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Stakeholder Pressures and Decarbonization Strategies in Mittelstand Firms

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Abstract

This study examines the influence of stakeholder pressures and family ownership on strategic decarbonization choices of German Mittelstand firms. It distinguishes between *symbolic* strategies focusing on compensating CO_2-emissions and *substantive* strategies directed toward reducing carbon emissions. The relative pressure exerted by *internal* and *external* stakeholders on these strategic choices is examined. Data from 443 manufacturing firms reveal that overall stakeholder pressures increase the pursuit of decarbonization strategies. Internal stakeholders pressures are associated with increased reliance on substantive decarbonization strategies both in family-owned and non-family-owned firms. Pressure from external stakeholders are associated with increased reliance on both substantive and symbolic decarbonization strategies only in non-family-owned firms. No effect of external pressures was found in family-owned firms. Implications for theory, management practice, and policy makers are discussed.

Keywords Decarbonization strategies · Family firms · Mittelstand · Stakeholder pressures · Symbolic and substantive strategies

Introduction

Business organizations around the world are increasingly facing legislative and stakeholder pressures to reduce their carbon emissions and decarbonize their operations and value chain. For example, in its transition toward a carbon neutral economy by 2050, since 2022 the European Union (EU) has mandated listed firms with over 500 employees to report carbon emissions in a standardized objective and transparent format; this mandate will apply to all listed firms by 2026 (Fetting, 2020). Known for their innovative high-quality products (De Massis et al., 2017), the private mid-sized firms in the German Mittelstand[1] manufacturing sector are important suppliers of listed firms. As Germany is a member state of EU, these firms feel the cascading pressures from their buyers and other stakeholders to decarbonize (Buettner et al., 2022).

Firms have been found to use two types of decarbonization strategies—symbolic and/or substantive (e.g., Damert et al., 2017). *Symbolic decarbonization strategies* focus on compensating carbon emissions by purchasing CO_2-certificates, planting trees, etc. That is, while a firm continues to generate harmful emissions through its operations or value chain, it counterbalances these negative effects outside of its organizational boundaries. *Substantive decarbonization strategies*, on the other hand, focus on reducing the CO_2-emissions of a firm through changes in its business model, operations, processes, resources used, etc. While the goal of a symbolic strategy is often to establish and maintain a positive organizational image, a substantive strategy is not so much image driven but rather the result of a voluntary commitment to the environment.

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[1] We employ a quantitative definition based on employees that comprises medium-sized firms (between 50 and 499 employees) and mid-cap firms (between 500 and 2,999 employees). Other definitions of the Mittelstand also include the unity of ownership and management as a criterion, e.g., Pahnke et al. (2023).

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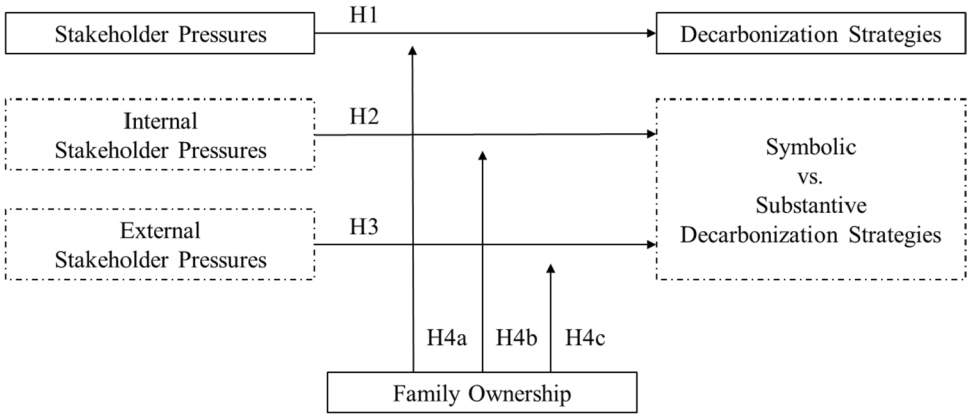

Fig. 1 Stakeholder pressures and decarbonization strategies

Various factors affect a firm's choice of environmental strategies and that of taking symbolic versus substantive actions. Past research has established the influential role of stakeholder pressures to direct business leaders' attention toward the environmental performance of their firms and adopt strategies to reduce their carbon emissions (e.g., Brulhart et al., 2019; Buysse & Verbeke, 2003). However, not all stakeholders exert an equal influence on strategies of a firm and efforts are underway to identify the impact of different stakeholder groups on carbon mitigation strategies of organizations. Preliminary research points to mixed findings. For example, in a trans-national study of 214 supply chain managers, most of whom were in the USA and Canada, Hyatt and Berente (2017) found that pressures from *internal stakeholders* like owners, managers, and employees were the primary drivers of substantive environmental practices. In contrast, Dhanda et al.'s (2022) study of 2502 companies across continents and industries revealed that *external stakeholders* such as legislators are more significant influencers of firm's environmental strategies. Such conflicting findings have led to growing calls to identify the contextual factors and conditions that affect the relationship between stakeholder influences and environmental strategies (e.g., Seroka-Stolka & Fijorek, 2020; Vazquez, 2018; Yunus et al., 2020). In response to these calls, we explore *how do the pressures from internal versus external stakeholder groups influence the importance of symbolic versus substantive decarbonization strategies of Mittelstand firms?*

Prior research shows that firm ownership exerts a significant influence on perception of stakeholder pressures, environmental strategies of a firm, and related outcomes (e.g., Block & Wagner, 2014; Cruz et al., 2014). Often described as stewards with a long-term vision, leaders of family-owned firms are highly motivated to maintain a positive reputation with internal and external stakeholders, especially those that are socially proximate (e.g., Neubaum et al., 2012). In a recent study of 2936 Spanish manufacturing firms, Garcés-Ayerbe et al. (2022) revealed that family firms reap significantly higher financial benefits from investments in environmental strategies than their non-family counterparts. Building on this research, we seek to understand how firm ownership influences the relationship between stakeholder pressures (internal versus external) and a firm's choice of environmental decarbonization strategy (substantive versus symbolic) in Mittelstand firms. This leads to our second research question: *To what extent does family ownership influence these relationships?*

To address our research questions, we develop and test a conceptual model (Fig. 1) using literature on salience of different stakeholder groups (internal and external) and environmental strategies (symbolic and substantive) in family and non-family firms. This model is tested with survey data from 443 German Mittelstand manufacturing firms. Consistent with previous research, stakeholder pressures lead Mittelstand firms to pursue decarbonization strategies. Moreover, pressures from internal stakeholders lead Mittelstand firms to pursue substantive decarbonization strategies, whereas pressures from external stakeholders push them more strongly toward symbolic rather than substantive decarbonization strategies. For family-owned firms, external stakeholder pressures seem not to influence either substantive or symbolic decarbonization strategies.

With these results, our study contributes to three literature streams. First, by focusing on mid-sized private manufacturing firms, it adds a layer of contextualization to the literature on the decarbonization of the industrial sector as earlier studies have mainly focused on large and listed firms (e.g., Damert & Baumgartner, 2018; Johnson et al., 2023; Wimbadi & Djalante, 2020). Second, by showing the differential influence of internal and external stakeholder pressures on the type of decarbonization strategy adopted by firms, we extend the research exploring the relationship between stakeholder pressures and environmental sustainability (e.g., Alt et al., 2015; Dhanda et al., 2022; Garcés-Ayerbe et al., 2012; Hyatt & Berente, 2017; Murillo-Luna et al., 2010). Finally, our research suggests that different factors lead family- and non-family-owned firms to adopt environmental strategies and taking substantive actions. Thus, it contributes to the

literature on the determinants and drivers of environmental management of SMEs and Mittelstand firms (e.g., Dou et al., 2019; Eikelenboom & de Jong, 2019; Ernst et al., 2022; Sharma & Sharma, 2011).

Theoretical Background

Stakeholder Pressures

Stakeholder theory suggests that organizations should consider the interests and concerns of all stakeholders, that is, "any group or individual who can affect or is affected by the achievement of an organization's objectives" (Freeman, 1984, p. 46). According to this theory, firms have a responsibility to manage and balance the interests and needs of various stakeholders and not prioritize the interests of one group at the neglect of another. In this regard, stakeholder theory is in sharp contrast to shareholder theory, which posits that firms should focus primarily on the interest of their owners or shareholders. The literature distinguishes between different types of stakeholders based on their power, legitimacy, urgency, and proximity to a firm (Driscoll & Starik, 2004; Mitchell et al., 1997). Two important classifications are primary and secondary or internal and external stakeholders (Carroll & Näsi, 1997). Following previous research on environmental strategies by Hyatt and Berente (2017), we use the latter classification and distinguish between internal and external stakeholder groups. Internal stakeholders comprise individuals or groups that are located *within* the firm's boundaries and who are involved directly in the firm's operations and governance. In the Mittelstand firms of interest in this study, internal stakeholders comprise owners, managers, and employees. External stakeholders are groups and/or individuals *outside* the firm's boundaries and who have an interest in or are affected by the firm. Examples are customers and suppliers, governments, and regulatory agencies as well as non-governmental organizations and consumer groups.

