift, toward, velocity, wish	Accuracy, afraid, anxious, avoid, careful, conservative, defend, duty, escape, escaping, evade, fail, fear, loss, obligation, ought, pain, prevent, protect, responsible, risk, safety, security, threat, vigilance

3.2.3 | Moderator: Industry volatility

We examined the moderating effect of industry volatility on CEO regulatory focus and companies' CO₂ emissions. We measured industry volatility as the standard deviation of sales growth over a 5-year period (Finkelstein, 2009; Gallemore & Labro, 2015), with industry defined by three-digit standard industrial classification (SIC) codes. Thus, industry volatility captured demand instability (Finkelstein, 2009) and sales growth volatility (Gallemore & Labro, 2015) within an industry. High industry volatility indicates a considerable level of volatility, instability, and insecurity in the market, whereas low industry volatility implies stable demand and a low level of uncertainty.

3.2.4 | Control variables

In the regression, we controlled for factors that potentially impacted firms' carbon emissions and CEO regulatory focus. Based on prior research on CEO regulatory focus and strategic outcomes, we accounted for firm and CEO characteristics (Gamache et al., 2015, 2020). First, we controlled for *firm size* and *net income* to account for firm-specific capabilities that may influence firms' carbon footprint. We measured firm size as the natural logarithm of total assets (Gamache et al., 2015, 2020). Second, to account for the demographic characteristics of CEOs, we tested for *CEO age* and *CEO tenure* (Mount & Baer, 2021). Third, we controlled for CEO remuneration incentives (Gamache et al., 2015, 2020) through the natural logarithm of the comprehensive variable *total compensation* (Mahmoudian & Jermias, 2022; Nuber & Velte, 2021). While firm-level control variables were derived from Compustat, CEO variables were obtained from the Execucomp database.

3.3 | Analysis

We used a fixed-effects estimation to test our hypotheses, including firm and year fixed-effects. We relied on firm fixed-effects regressions to address endogeneity concerns by reducing the potential influence

of unobservables and time constants on firm and CEO characteristics (Wooldridge, 2012). Hausman (1978) indicated the suitability of a fixed-effects model ($\chi^2 = 61.30$, $p < .001$). Moreover, we estimated robust standard errors by company and lagged all independent and control variables by 1 year (Gamache et al., 2015, 2020). In addition, because many companies do not disclose their carbon emissions (Busch et al., 2020), the study faces a potential sample selection bias. To address this concern of sample-induced endogeneity, we conducted Heckman's (1979) two-stage estimation (Certo et al., 2016; Clougherty et al., 2016). Additionally, for robustness purposes, we conducted a random-effects estimation to capture additional support for our hypotheses. The Heckman analysis and the random-effects regression can be found in the separate Online Appendix.

4 | RESULTS

Table 2 presents descriptive sample statistics and bivariate correlation coefficients for all variables in the model. CEO promotion and prevention foci demonstrate a weak correlation ($\beta = -.05$). This finding is consistent with previous research in that both foci represent distinct constructs (Gamache et al., 2015, 2020; Lanaj et al., 2012). Furthermore, the pairwise correlation coefficients do not exceed |0.30|, except for the expected variables of carbon emissions and firm size ($\beta = .35$), and CEO tenure and CEO age ($\beta = .45$). In addition, computed variance inflation factors (VIFs) remain well below the multicollinearity thresholds (Salmerón Gómez et al., 2016). With a mean VIF of 1.21, none of the VIFs exceed 1.55. Moreover, the conditional number ranks well below 20, indicating that the estimation is unlikely to suffer from multicollinearity (Greene, 2011). After additional consideration of the recommendations of Kalnins (2018), we conclude that multicollinearity is unlikely to affect our estimations.

Table 3 exhibits the regression results of the hypothesis examination. Model 1 includes control variables only, while Model 2 estimates the controls and both independent variables because of their character as independent constructs. Models 3 and 4 comprise the full model for each interaction term. Finally, Model 5 includes all hypothesized variables. Throughout all models, firm size is positively and significantly associated ($p < .05$) with corporate CO₂ emissions.