Stakeholders can be both a motivation and a barrier to a firm's decisions and the resulting operations. To facilitate their interests, they may exert pressure on the firm. The pressure can vary strongly by the nature of stakeholder groups and firms can respond to these pressures in either a reactive or proactive way (e.g., Buysse & Verbeke, 2003; Cadez et al., 2019). The response of firms depends on the nature and closeness of the relationships between the firm and its stakeholders. A review of this literature by Deferne et al. (2022) suggests that firms are more responsive to pressures from more proximate and closer stakeholders.

While early empirical research on stakeholder influence and pressure has focused on large firms, recent studies have investigated the role of stakeholders in small- and mid-sized firms (Ernst et al., 2022; Lähdesmäki, et al., 2019). These studies often apply a social proximity perspective to understand the importance of stakeholder influence and pressure. It is argued that small- and mid-sized firms are strongly embedded in their local environment and the social proximity between the firm and their local stakeholders is often high. This social proximity describes the number and type of social relationships that the firm and its stakeholders share beyond the business context. It influences the salience and urgency of a stakeholder's claims and perceptions of their legitimacy and power (Lähdesmäki et al., 2019; Mitchell et al., 1997). The higher the social proximity between the firm and the respective stakeholder group, the more importance the firm will attribute to the stakeholder's concerns and the more effective stakeholder pressure will be.

Prior research argues that the salience toward different stakeholder groups varies in family and non-family firms (Garcés-Ayerbe et al., 2022). Irrespective of firm size, as family firms are more locally embedded than non-family firms, they tend to be more responsive toward claims from local stakeholder groups (Amato et al., 2023). Among local stakeholder groups, family firms tend to nurture particularly close relationships with their employees and managers expressed in terms of stable and long-term employment relations (Bassanini et al., 2013). Hence, ceteris paribus, concerns articulated, and pressures from internal stakeholders should have a particularly strong effect on the firm's decisions and actions.

Stakeholder Pressures and Environmental Action

Stakeholder pressures have been shown to influence a firm's course of environmental strategy and action (e.g., Aragòn-Correa et al., 2020; Darnall et al., 2010). Important stakeholder groups have expectations about how the firm should treat the natural environment and accordingly can put pressure on the firm regarding its environmental values, strategies, and practices. Such stakeholder pressures toward environmental sustainability can come from *internal* but also from *external* stakeholders. Ramanathan et al. (2014) found that internal stakeholders possess the greatest impact on the environmental performance of a firm, as compared to economic, regulative, and external stakeholder pressures. Firm owners and members of the top management team are particularly influential in its environmental strategy, not only by dictating firms' values and norms but also by controlling resources (e.g., Hyatt & Berente, 2017). For example, environmentally conscious owners and employees tend to direct resources and efforts to enhance the sustainability performance of their firm (Buysse & Verbeke, 2003; Cadez et al., 2019). External stakeholders affect the firm's resources and strategy by their actions or interactions with the firm (e.g., Schmitz et al., 2019; Sharma & Henriques, 2005). For

example, regulators are an especially influential external stakeholder group when considering policies and guidelines related to climate change (e.g., Schmitz et al., 2019; Yunus et al., 2020). Moreover, climate-conscious consumers, investors, and suppliers exert their influence by supporting and/or providing (financial) resources to firms that align with their values and preferences related to climate change (Buysse & Verbeke, 2003; Cadez et al., 2019; Sprengel & Busch, 2011). Other external stakeholders like non-governmental organizations (NGOs) and the media exert indirect pressures on a firm by influencing the opinion of other resource-providing stakeholders (Cadez et al., 2019; Dhanda et al., 2022).

Corporate Decarbonization Strategies

Varied terms have been used to describe corporate environmental strategies of a firm (Damert et al., 2017). These include climate change strategy (Kolk & Pinkse, 2005; Okereke & Russel, 2010), carbon management strategy (Busch & Schwarzkopf, 2013; Lee, 2012; Yunus et al., 2020), climate change mitigation strategy (Cadez & Czerny, 2016; Weinhofer & Hoffmann, 2010), and greenhouse gas reduction strategy (Cadez et al., 2019). Consolidating this literature, Wimbadi and Djalante (2020, p. 4) define decarbonization as "the process by which countries, individuals, or other entities aim to achieve zero fossil carbon existence [which] typically refers to a reduction of the CO_2-emissions associated with electricity, industry, and transport" (IPCC, 2018). In business organizations, corporate decarbonization strategies are a set of policies and actions aimed to reduce or eliminate the carbon emissions of a firm. Johnson et al. (2023) suggest that any combination of administrative, applicative, or collaborative actions may be adopted to achieve a firms' decarbonization goals. Administrative actions include setting targets or monitoring carbon emissions; applicative actions aim to improve energy efficiency through product innovations and process improvement; and collaborative actions involve coordination of supply chain with others and carbon trading or offsetting. Drawing upon the distinction used by Combs et al. (2023) and Hyatt and Berente (2017) for social and environmental strategies, respectively, we differentiate between symbolic and substantive decarbonization.

Symbolic Decarbonization Strategies

Symbolic management refers to the manipulation or ceremonial adoption of organizational symbols or objects to enhance a firm's reputation through impression management (Hyatt & Berente, 2017; Johnson, 1990). The aim is to rationalize the activities of a firm to gain legitimacy with its key stakeholders (Pfeffer, 1981). Being less resource intensive, such actions are easier to implement and modify as they do not require changes in organizational strategy or operations (e.g., Durand et al., 2019; Mahon, 2002). Previously, symbolic strategies have been analyzed in the context of corporate social responsibility (CSR) of organizations (e.g., Wickert et al., 2017; Zhong et al., 2022). Symbolic CSR includes low-cost CSR communication about activities without real societal benefits (Nardi, 2022). Nevertheless, depending on the stakeholders, firms are directed to symbolic CSR actions that can positively affect a firm's financial performance (Schons & Steinmeier, 2016).

This study extends the usage of the concepts of symbolic and substantive strategies to examine corporate decarbonization. Symbolic environmental actions build the appearance of a firm's environmental commitment with the goal of protecting its reputation, but not necessarily enhancing its environmental performance (e.g., Hyatt & Berente, 2017; Rodrigue et al., 2013). The focus is on managing the impressions of key stakeholders regarding the environmental commitment of a firm without expending significant organizational resources or effort to change an organizational business model or activities causing negative impact (Truong et al., 2021). *Symbolic decarbonization strategies* like purchasing CO_2-certificates to compensate for the carbon emissions of a firm focus on creating a positive impression of a firm's environmental strategy on its key stakeholders, rather than reducing the harmful impact of the CO_2-emissions of its operations. Such purchasing of CO_2-certificates can be both mandatory (also referred to as carbon trading) and voluntarily (also referred to as carbon offsetting).

Substantive Decarbonization Strategies

Substantive managerial strategies require fundamental changes in an organization. Such changes require significant and often irreversible investments of capital and organizational resources (e.g., Durand et al., 2019; Sharma & Sharma, 2019). Strategies that assign a high priority to environmental criteria in a firm's decision-making are referred to as substantive environmental strategies (Hyatt & Berente, 2017). Such strategies rely on a deep commitment of organizational players and resource investments aimed toward improving the environmental performance of a firm (Sharma & Vredenburg, 1998). Like the concept of symbolic strategies, prior literature examined firms' substantive CSR strategies (e.g., Nardi, 2022; Schons & Steinmeier, 2016; Wickert et al., 2017; Zhong et al., 2022). For instance, firms are more likely to engage in substantive CSR when stakeholders value and monitor the firms' socio-environmental performance more closely and the respective resources are available (Durand et al., 2019; Perez-Batres et al., 2012).

As our study focuses on the specific environmental strategy of decarbonization, we define *substantive decarbonization strategies* as organizational actions aimed to reduce its

CO_2-emissions. Such actions may be internally or externally focused and include activities, like generating or using green electricity or reducing CO_2-emissions of the value chain. Commitment of top organizational leaders is essential for such resource intensive substantive decarbonization strategies aimed to reduce the negative environmental impact of firms' operations (Dahlmann et al., 2019).

Hypotheses

Stakeholder Pressures and Decarbonization Strategies

Long-term success of a firm relies on creating value for all key stakeholders (Freeman, 1984), including those concerned about environmental sustainability. While the relative power, legitimacy, urgency, and proximity of different stakeholder groups may vary (Driscoll & Starik, 2004; Mitchell et al., 1997), organizational survival necessitates understanding and addressing perspectives of different stakeholders. The existing literature shows an interrelation between stakeholder pressures and environmental strategies (e.g., Brulhart et al., 2019; Murillo-Luna et al., 2010). In the context of carbon emissions, stakeholder pressures have been found to determine the adoption of greenhouse gas reduction strategies (Cadez et al., 2019) and low-carbon operational practices (Böttcher & Müller, 2015). Evidence from prior studies of a positive influence of stakeholder pressures on organizational sustainability actions and strategies leads to our first hypothesis related to decarbonization strategies.

Hypothesis 1 Stakeholder pressures lead Mittelstand firms to pursue decarbonization strategies.

Internal Stakeholder Pressures

We differentiate between internal and external stakeholder pressures and between symbolic and substantive decarbonization strategies. Aimed to improve the environmental performance of a firm, substantive decarbonization strategies require major organizational resources and changes (e.g., Truong et al., 2021). Berrone et al. (2009) describe pollution prevention strategies, which are closely related to decarbonization strategies, as technologically, socially, and structurally complex and risky. Internal stakeholders internalize a firm's values and norms related to its key positions, including its strategy of environmental protection (e.g., Hyatt & Berente, 2017). High-proximity internal stakeholders like employees and managers, who are characterized by a low physical distance and high involvement in a firm, are not only involved in the establishment and implementation of its sustainability strategies, but they are also influenced by related actions in their day-to-day work (e.g., Alt et al., 2015; Darnall et al., 2009; Schons & Steinmeier, 2016). Accordingly, internal stakeholders can recognize and differentiate the substantive efforts of a firm to decarbonize from image building symbolic actions. Such distinctions are often more difficult for external stakeholders (Perez-Batres & Doh, 2014). Nevertheless, substantive and symbolic strategies are not mutually exclusive and internal stakeholders might want the firm to also use symbolic strategies to communicate its environmental commitment (Hyatt & Berente, 2017). Accordingly, we hypothesize that high internal stakeholder pressures lead to both substantive and symbolic decarbonization strategies, but the effects are stronger for substantive decarbonization.

Hypothesis 2 Internal stakeholder pressures lead Mittelstand firms to pursue substantive decarbonization strategies more strongly than symbolic decarbonization strategies.

External Stakeholder Pressures

Symbolic actions build the impression of environmental commitment at low costs (e.g., Truong et al., 2021). Indeed, the purchase of CO_2-certificates signals a commitment for decarbonization. But it implies comparatively little costs and long-term organizational changes for the firm, compared to, for example, adjusting the production process and changing the product design and functionality toward low-carbon products. Prior literature identifies symbolic sustainability actions and strategies as a response to external stakeholders to build the impression of sustainable commitment and to gain legitimacy (e.g., Dahlmann et al., 2019; Shabana & Ravlin, 2016; Truong et al., 2021). Pressures from low-proximity stakeholders with a high physical distance and low involvement in the firm have been found to encourage greenwashing, which is closely related to the adoption of symbolic environmental practices (Schons & Steinmeier, 2016; Testa et al., 2018). External stakeholders like customers and industrial associations are low-proximity stakeholders with high information asymmetries. This makes it difficult for them to clearly distinguish between symbolic and substantive actions of a firm (Schons & Steinmeier, 2016). Some firms may take advantage of this situation and engage in opportunistic behavior of adopting symbolic low-cost decarbonization strategies to appease distal stakeholders (Kulkarni, 2000). Although more discerning and informed external stakeholders may be able to distinguish between firms pursuing symbolic versus substantive decarbonization strategies, overall, we expect external stakeholder pressures propel firms toward symbolic decarbonization strategies.

Hypothesis 3 External stakeholder pressures lead Mittelstand firms to pursue symbolic decarbonization strategies more strongly than substantive decarbonization strategies.

The Moderating Role of Family Ownership

Family-owned firms differ from non-family-owned firms by simultaneously pursuing both economic and non-economic goals (Chrisman et al., 2012). In this regard, Gómez-Mejía et al. (2007, p.106) defined socioemotional wealth as referring to the "non-financial aspects of the firm that meet the family's affective needs, such as identity, the ability to exercise family influence, and the perpetuation of the family dynasty." Accordingly, family-owned firms with transgenerational continuity intentions are managed with a long-term orientation (e.g., Chua et al., 1999). Leaders of such enterprises pay particular attention to their reputation (e.g., Deephouse & Jaskiewicz, 2013; Zellweger et al., 2013), as the firm's identity is inextricably linked with that of the owner family (Block, 2010; Combs et al., 2023).

As these characteristics affect the management of ethical and sustainability issues of family firms (e.g., Dou et al., 2019; Vazquez, 2018), they are likely to also influence the decarbonization strategies adopted. Indeed, prior research shows that family ownership has distinct effects on the dimensions of CSR (Block & Wagner, 2014), which also varies by the stakeholder type linked to the CSR dimension (Cruz et al., 2014). Eager to protect their socioemotional wealth resources, family firms better leverage symbolic [substantive] CSR to enhance short-term [long-term] financial performance (Combs et al., 2023). Family ownership not only affects the financial performance of firms but also influences their environmental performance (e.g., Berrone et al., 2010; Terlaak et al., 2018). However, research on sustainability in family-owned firms is still in its early stage (Clauß et al., 2022; Ferreira et al., 2021) and especially underdeveloped is the environmental pillar of sustainability.

Due to their aspiration to protect the socioemotional wealth and reputation of the controlling family, family firms differ from non-family-owned firms in their stakeholder management approach (Neubaum et al., 2012; Sharma, 2001). While caring more for their stakeholders (Cennamo et al., 2012), family-owned firms tend to use an informal approach to managing relationships both with internal and external stakeholders (Campopiano & De Massis, 2015; García-Sánchez et al., 2021). The different approach of family-owned firms to stakeholder management has also been observed regarding sustainability, highlighting employee satisfaction and informal communication with externals as key drivers for sustainability in these firms (e.g., Broccardo et al., 2019; Cruz et al., 2014).

Transferring these considerations to the decarbonization context, we argue that the stakeholder management approach and the importance of stakeholder pressures will differ in family-owned versus non-family-owned firms translating into a moderation effect. More precisely, we hypothesize that the effect of stakeholder pressures on pursuing decarbonization strategies will be stronger in family-owned firms as compared to non-family-owned firms. We argue that this moderation effect should hold for all types of decarbonization strategies irrespective of the type of decarbonization strategy (symbolic versus substantive).

Hypothesis 4a Family ownership strengthens the positive effect of stakeholder pressures on pursuing decarbonization strategies.

Internal stakeholders internalize the values and norms of a firm regarding environmental protection (e.g., Hyatt & Berente, 2017). They are involved in establishing the referent strategies (e.g., Alt et al., 2015; Darnall et al., 2009). Thus, internal stakeholders are able to recognize the substantive or symbolic nature of decarbonization strategies. As dominant internal stakeholders, family members face additional pressures to preserve the longevity of the enterprise and preserve the socioemotional wealth of the family (e.g., Chua et al., 1999; Gómez-Mejía et al., 2007; Le Breton-Miller & Miller, 2006). Moreover, family-owned firms have close and long-term relationships with their employees as they are considered an integral part of the organization (Broccardo et al., 2019) and sometimes even as part of the family (Barnett & Kellermanns, 2006; Deferne et al., 2022). Family firm employees report higher levels of job satisfaction (Block et al., 2015) and closer identification with the firm (Reck et al., 2022; Vallejo, 2009) compared to employees in non-family firms. This is particularly true for small- and mid-sized firms, who are often locally embedded and have a high level of social proximity with their employees. Consequently and in line with prior research on the importance of social proximity determining salience toward stakeholders (Lefebvre, 2023; Schons & Steinmeier, 2016), we hypothesize that the positive effect of internal stakeholder pressures on pursuing substantive decarbonization strategies will be stronger in family-owned firms compared to non-family-owned firms.

Hypothesis 4b Family ownership strengthens the positive effect of internal stakeholder pressures on pursuing substantive decarbonization strategies.