Hypothesis 1 assumes that CEO promotion focus and corporate carbon emissions have a positive relationship. The coefficient for CEO promotion focus is positive and significant ($p < .05$ for Models 2–3 and 5), thus providing support for Hypothesis 1. This finding indicates that firms' CO₂ emission levels are likely to rise as CEO promotion focus grows.

Hypothesis 2 predicts a negative association between CEO prevention focus and corporate carbon emissions. The coefficient for CEO prevention focus is negative and significant ($p < .01$ for Models 2–3; $p < .001$ for Models 4–5) and thus supports Hypothesis 2. The finding indicates that carbon emissions are more likely to decrease as CEO prevention focus increases. Interestingly, throughout the models, the CEO prevention focus coefficient exhibits a larger relative impact on firms' carbon emissions ($\beta = -.128$ in Model 2) than the CEO

TABLE 2 Descriptive sample statistics and bivariate correlation coefficients.

Variables	Mean	SD	Min	Max	1	2	3	4	5	6	7	8	9
1. Carbon emissions	12.76	2.18	8.35	18.07	1.000								
2. CEO promotion focus	0.56	0.29	0.00	2.36	0.040 (0.019)	1.000							
3. CEO prevention focus	0.18	0.21	0.00	2.29	−0.003 (0.842)	−0.053 (0.002)	1.000						
4. Industry volatility	0.24	0.28	0.00	2.67	−0.046 (0.006)	0.001 (0.955)	0.012 (0.486)	1.000					
5. Firm size	9.66	1.40	5.78	14.76	0.347 (0.000)	−0.047 (0.006)	0.191 (0.000)	−0.127 (0.000)	1.000				
6. Net income	1,580.43	3,692.80	−27,684.00	45,220.00	0.271 (0.000)	0.005 (0.758)	0.041 (0.015)	−0.076 (0.000)	0.510 (0.000)	1.000			
7. CEO age	56.98	6.02	35.00	83.00	0.071 (0.000)	−0.034 (0.046)	0.005 (0.750)	0.036 (0.031)	0.085 (0.000)	0.037 (0.027)	1.000		
8. CEO tenure	6.75	6.36	0.00	53.00	−0.098 (0.000)	−0.094 (0.000)	−0.044 (0.009)	0.024 (0.150)	−0.095 (0.000)	−0.039 (0.020)	0.446 (0.000)	1.000	
9. Total compensation	8.95	0.87	−6.91	11.83	0.169 (0.000)	−0.010 (0.536)	−0.010 (0.547)	0.005 (0.746)	0.293 (0.000)	0.182 (0.000)	0.090 (0.000)	0.025 (0.145)	1.000

Note: $n = 4009$. The table reports the mean, standard deviations (SDs), minimums, maxima, and Pearson correlation coefficients; p -values are in parentheses. All independent and control variables are lagged by 1 year. Carbon emissions, firm size, and total compensation are log-transformed. Carbon emissions are winsorized at the 1% level.

TABLE 3 Fixed-effects regression results with corporate CO₂ emissions as the dependent variable.