To protect their socioemotional wealth and reputation, family-owned firms are responsive to external stakeholders to avoid negative assessments (Berrone et al., 2010; Gómez-Mejía et al., 2007). They often have close cooperative relationships with local communities, customers, and suppliers (e.g., Broccardo et al., 2019; Campopiano & De Massis, 2015). Strong relationships exist with the legislators and

(sometimes) even with competitors (Bendell, 2022). Communication of family-owned firms with external stakeholders is also found to be more informal and personal (Campopiano & De Massis, 2015). Overall, we argue that due to the long term and informal nature of the relationships, the information asymmetries between family-owned firms and their external stakeholders are lower as compared to non-family-owned firms. Hence, although there is some evidence to suggest that family-owned firms are more likely to get away with symbolic actions (Combs et al., 2023; Du, 2015), we argue that the lower asymmetries between them and their external stakeholders lead them to be very cautious with regard to symbolic decarbonization strategies. Such a behavior would have a negative effect on their long-term corporate reputation. Symbolic decarbonization strategies of impression management are more likely to be recognized and abhorred. In contrast, the external stakeholders of non-family-owned firms rely on formal communication channels making it more challenging to overcome information asymmetries and recognize the symbolic nature of a strategy (Kulkarni, 2000; Schons & Steinmeier, 2016). Another argument supporting a lower effect of external stakeholder pressure on symbolic decarbonization in family-owned firms concerns the desire for independence and control that family-owned firms seek. This desire to maintain control makes them less attentive toward pressures from external stakeholder groups, such as banks or other financial institutions. Following these two lines of arguments, we hypothesize that the positive effect of external stakeholder pressures on pursuing symbolic decarbonization strategies will be weaker in family-owned firms compared to non-family-owned firms.

Hypothesis 4c Family ownership weakens the positive effect of external stakeholder pressures on pursuing symbolic decarbonization strategies.

Figure 1 summarizes our conceptual framework and hypotheses.

Data and Method

Data Sources and Data Collection

The Orbis database was used to generate a population of 10,765 German Mittelstand manufacturing firms.[2] These firms were at least 10 years old as of September 2020 and employed between 50 and 2999 individuals (IfM Bonn, 2016; Röhl, 2018). Subsidiaries of larger corporations as well as foreign, non-profit, and state-owned firms were excluded.

Our survey took place in the first four months of 2022. By that time, the European Green Deal, which is a set of policy initiatives to make the European Union (EU) climate neutral in 2050, were in progress and had been partially approved (Mogos et al., 2023). The European Green Deal legislated that greenhouse gas emissions should be 55% lower in 2030 compared to 1990. To conduct a survey exploring our research questions, we worked with an empirical social research institute using 'Computer Assisted Telephone Interviews' (CATI). The survey included single-choice, multiple-choice, and ranking questions related to decarbonization and environmental sustainability. Firm-specific financial and ownership data from Orbis were matched to the survey data.

Resulting Sample and Assessment of Sample Biases

Of the 1959 firms randomly drawn and contacted from the population of 10,765 firms, completed surveys were received from 444 firms. The resulting response rate of 22.66% compares well with previous sustainability research (e.g., Böttcher & Müller, 2015; Cadez & Czerny, 2016; Chen, 2008; Seroka-Stolka & Fijorek, 2020). One observation was dropped, as the firm employed more than 3000 individuals. The surveyed sample represents the population in terms of industry and locational distribution. However, the surveyed firms are somewhat larger in terms of number of employees. The 443 firms of our final sample are between 12 and 208 years old (mean: 49 years) and have between 50 and 2722 employees (mean: 346 employees). The sample consists of 86% medium-sized firms with 50–499 employees and 14% mid-cap firms with 500–2999 employees (IfM Bonn, 2016; Röhl, 2018). The surveyed firms are distributed across all 16 German federal states with most firms from North Rhine-Westphalia (29.57%), Baden-Württemberg (16.03%), and Bavaria (13.77%). Most frequently observed industry sectors are machinery (NACE 28, 24.60%), fabricated metal products (NACE 25, 21.90%), and rubber and plastics products (NACE 22, 12.64%).

Several measures to identify and reduce potential sample biases were applied. First, to control for *non-response bias*, we compared the characteristics of the 1959 firms that were contacted for the survey and the 443 that took part. The respondents were significantly larger in terms of number of employees compared to the non-respondents, but the two groups did not differ in terms of industry sector and location.

The Russian war against Ukraine started on February 24, 2022, during the survey period. As the conflict influenced

[2] The manufacturing industries included in our sample are NACE 20–30. NACE is the abbreviation for nomenclature statistique des activités économiques dans la Communauté européenne, a statistical classification of economic activities in the European Union.

Table 1 Means and correlations

Variables	Mean	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Decarbonization strategies (1)	3.40											
Substantive decarbonization strategies (2)	3.80	0.85										
Symbolic decarbonization strategies (3)	2.57	0.76	0.32									
Stakeholder pressures (4)	2.36	0.38	0.37	0.25								
Internal stakeholder pressures (5)	$-7e^{-10}$	0.34	0.37	0.17	0.68							
External stakeholder pressures (6)	$-3e^{-10}$	0.26	0.21	0.22	0.85	0.19						
Family ownership *(dummy)* (7)	0.54	−0.07	−0.06	−0.05	−0.04	−0.08	−0.00					
Age (log) (8)	3.70	0.07	0.03	0.10	0.03	0.04	0.02	0.27				
Employees 2018 (log) (9)	5.22	0.10	0.09	0.08	0.24	0.21	0.17	−0.04	0.21			
Profitability *(dummy)* (10)	0.44	0.12	0.14	0.05	0.04	0.05	0.02	0.05	0.03	−0.02		
Growth ambitions *(dummy)* (11)	0.52	0.08	0.07	0.06	0.15	0.12	0.11	−0.05	−0.01	0.12	0.10	
CO_2-neutrality target *(dummy)* (12)	0.37	0.33	0.35	0.18	0.27	0.30	0.15	−0.04	0.03	0.14	0.01	0.09

The variables internal stakeholder pressures (5) and external stakeholder pressures (6) result from a principal factor analysis of 16 stakeholder pressure items with varimax rotation (STATA commands: *factor; rotate*, *varimax*). The factor values have been predicted by STATA using the post-estimation command *predict*. The values therefore deviate from the original scale and the mean values should be interpreted with caution

SD = standard deviation; *N* = 443

energy-related topics, we were concerned about the effect on the response behavior of our survey participants. To address this concern, we divided the sample into two groups of early and late respondents and compared the distribution of the three dependent variables. The early respondents were those respondents answering the survey between January 18 and February 23 before the war started (187 firms); the late respondents (256 firms) took part between February 24 and April 14. As no differences in the dependent variables can be observed between the two groups, we can rule out a substantial influence of the Russian war against Ukraine as well as a *late response bias*.

We also applied measures to mitigate the risk of *common method bias* and related measurement biases (Podsakoff et al., 2012). Addressing the ability to respond accurately, we formulated the survey questions in a simple and understandable way and provided explanatory texts, read out by the interviewers in case of further inquiry. Prior to the interviews, the research institute contacted the firms to identify the person responsible for sustainability in order to obtain the optimal respondent fit and guarantee the respondent's experience with the topic of the survey. Addressing the participants' motivation to respond accurately, we incentivized participation by offering a customized management summary for the firm and an invitation for a workshop on the survey results. Also, respondents were assured that their data will be processed anonymously and for scientific reasons only. The questions were ordered in a way that participants would not notice a direct relationship between the constructs. Moreover, we tried to minimize common method bias by changing the order of the survey questions related to the dependent and independent variables. The correlations between the dependent variables on decarbonization strategies and the independent stakeholder pressures were below 0.40 (see Table 1). Also, the moderator variable family ownership originates from another data source. Additionally, we applied the marker variable technique and included two marker variables on the COVID-19 crisis and digital transformation in our survey.[3] As correlations between the marker variables and our dependent and independent variables lie below 0.20, a possible common method bias can be ruled out.

We also addressed a potential *social desirability bias*. Respondents with a high level of commitment to the firm might show socially desirable response behavior. Based on established scales (Allen & Meyer, 1990; Mowday et al., 1979), we included a commitment measure in our survey[4] and ran a linear regression analysis using the commitment measure as dependent variable and the decarbonization strategies and stakeholder pressures measures as independent variables. No significant effects were found, alleviating concerns related to individual commitment and social desirability.

[3] The two marker variables refer to the impact of the COVID-19 crisis on the firm's revenues (measured on a five-point scale from 1 = 'high revenue decline' to 5 = 'high revenue increase') and the assessment of digital transformation as the greatest challenge of current times (measured on a five-point Likert scale from 1 = 'strongly disagree' to 5 = 'strongly agree').