Variables	Model 1			Model 2			Model 3			Model 4			Model 5		
	Beta	SE	p	Beta	SE	p	Beta	SE	p	Beta	SE	p	Beta	SE	p
CEO promotion focus				.063	0.030	.034 *	.077	0.038	.042 *	.049	0.030	.106	.076	0.038	.045 *
CEO prevention focus				-.128	0.043	.003 **	-.121	0.042	.005 **	-.188	0.053	.000 ***	-.186	0.053	.000 ***
CEO promotion × industry volatility							-.114	0.071	.110				-.111	0.070	.111
CEO prevention × industry volatility										.297	0.112	.008 **	.294	0.111	.008 **
Industry volatility							.072	0.067	.287	-.046	0.057	.425	.017	0.075	.815
Firm size	.592	.055	.000 ***	.597	0.055	.000 ***	.598	0.056	.000 ***	.599	0.055	.000 ***	.598	0.055	.000 ***
Net income	-.000	.000	.275	-.000	0.000	.225	-.000	0.000	.035 *	-.000	0.000	.034 *	-.000	0.000	.032 *
CEO age	.007	.004	.111	.006	0.004	.129	.008	0.004	.083 †	.008	0.004	.086 †	.008	0.004	.083 †
CEO tenure	-.004	.005	.451	-.003	0.005	.517	-.006	0.005	.290	-.006	0.005	.294	-.006	0.005	.289
Total compensation	-.023	.026	.391	-.024	0.026	.354	-.023	0.020	.250	-.023	0.020	.246	-.023	0.020	.245
Constant	6.986	.569	.000 ***	6.958	0.571	.000 ***	6.832	0.593	.000 ***	6.863	0.591	.000 ***	6.849	0.591	.000 ***
Observations	4009			4009			3518			3518			3518		
Firms	512			512			492			492			492		
Firm FE	Yes			Yes			Yes			Yes			Yes		
Year FE	Yes			Yes			Yes			Yes			Yes		
Within R ²	.133			.136			.143			.144			.144		
Between R ²	.158			.160			.150			.150			.150		
Overall R ²	.129			.131			.125			.125			.125		

Note: The table reports the estimated coefficient values (Beta), standard errors (SE), and p-values (p). SE are clustered by firms. All independent and control variables are lagged by 1 year. Carbon emissions, firm size, and total compensation are log-transformed. Carbon emissions are winsorized at the 1% level. Firm and year fixed-effects are included in calculations but not shown. Two-tailed test.

†p < .1;

*p < .05, **p < .01, and ***p < .001.

promotion focus has on corporate CO₂ emissions ($\beta = .063$ in Model 2), suggesting that a prevention focus orientation has a greater relative impact on corporate carbon emissions.

Hypotheses 3 and 4 assume a moderated effect of industry volatility on the CEO regulatory focus and CO₂ relationship. To test both hypotheses, we computed interaction terms by multiplying industry volatility and CEO promotion focus (for Hypothesis 3) and CEO prevention focus (for Hypothesis 4). The positive (negative) association between CEO promotion focus (CEO prevention focus) and corporate carbon emissions was robust in volatile markets. Hypothesis 3 predicts a negative moderation effect of volatile industries on the relationship between CEO promotion focus and carbon emissions. We find that the coefficient of CEO promotion focus remains positive and significant in the moderated full Model 5 ($\beta = .076$, $p < .05$). The interaction term of CEO promotion focus \times industry volatility yields a negative but not significant relationship in both Model 3 ($\beta = -.114$, $p > .1$) and the moderated full Model 5 ($\beta = -.111$, $p > .1$). Hence, we do not find robust evidence that the positive relationship between CEO promotion focus and corporate carbon emissions weakens in more demand-volatile industries. We therefore find no evidence supporting Hypothesis 3. We consider the potential implications in the discussion section.

Hypothesis 4 forecasts that industry volatility positively moderates the impact of CEO prevention focus on firms' CO₂ emissions. The coefficient of CEO prevention focus continues to be negative and significant in Model 4 ($\beta = -.188$, $p < .001$) and the moderated full Model 5 ($\beta = -.186$, $p < .001$). The interaction term of CEO prevention focus \times industry volatility yields a positive and significant relationship in Model 3 ($\beta = .297$, $p = .008$) and the moderated full Model 5 ($\beta = .294$, $p = .008$). We find strong empirical proof that the influence of CEO prevention on corporate CO₂ emissions decreases in volatile industries. Thus, Hypothesis 4 is supported. Figure 2 displays the significant interaction effects of industry volatility on the relationship between CEO prevention focus and firms' CO₂ emissions.