[4] The three items included in the commitment scale are 'I care deeply about the future of this firm,' 'I feel a strong sense of belonging to this firm,' and 'I feel proud when I can tell others that I belong to this firm' (measured on a five-point Likert scale from 1 = 'strongly disagree' to 5 = 'strongly agree').

Measures

As noted above, the dependent as well as independent variables and most of the control variables are based on survey data (see Appendix A for an extract from the survey questionnaire).

Dependent Variables

As we did not find established scales for the measurement of a firm's decarbonization strategies, we developed our own scales. The scales were tested with practitioners prior to the survey. Respondents were asked to indicate the importance of three approaches to achieving their firms' CO_2-emission targets on a five-point scale ranging from 'unimportant' to 'very important.' These approaches were (i) internal CO_2-reduction (e.g., reduction of process emissions or use of internally generated green electricity), (ii) external CO_2-reduction (reduction of value chain emissions), and (iii) CO_2-compensation (e.g., purchase of CO_2-certificates). All three dependent variables used in the analysis are derived from the survey data.

The first dependent variable − *decarbonization strategies* is calculated as the row mean of the three approaches and represents the overall importance of strategies to address CO_2-emissions. The second dependent variable − *symbolic decarbonization strategies* is based on the responses to the third approach of CO_2-compensation. Our third dependent variable −*substantive decarbonization strategies* is calculated as the row mean of the two approaches of internal and external CO_2-reduction.

Independent Variables

Two of the three independent variables are derived from the survey data. Responses to the question 'Please indicate how much pressure the following stakeholders exert on your firm with regard to reducing CO_2-emissions' were measured on a 5-point scale from 'no pressure' to 'very high pressure.' Sixteen stakeholder categories of influencers of CO_2-emission strategies derived from the literature were provided to the respondents (Böttcher & Müller, 2015; Seroka-Stolka & Fijorek, 2020).

The independent variable *stakeholder pressures* was calculated as the row mean of the sixteen stakeholders, thereby representing the overall perceived stakeholder pressures regarding reducing CO_2-emissions. A principal-factor analysis was conducted to reduce the 16 indicators to two latent factors that reflect our a priori theoretical constructs of *internal* and *external stakeholder pressures* (Table 2). The correlation matrix is appropriate for factor analysis. Bartlett's test of sphericity is significant ($p < 0.001$) and the Kaiser–Meyer–Olkin measure of sampling adequacy is 0.928. We forced the factor analysis to extract two factors and used varimax rotation to facilitate the interpretation.[5] Factor one (*external stakeholder pressures*) comprises pressures from the following twelve stakeholders: trade unions/works council, distributers/suppliers, trade, end consumer, consumer associations, competitors, banks/financial institutions, insurance companies, legislators, ecology associations, press/media, and the local population (Cronbach's alpha $\alpha = 0.89$). These stakeholders represent actors from outside of the firm exerting pressures to reduce its CO_2-emissions. Factor two (*internal stakeholder pressure*) refers to pressures from the following four stakeholders: owners/shareholders, top management, middle management, and employees (Cronbach's alpha $\alpha = 0.81$). These stakeholders represent actors from inside the firm. The low inter-factor correlation of 0.19 supports the classification of stakeholders into external and internal. 6.3% of the respondents did not provide any information about stakeholder pressures and mean value imputation was used.[6]

For the family ownership variable, firm ownership data were obtained from Orbis and supplemented by a manual search of corporate websites. The dichotomous variable *family ownership (dummy)* equals one when at least 51% of ownership shares are attributed to the founder and/or the family. The sample contains 241 (55%) family-owned firms and 202 (45%) non-family-owned firms (Table 1).

Control Variables

Prior research indicates that several firm characteristics influence the environmental sustainability efforts of firms (Balasubramanian et al., 2021). Consequently, we included several firm-level control variables in our study. For the first set of control variables, the underlying data are obtained from Orbis. First, firm age is frequently included in family firm research and studies on the environmental sustainability and performance relationship (e.g., Chrisman et al., 2012; Shrivastava & Tamvada, 2019). In this study, we use the variable *firm age (log)*, calculated as the logarithmized number of years since the founding of the firm. Second, *firm size* has been identified as an influential contextual variable in studies on decarbonization strategies (Böttcher & Müller, 2015; Lee, 2012; Weinhofer & Hoffmann, 2010) and the

[5] The principal factor analysis was conducted with STATA (commands: *factor*; *rotate, varimax*). We then created a new variable for each factor using the STATA command *predict* that contains the factor values scored by the regression method.

[6] To find out about potential selection effects, we correlated a dummy variable indicating missing values with the variables *decarbonization strategies*, *symbolic decarbonization strategies*, and *substantive decarbonization strategies.* The correlations were -0.036, -0.02, and -0.05, which is low. Selection effects are unlikely.

Table 2 Factor analysis: perceived stakeholder pressures to reduce CO_2-emissions

	Variance	Difference	Proportion	Cumulative
Factor 1	4.32	1.61	0.62	0.62
Factor 2	2.71		0.39	1.01

Factor rotation matrix

	Factor 1	Factor 2
Factor 1	0.81	0.59
Factor 2	−0.59	0.81

Rotated factor loadings (pattern matrix) and unique variances sorted

	Factor 1	Factor 2	Uniqueness
Ecology associations	0.67	0.27	0.48
Local population	0.64	0.32	0.49
Insurance companies	0.63	0.20	0.56
Consumer associations	0.61	0.27	0.56
Press/media	0.59	0.31	0.55
Banks/financial institutions	0.59	0.28	0.57
Distributers/suppliers	0.57	0.14	0.66
Trade unions/works council	0.53	0.30	0.62
Trade	0.53	0.27	0.65
Competitors	0.53	0.39	0.57
End consumer	0.49	0.31	0.67
Legislators	0.49	0.27	0.69
Top management	0.18	0.76	0.39
Owners/shareholders	0.16	0.68	0.50
Middle management	0.32	0.66	0.46
Employees	0.45	0.51	0.54

A principal factor analysis with varimax rotation was employed (STATA commands: *factor; rotate*, *varimax*).
443 observations. Chi^2 (120) = 2899.38. Prob > Chi^2 = 0.00. Kaiser–Meyer–Olkin measure of sampling adequacy = 0.93

relationship between stakeholder pressures and environmental sustainability (Buysse & Verbeke, 2003; Seroka-Stolka & Fijorek, 2020; Yunus et al., 2020). In our study, firm size is measured by the logarithmized number of employees in 2018 as the variable *employees 2018 (log)*. Third, industry sector is another widely used control variable in comparable research (e.g., Dhanda et al., 2022; Garcés-Ayerbe et al., 2012; Henriques & Sadorsky, 1999; Hyatt & Berente, 2017). We include a set of dichotomous variables labeled *NACE 20 to 30*, representing the specific industry of the firm.

Additional control variables are derived from our survey data, starting with a profitability measure (e.g., Damert et al., 2017; Flammer, 2013). Responses to the question 'How do you rate the profitability of your firm compared to your competitors?' were measured on a five-point scale ranging from 'much worse' to 'much better.' Based on the answers to this question, the dichotomous variable *profitability* was created, taking the value of one if the firm believes to have a higher profitability compared to its competitors (scale values four and five), zero otherwise (scale values one to three). Furthermore, we include a growth measure. Responses to the question 'What are your firm's growth ambitions for the next 5 years?' were measured on a five-point scale ranging from 'low growth ambitions' to 'high growth ambitions.' Building on the answers to this question, we built the dichotomous variable *growth ambitions*, taking the value of one if the firm has high growth ambitions (scale values four and five), zero otherwise (scale values one to three). Finally, we control whether the firm has already set a *target year for CO_2-neutrality* (covering Scope 1 and 2 emissions) or not. For the question 'By which year does your firm plan to be CO_2-neutral in terms of its own CO_2-emissions (Scope 1 and 2)?', respondents had to select between nine options, ranging from 'we are already CO_2-neutral' to 'We have not yet set a specific target year.' Based on the responses to this question, we constructed the dichotomous variable *CO_2-neutrality target*, taking the value of one when the firm has set itself a target year for CO_2-neutrality, zero otherwise. For 2.9% of the values of the *profitability* variable

Table 3 Linear regressions for decarbonization strategies

	Decarbonization strategies	
	(1)	(2)
H1: Stakeholder pressures	0.32*** (0.05)	0.36*** (0.07)
Family ownership *(dummy)*	−0.12* (0.07)	0.06 (0.23)
H4a: Family ownership *(dummy)* × stakeholder pressures		−0.07 (0.09)
Age (log)	0.10* (0.06)	0.10* (0.06)
Employees 2018 (log)	−0.01 (0.04)	−0.00 (0.04)
Profitability *(dummy)*	0.17** (0.07)	0.17** (0.07)
Growth ambitions *(dummy)*	0.01 (0.07)	0.01 (0.07)
CO_2-neutrality target *(dummy)*	0.41*** (0.07)	0.41*** (0.07)
Industry categories		
NACE 21-Pharmaceuticals	−0.16 (0.25)	−0.15 (0.25)
NACE 22-Rubber and plastics	−0.04 (0.16)	−0.04 (0.16)
NACE 23-Non-metallic mineral products	−0.12 (0.18)	−0.12 (0.18)
NACE 24-Basic metals	−0.08 (0.20)	−0.07 (0.20)
NACE 25-Fabricated metal products	−0.20 (0.14)	−0.19 (0.14)
NACE 26-Computer, electronic, & optical products	−0.37** (0.17)	−0.36** (0.17)
NACE 27-Electrical equipment	−0.28* (0.17)	−0.28* (0.17)
NACE 28-Machinery	−0.29** (0.14)	−0.29** (0.14)
NACE 29-Motor vehicles	−0.27 (0.23)	−0.27 (0.23)
NACE 30-Other transport equipment	−0.01 (0.34)	0.02 (0.34)
Constant	2.31*** (0.29)	2.21*** (0.32)
Observations	443	443
R^2	0.24	0.24

Standard errors in parentheses. *$p<0.1$, **$p<0.05$, and ***$p<0.01$. Variable NACE 20—Chemicals dropped

and for 2.7% of the values of the *growth ambitions* variable, mean value imputation was used to replace missing values in the data.[7]

Results

Main Results

Table 1 presents the variable means and correlations, while the results of the linear OLS regressions are presented in Table 3 for decarbonization strategies and Table 4 for substantive and symbolic decarbonization strategies. Equations (1) and (3) in Table 4 are estimated using Stata's *mvreg* command, which also estimates the between-equation covariances allowing us to test the equality of coefficients across equations. Supporting hypothesis 1, we find a positive effect of overall stakeholder pressures on the pursuit of decarbonization strategies ($\beta=0.32$, $p<0.01$).

Internal stakeholder pressures show a positive effect on substantive ($\beta=0.25$, $p<0.01$) but no significant effect on symbolic decarbonization strategies. We test the equality of these two coefficients and show that they significantly differ from each other ($p=0.088$). Accordingly, hypothesis 2, stating that internal stakeholder pressures lead Mittelstand firms to pursue substantive decarbonization strategies more strongly than symbolic decarbonization strategies, is supported. This procedure is repeated for the subsequent hypothesis. External stakeholder pressures have a positive effect on substantive ($\beta=0.11$, $p<0.01$) and symbolic ($\beta=0.25$, $p<0.01$) decarbonization strategies. The test for equality of these two coefficients shows that they significantly differ from each other ($p=0.048$), supporting hypothesis 3 that external stakeholder pressures lead Mittelstand firms to pursue symbolic decarbonization strategies more strongly than substantive decarbonization strategies.

Model 2 (Table 4) shows the interaction of stakeholder pressures and family ownership. Models 2 and 4 report the family ownership interaction with internal and external stakeholder pressures. Three of the four interaction effects are insignificant. Hypotheses 4a and 4b theorizing that

[7] To find out about potential selection effects, we correlated dummy variables indicating missing values with the variables *decarbonization strategies*, *symbolic decarbonization strategies*, and *substantive decarbonization strategies.* The correlations were all below an absolute value of 0.07, which is low. Selection effects are unlikely.

Table 4 Standard errors in parentheses

	Substantive decarbonization strategies		Symbolic decarbonization strategies	
	(1)	(2)	(3)	(4)
H2: Internal stakeholder pressures	0.25*** (0.04)	0.19*** (0.07)	0.11 (0.08)	0.14 (0.11)
H3: External stakeholder pressures	0.11*** (0.04)	0.11** (0.05)	0.25*** (0.07)	0.44*** (0.09)
Family ownership *(dummy)*	−0.08 (0.07)	−0.08 (0.07)	−0.18 (0.12)	−0.16 (0.12)
H4b: Family ownership *(dummy)* × internal stakeholder pressures		0.10 (0.08)		−0.05 (0.14)
H4c: Family ownership *(dummy)* × external stakeholder pressures		−0.00 (0.08)		−0.40*** (0.13)
Age (log)	0.04 (0.06)	0.05 (0.06)	0.24** (0.10)	0.21** (0.10)
Employees 2018 (log)	−0.01 (0.04)	−0.02 (0.04)	0.00 (0.07)	0.02 (0.07)
Profitability *(dummy)*	0.20*** (0.07)	0.20*** (0.07)	0.09 (0.12)	0.08 (0.12)
Growth ambitions *(dummy)*	−0.01 (0.07)	0.00 (0.07)	0.04 (0.12)	0.07 (0.12)
CO_2-neutrality target *(dummy)*	0.41*** (0.07)	0.42*** (0.07)	0.32** (0.13)	0.35*** (0.13)
NACE 21-Pharmaceuticals	−0.25 (0.25)	−0.26 (0.25)	−0.08 (0.45)	−0.02 (0.45)
NACE 22-Rubber and plastics	0.14 (0.16)	0.14 (0.16)	−0.40 (0.28)	−0.41 (0.27)
NACE 23-Non-metallic mineral products	−0.01 (0.18)	−0.01 (0.18)	−0.36 (0.32)	−0.32 (0.32)
NACE 24-Basic metals	0.07 (0.20)	0.07 (0.20)	−0.46 (0.35)	−0.40 (0.35)
NACE 25-Fabricated metal products	−0.04 (0.14)	−0.05 (0.14)	−0.48* (0.26)	−0.46* (0.25)
NACE 26-Computer, electronic, & optical products	−0.21 (0.17)	−0.23 (0.17)	−0.68** (0.31)	−0.69** (0.31)
NACE 27-Electrical equipment	−0.14 (0.17)	−0.14 (0.17)	−0.55* (0.30)	−0.51* (0.30)
NACE 28-Machinery	−0.11 (0.14)	−0.11 (0.14)	−0.66*** (0.25)	−0.66*** (0.25)
NACE 29-Motor vehicles	−0.03 (0.23)	−0.04 (0.23)	−0.60 (0.40)	−0.58 (0.40)
NACE 30-Other transport equipment	0.02 (0.34)	−0.00 (0.34)	−0.08 (0.60)	0.11 (0.59)
Constant	3.57*** (0.28)	3.59*** (0.28)	2.06*** (0.50)	2.01*** (0.50)
Observations	443	443	443	443
R^2	0.25	0.25	0.11	0.13

Standard errors in parentheses; *$p<0.1$, **$p<0.05$, and ***$p<0.01$. Variable NACE 20-Chemicals dropped; Eqs. (1) and (3) are estimated using Stata's mvreg command, which also estimates the between-equation covariances allowing us to test coefficients across equations

family ownership strengthens stakeholder pressures to pursue decarbonization strategies (hypothesis 4a) or enhance internal stakeholder pressures (hypothesis 4b) to pursue substantive decarbonization strategies are not supported. However, hypothesis 4c is confirmed, indicating that family ownership weakens the positive effect of external stakeholder pressures on the pursuit of symbolic decarbonization strategies ($\beta = -0.40$, $p<0.01$). Figure 2 graphically depicts the interaction effects, and the predictive margins of family ownership with 95% confidence intervals for symbolic decarbonization strategies based on a linear OLS regression.