5 | DISCUSSION

CO₂ emissions represent an increasingly important concern for CEOs. As the highest-ranking managers representing the principal authority in their organizations, CEOs' decisions deliberately or unintentionally influence firms' carbon footprints. We therefore devoted ourselves to examining how the motivational dispositions of CEOs impact firms' carbon strategies in this study. Building on the notion of regulatory focus theory, we explore how a CEO's regulatory focus relates to a corporation's carbon emissions. Our central finding is that CEO regulatory focus indeed relates to firms' carbon footprint. Consistent with our theorization, we find that a promotion-focused CEO has a positive association with corporate carbon emissions, and a prevention-focused CEO is negatively associated with corporate carbon footprints. Industry volatility positively moderates the relationship between CEO prevention focus and CO₂ emissions in that high volatility weakens the negative influence of CEO prevention focus on

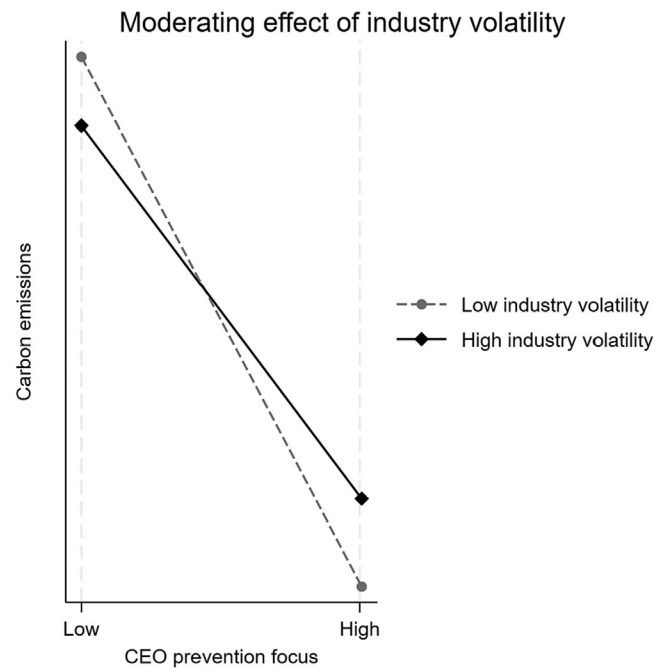


FIGURE 2 Moderating effect of industry volatility for the impact of CEO prevention focus on corporate carbon emissions. Note: high and low industry volatility displayed at one standard deviation above and below the mean. High and low CEO prevention focuses are displayed on the x-axis at one standard deviation above and below the mean. Corporate carbon emissions (log) displayed on the y-axis.

carbon emissions. In sum, we find empirical support for Hypotheses 1, 2, and 4, but Hypothesis 3 has no empirical evidence.

5.1 | Implications for theory and research

The article's findings contribute to the literature in several ways. First and foremost, this study promotes the application of an individual-level perspective in exploring the antecedents of corporate carbon emissions and specifically the role of a firm leader's psychological orientation. We find support that the motivational disposition of CEOs does indeed impact firms' carbon emissions. The emerging literature on corporate carbon emissions thus far has placed great emphasis on investigating the role of certain firm-level antecedents, such as how initiating new projects can help improve energy efficiency and thus reduce corporate carbon emissions (Wei et al., 2022). Adding greater nuance to our understanding of the drivers of corporate carbon emissions, the article recognizes two mechanisms—CEO promotion or prevention focus toward carbon emissions—that explain why firms might differ in terms of their carbon footprints. We thereby demonstrate that CEO attributes influence a firm's environmental and climate performance. The findings also expand upon previous empirical research on the relationship between (non-motivational) CEO characteristics and CSR focused on CEO narcissism (Petrenko et al., 2016; Tang et al., 2018), CEO hubris (Tang et al., 2015), CEO biographies (Lewis et al., 2014; Manner, 2010), and CEO ability (Yuan et al., 2019).

However, these previous studies have not honed in on corporate carbon emissions.