Results of Sensitivity Analyses and Robustness Checks

We conducted various sensitivity analyses and robustness checks. Subsample analyses for the 241 family-owned and the 202 non-family-owned firms are performed. Starting with a mean value comparison, we find that the family-owned firms in our sample are significantly older, with a mean age of 57 years compared to a mean age of 38 years for non-family-owned firms ($p<0.01$). There is no difference in firm size between family-owned and non-family-owned firms. We then perform separately for each subsample the regression analyses for our first three hypotheses. Results for the subsample of family-owned firms can be found in Table 5 and for the non-family-owned firm subsample in Table 6 of Appendix B. For both subsamples, overall stakeholder pressures have a positive effect on the pursuit of decarbonization strategies (family-owned firms: $\beta = 0.23$, $p<0.01$; non-family-owned firms: $\beta = 0.38$, $p<0.01$). Also, internal stakeholders push firms toward substantive decarbonization strategies (family-owned firms: $\beta = 0.26$, $p<0.01$; non-family-owned firms: $\beta = 0.22$, $p<0.01$) but not toward symbolic decarbonization strategies. We cannot find an effect of external stakeholders on either symbolic or substantive decarbonization strategies in family-owned firms. However, for non-family-owned firms, external stakeholders have a positive effect on both substantive ($\beta = 0.11$, $p<0.05$) and symbolic ($\beta = 0.44$, $p<0.01$) decarbonization strategies. The test for equality of these two coefficients shows that they significantly differ from each other ($p<0.01$), stating

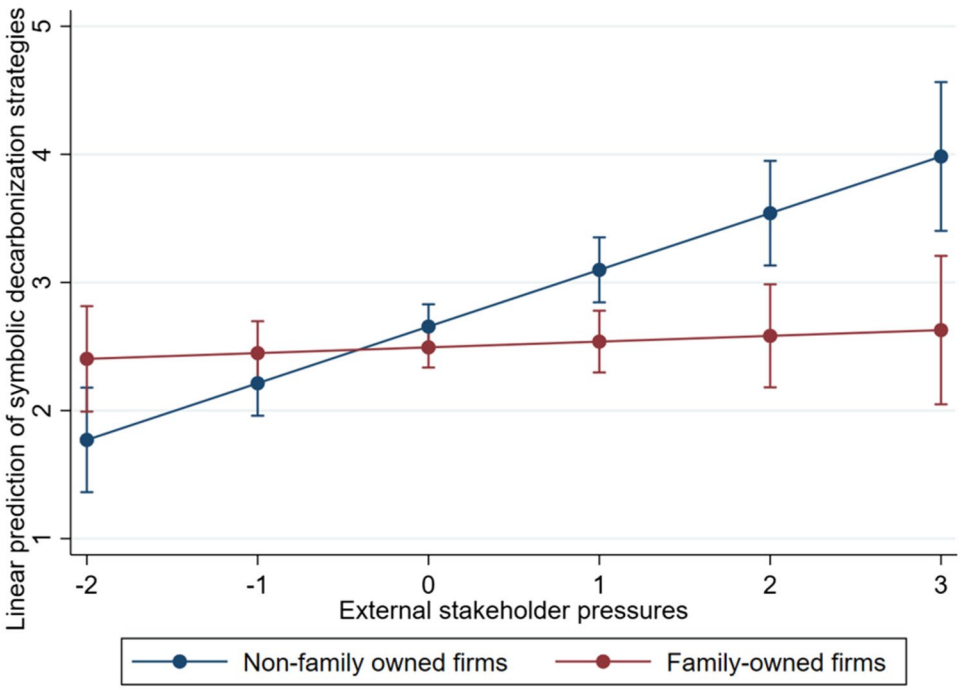

Fig. 2 Symbolic decarbonization strategies of family- vs non-family-owned firms. Predictive margins of family ownership with 95% confidence intervals for symbolic decarbonization strategies

that external stakeholder pressures lead non-family-owned Mittelstand firms to pursue symbolic decarbonization strategies more strongly than substantive decarbonization strategies. Next to these subsample analyses, we also restricted our sample to firms that have already set a target year for CO_2-neutrality. Table 7 of Appendix B shows the results. The sample size drops from 443 to 162. With the reduced sample, internal stakeholder pressures show a similar effect for substantive versus symbolic decarbonization ($\beta = 0.15$ vs. $\beta = 0.05$, difference test is $p = 0.472$) and external stakeholder pressure shows a stronger effect for symbolic versus substantive decarbonization ($\beta = 0.32$ vs. $\beta = 0.08$, difference test is $p = 0.058$). In line with the finding from our main analysis, the subsample analysis shows that family ownership reduces the effect of external stakeholder pressures on symbolic decarbonization ($\beta = -0.80$, $p < 0.01$).

As another robustness test, we replaced the dummy variable *family ownership* with a dummy variable for family management. Based on Orbis data, the dichotomous variable *family management (dummy)* is calculated and equals one, if the family is engaged in the management of the firm, zero otherwise. Most results remain robust when we apply family management instead of family ownership as a variable to investigate our hypotheses. However, the interaction effect of hypothesis 4c becomes insignificant for family management, leading to an interesting finding that it is family owners and not family managers who seem to weaken the effect of external pressures to pursue symbolic decarbonization strategies. We also tested hypothesis 2 (hypothesis 3) about the differences in the effects of internal (external) stakeholder pressures on substantive versus symbolic decarbonization strategies in an integrated structural equation model (SEM). The results from the SEM model are like the findings of our regression analyses. Internal stakeholder pressure has a stronger effect on substantive versus symbolic decarbonization (test of equality of coefficients is $p = 0.08$), while external stakeholder pressure has a stronger effect on symbolic versus substantive decarbonization (test of equality of coefficients is $p = 0.04$).

Discussion

Summary and Interpretation of Results

Using survey data collected from 443 German Mittelstand manufacturing firms, we analyze the influence of stakeholder pressures on the decarbonization strategies of Mittelstand firms and the role of family ownership in this relationship. Doing so, we differentiate between symbolic decarbonization strategies focused on compensating CO_2-emissions and substantive decarbonization strategies to reduce CO_2-emissions. Consistent with previous research and in line with our hypothesis, stakeholder pressures lead Mittelstand firms to pursue decarbonization strategies.

Internal stakeholder pressures lead these mid-sized German firms (both family-owned and non-family-owned firms) to pursue substantive decarbonization strategies; external stakeholder pressures lead non-family-owned firms toward symbolic rather than substantive decarbonization strategies.

For family-owned firms, no effect was found for external stakeholder pressures whatsoever. The latter result appears in contrast to prior research of Cruz et al. (2014), who find that family firms in their CSR behavior adhere more toward pressure from external stakeholders. However, Cruz et al. (2014) analyzed large publicly listed firms and do not distinguish between substantive and symbolic CSR. Future research is needed along the line of Darnall et al. (2010) to compare the decarbonization strategies and associated stakeholder pressures of small and private (family) firms with the decarbonization strategies of large and listed (family) firms.

Our result that external stakeholders have no effect on pursuit of symbolic decarbonization strategies by family firms does not align with the findings of Combs et al. (2023). Studying S&P 500 firms, they reveal that in the short term, family-owned firms are more likely to get away with symbolic CSR due to their reputation and strong stakeholder relationships. Du (2015) provides evidence that Chinese family-owned firms use actions like philanthropic giving to alleviate negative reputational impacts of their environmental misconduct. Despite this evidence that family-owned firms tend to engage in symbolic behavior, we find that family owners (but not family managers) weaken the effect of external stakeholder pressures on symbolic decarbonization. This finding confirms the argument that the close relationships and informal communication of family firms with certain external stakeholders (e.g., Bendell, 2022; Broccardo et al., 2019; Campopiano & De Massis, 2015) reduce information asymmetries and enable these stakeholders to recognize the symbolic nature of the decarbonization strategy. Accordingly, the external stakeholders of family-owned firms might tolerate symbolic actions in certain areas like CSR or corporate giving (Combs et al., 2023; Du, 2015), but are less tolerant in the case of climate change mitigation strategies, like decarbonization. This opens an interesting avenue of future research to uncover perceived urgency of different dimensions of sustainability for internal and external stakeholders.

Contributions to the Literature.

Our study makes three contributions to the literature. First, it links the literature on stakeholder pressures and its effects on environmental sustainability with that on firm ownership and environmental sustainability (e.g., Dhanda et al., 2022; Garcés-Ayerbe et al., 2022; Seroka-Stolka & Fijorek, 2020). To the best of our knowledge, the literature at this important intersection has not distinguished between symbolic and substantive environmental practices. Our study shows that this distinction is needed to understand how firm ownership and stakeholder pressure work in concert to shape a firm's environmental strategy and actions. We also contribute to the literature on symbolic and substantive management (Pfeffer, 1981). While prior research has applied these concepts to CSR or the social dimension of sustainability (e.g., Nardi, 2022; Schons & Steinmeier, 2016; Wickert et al., 2017; Zhong et al., 2022) and environmental strategies (e.g., Hyatt & Berente, 2017; Rodrigue et al., 2013; Truong et al., 2021), we extend the concept to the issue of decarbonization, defining and examining symbolic and substantive decarbonization strategies. Doing so, we further focus and develop the concept of symbolic and substantive strategies for usage in future studies.