Second, we advance the growing empirical research on the role of CEOs' regulatory focus for strategic outcomes (Gamache et al., 2020; Qian et al., 2023; Scoresby et al., 2021). Notably, this study refines and further develops Gamache et al.'s (2020) most recent research on stakeholder strategies. While Gamache et al. (2020) concentrate on firm engagement in governance- and social-oriented initiatives (as well as firm receptivity to governance- and social-oriented activism), we devote ourselves exclusively to corporate carbon emissions. Gamache et al. (2020, p. 1307) define that socially oriented stakeholder strategies "promote positive social and environmental wellness initiatives" that benefit "a wider breadth of stakeholders (e.g., employees, communities, and the environment)." However, we argue that it is of central importance to look at stakeholders individually without compounding them. By exploring corporate carbon emissions exclusively, we consider the natural environment as a key stakeholder of companies that is directly affected by a firm's carbon footprint (Laine, 2010; Phillips & Reichart, 2000); this builds a bridge to research on corporate sustainability, which has its roots in the triple bottom line approach and which calls for distinguishing how firms contribute to social or environmental issues (Vaupel et al., 2023). Deviating from Gamache et al.'s (2020) findings, the results of this study are also interesting for another reason. Gamache et al. (2020) suggest a positive association between CEO promotion focus and a firm's engagement in socially oriented stakeholder strategies. In contrast, we find that CEO promotion focus has a positive association with firms' carbon emissions. Thus, our results suggest that promotion-oriented CEOs lead firms with increased carbon footprints. We therefore underline that it is important to thematically and methodically recalibrate the environment. In sum, our study expands CEO regulatory focus theorizing to the highly discussed area of CO₂ and climate change, and we add to a more precise understanding of the influence of CEO regulatory focus on environmental and climate change concerns.

Third, the impact of CEO regulatory focus on CO₂ emissions is moderated by industry volatility such that volatility weakens the negative influence of CEO prevention focus on corporate carbon emissions. These findings illustrate that the positive role of CEO prevention focus in lowering corporate carbon emissions decreases in industries with high demand volatility. In other words, CEO prevention focus has a stronger CO₂-reducing impact in industries with low demand instability. This finding underlines the notion of so-called regulatory fit, according to which specific business environments can feel right or wrong for certain CEOs (Wallace et al., 2010). Following the theoretical underpinnings of regulatory fit, the role of a regulatory focus is emphasized when it matches the contextual environment of a CEO (e.g., the volatility of the industry). In fact, heading a firm in a more volatile industry does not fit prevention-focused CEOs' desire for security and the avoidance of losses. High volatility might divert a CEO's attention from CO₂ emissions toward financial concerns to satisfy their need for security and responsibility to secure the company's existence. Regarding the role of promotion-focused CEOs in

corporate carbon emissions, we find no statistical evidence for a moderating effect of industry volatility. One might speculate that higher volatility in the industry does not make low-carbon opportunities more attractive for CEOs with a high promotion focus. High demand instability probably does not redirect the gain-seeking tendency of high-promotion CEOs toward low-carbon opportunities but rather toward profit-enhancing opportunities. CEOs high in promotion focus may not perceive gains related to CO₂ emission reduction as more salient in a volatile environment.

5.2 | Implications for practice

On a practical level, this study sheds light on the role of CEOs in a firm's carbon management. The findings have practical and managerial implications in at least three main ways. First, CEOs and their personal preferences likely play a more important role in influencing corporate carbon footprints and strategies than previously thought. The results support public assertions that CEOs' climate leadership is vital for tackling global climate change (UN Global Compact and Accenture, 2021). However, little scholarly attention has been given so far to the impact of CEOs on a company's carbon footprint and, thus, climate change. This work is the first to empirically examine the influence of CEOs' motivational disposition on firms' CO₂ emissions. We demonstrate that CEOs' motivational orientation is relevant for firms' climate-related strategies.

Second, we offer an explanation for why the carbon footprints of firms develop differently. An enhanced understanding of the drivers of corporate CO₂ emission levels is highly relevant to practitioners. While companies directed by promotion-oriented CEOs tend to have higher carbon emissions, those managed by prevention-oriented CEOs are likely to have lower carbon footprints. Thus, we contribute one important piece to the puzzle of why firms differ with respect to their decarbonization efforts.

Lastly, the findings are also relevant for boards of directors and CEOs. Boards of directors should recognize CEOs' motivational dispositions (Scoresby et al., 2021), notably concerning climate change. For example, the impact of CEOs on firms' carbon emissions has important implications for CEO recruiting. CEO selection plays a critical role when a board of directors wants a company to pursue decarbonization strategies. Boards of directors should carefully consider CEOs' motivational orientation before hiring because leaders who are aware of their natural predisposition toward one focus can consciously use beneficial traits or avoid negative choices (Gamache et al., 2015). Thus, board members should ensure that CEOs are aware of the impact of their motivational orientation on corporate carbon emissions so that they can adjust their actions accordingly.

5.3 | Limitations and avenues for further research

The study's findings and limitations indicate promising avenues for future research in four areas. First, this study followed Gamache

et al.'s (2015, 2020) operationalization to assess the chronic regulatory focus of CEOs. Like many operationalizations of psychological variables based on observable data, this measurement method has its merits as well as its limitations. Based on the theory of regulatory focus, future research could, for example, use self-reported data to look at the situational regulatory focus of CEOs and how it relates to specific goals; this would also open an exciting area for future research, following from Bilgili et al. (2020), to investigate the extent to which there are ideal CEO types for environmental matters based on the orthogonal nature of regulatory focus (e.g., configurations of the chronic and situational inclination toward promotion and prevention focus).

Second, given the supreme decision-making authority of CEOs, this study focused on the effect of CEOs' regulatory focus on carbon strategies. We hold that CEOs' actions and decisions ultimately influence firms' carbon footprints. Future studies could analyze the impact of the regulatory focus of the top management team (TMT), individual TMT members, and the board of directors on firms' carbon strategies. CEOs' regulatory focus may be attenuated or reinforced by the TMT members' regulatory focus (Gamache et al., 2015). Prior research has shown that TMT members have the potential to influence companies' CSR performance (Fu et al., 2020; Kanashiro & Rivera, 2019; Shaikat et al., 2016).

Third, we focused on large U.S. corporations listed in the S&P 500 index. Because of their considerable carbon footprint, they represent a suitable subject of inquiry. However, the results may have limited generalizability to non-U.S. companies. Companies' responses to environmental and climate concerns may differ across countries because they integrate national regulations, policies, and social norms that influence their environmental and emission performance (Orazalin & Mahmood, 2021). Since climate change impacts businesses of all sizes and regions worldwide (United Nations Global Compact & Accenture, 2015, 2021), an investigation into firms headquartered outside the United States may yield interesting insights.

Lastly, we explored the impact of CEO regulatory focus on carbon emissions of S&P 500 U.S. firms indexed between 2007 and 2018. Scholars may replicate the findings with companies' future carbon footprints. We chose 2018 as the last year of inquiry because the Trump administration officially declared withdrawal from the Paris Agreement in 2019. However, the United States rejoined the agreement under President Biden in 2021. Moreover, in 2021, the United States announced its intention to achieve net-zero emissions by 2050, with other major world economies also pledging climate neutrality around mid-century. Future studies can usefully validate the findings with presumably evolving corporate decarbonization targets.

6 | CONCLUSION

Climate change concerns and carbon emissions have become increasingly important topics for companies and CEOs. This study provides evidence that the regulatory focus of CEOs impacts firms' carbon emissions. We contribute to the literature by identifying CEOs'

motivational disposition concerning firms' carbon emissions, advancing empirical research on regulatory focus in management, and, at a broader level, improving understanding of CEOs' carbon management. We hope that this study will motivate further management research on corporate climate strategies and CEO attributes. We view this study as a first step toward a better understanding of executives' decisive role in limiting and mitigating climate change.

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SUPPORTING INFORMATION

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