Our second contribution is toward the literature on the determinants and drivers of environmental management of SMEs and Mittelstand firms (e.g., Eikelenboom & de Jong, 2019; Ernst et al., 2022; Sharma & Sharma, 2011). We show that it is important to distinguish between family- and non-family-owned Mittelstand firms when analyzing the motivation to care about the natural environment and take related substantive and effective actions. Family ownership conditions the positive effect of external stakeholder pressures on decarbonization. Family-owned firms seem to be less attentive than non-family-owned firms toward external stakeholder pressures. This moderation effect can be explained by their desire to be independent from external stakeholders and maintain as much control as possible over the firms' strategies and actions. To our surprise and against our formulated hypothesis, we did not find a stronger effect of internal stakeholder pressure on substantive decarbonization for family-owned firms. This finding runs counter to prior family business research taking an internal stakeholder stewardship perspective on (environmental) sustainability in family firms (Cruz et al., 2014). Related to this, our study also adds to the literature on symbolic and substantive CSR in family firms. While Combs et al. (2023) show that family firms can (in the long run) achieve "more bang for their buck" by leveraging substantive CSR, our study shows that family firms are already more likely to choose substantive sustainability strategies in the first place.

Finally, we add to the small but growing literature on the decarbonization strategies and efforts of the industrial sector (Wimbadi & Djalante, 2020) by highlighting the prevailing heterogeneity of related strategies within the German manufacturing sector. Previous literature has mostly investigated large firms (Hyatt & Berente, 2017) and has focused on actual CO_2-emissions or reductions (Böttcher & Müller, 2015) without distinguishing between different approaches toward decarbonization. We extend this line of research using a sample of Mittelstand firms and by explicitly accounting for the different approaches that can be applied to achieve reductions in CO_2-emissions.

Limitations and Future Research

Our study is among the first to examine decarbonization strategies as an outcome variable in the Mittelstand context, providing a basis to build upon. As our measures include

only a limited set of decarbonization strategies, the reported findings may potentially be attributed to measurement error rather than the relative importance of substantive versus symbolic decarbonization measures. Hence, we encourage the development of multi-item measures to capture the full spectrum of these strategies. This could include nature-based solutions like planting trees or greening roofs or solar panels that firms may use to reduce their carbon emissions (Seddon, 2022).

As our study is based on data from the German Mittelstand manufacturing firms, its findings are most directly applicable to this context. Replication studies in other industries and locations should test the explanatory power of our results. Prior research has theorized about many other influential factors that may affect the environmental and decarbonization strategies of firms. For example, examining the drivers of supply chain decarbonization in the plastics industry, Zhao et al. (2022) identified regulations as an important driver. As we regard regulations as an external stakeholder, research to understand the specific role of regulations on adoption of symbolic or substantive decarbonization strategies is needed. Such regulatory-level research becomes essential with the introduction of new regulations, such as the EU taxonomy.

Our study is also not immune to endogeneity issues. It could be that specific decarbonization strategies lead to criticisms and pressures from particular stakeholders, which would imply a reverse causality. It is also possible that our study omits important factors associated with our main independent variables which could create an omitted variables bias problem. Future research could create longitudinal or panel data and/or make use of instrumental variables to reduce such endogeneity concerns. In this regard, the introduction of the EU taxonomy that applies to some but not all firms could provide a natural experiment to investigate how increased regulatory pressures affect decarbonization strategies of different types of firms.

Another promising research avenue is to consider decarbonization strategies from a capability-based perspective. Dynamic capabilities, referred to as a "firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece et al., 1997, p. 516), are crucial for sustainability (Buzzao & Rizzi, 2021). Prior research highlights the role of dynamic capabilities for the innovation of green products (e.g., Dangelico et al., 2017), processes (e.g., Bhatia, 2021), and business models (e.g., Inigo et al., 2017) as well as for a firm's environmental performance (Dzhengiz & Niesten, 2020; Eikelenboom & de Jong, 2019). So far, little is known about dynamic capabilities in the context of decarbonization strategies (cf. Lopes de Sousa Jabbour et al., 2020). Future research might examine how dynamic capabilities drive decarbonization and what types of capabilities matter most. Other potential decarbonization drivers worth analyzing are reputational aspects (e.g., Martín-de Castro et al., 2020), CEO characteristics such as sustainability orientation (e.g., Adomako et al., 2021) and market conditions like the level of competitiveness (e.g., Böttcher & Müller, 2015) or internationalization (e.g., Denicolai et al., 2021).

Besides, future extensions of reporting obligations regarding CO_2-emissions of Mittelstand firms could offer new data sources for future research. For example, the combination of data about actual CO2-emissions with survey data like ours would allow a deeper investigation of the effectiveness of the decarbonization strategy chosen.

Finally, our study has focused on family ownership as moderator of the relationship between stakeholder pressures and decarbonization strategy. Our supplementary analysis points to the differential effects of family owners and family managers on symbolic decarbonization strategy of a firm. Prior research shows heterogeneity within family firms as they can be categorized along dimensions, such as (non-) family management (Hiebl & Li, 2020; Yu et al., 2023) or CEO characteristics (e.g., Meier & Schier, 2021). More empirical research is needed about the role of such moderating factors in decarbonization strategies of Mittelstand firms.

Practical Implications

A few suggestions for firm owners, policy makers, and educational institutions emerge from our study. To begin with, as internal stakeholders matter more for substantive decarbonization, firm owners and leaders should consider systematically engaging employees to generate ideas for substantive decarbonization. Related efforts are already underway in some firms like the Dutch paint manufacturer Royal van Wijhe Verf and German Mittlestand firms like the food manufacturer Rügenwalder Mühle, the shower system and faucet manufacturer Hansgrohe, and ORCA that offers software solutions for the construction industry. In these enterprises, employees systematically contribute ideas for the climate neutrality and sustainability of the firm. As research shows that firms with the capability of stakeholder integration tend to develop effective environmental strategies (Delgado-Ceballos et al., 2012), such firms with deeper employee engagement are likely to progress with their decarbonization strategies more rapidly than others. We need such anecdotal examples to be used in case study teaching and/or portrayed in the media to act as role models in the (family) business community.

Policy makers eager to encourage firms to decarbonize could improve the conditions for more substantive versus symbolic decarbonization, e.g., by restricting CO_2-certificate trading or incentivizing substantive actions, such as implementing a CO_2-efficient production

process. Our study shows that too much external stakeholder pressure can be counterproductive and may push firms toward short-term and symbolic decarbonization strategies and actions, like carbon offsetting or compensation. While these are useful intermittent steps toward substantive strategies, environmental regulations should require companies to clearly distinguish between symbolic and substantive decarbonization actions taken in their reporting.

Our results also encourage educational institutions to further their investments and efforts in developing and disseminating knowledge about decarbonization (strategies) to current and future business leaders and employees. Pressures from internal stakeholder groups toward decarbonization seem to put firms on a path toward long-term and substantive decarbonization. With advancements in online education, certificate programs on decarbonization might be particularly useful for current employees as they can be pursued alongside full-time work commitments. This leads to parallel opportunities for educators to integrate sustainability and decarbonization-related insights into their current curriculum for management graduates.

Appendix A: Extract from the Questionnaire

1. Firms can take a variety of approaches to achieve their CO_2-emission targets. How important are the following approaches in your firm?

	Unimportant (1)	Rather unimportant (2)	Neutral (3)	Rather important (4)	Very important (5)
Internal CO_2-reduction (e.g., reduction of process emissions or use of internally generated green electricity)	◯	◯	◯	◯	◯
External CO_2-reduction (reduction of value chain emissions)	◯	◯	◯	◯	◯
CO_2-compensation (e.g., purchase of CO_2-certificates)	◯	◯	◯	◯	◯

2. Please indicate how much pressure the following stakeholders exert on your firm with regard to reducing CO_2-emissions.

	No pressure (1)	Very low pressure (2)	Low pressure (3)	High pressure (4)	Very high pressure (5)
Employees	◯	◯	◯	◯	◯
Top management	◯	◯	◯	◯	◯
Middle management	◯	◯	◯	◯	◯
Owners/shareholders	◯	◯	◯	◯	◯
Trade unions/works council	◯	◯	◯	◯	◯
Distributers/suppliers	◯	◯	◯	◯	◯
Trade	◯	◯	◯	◯	◯
End consumer	◯	◯	◯	◯	◯
Consumer associations	◯	◯	◯	◯	◯
Competitors	◯	◯	◯	◯	◯
Banks/financial institutions	◯	◯	◯	◯	◯
Insurance companies	◯	◯	◯	◯	◯
Legislators	◯	◯	◯	◯	◯
Ecology associations	◯	◯	◯	◯	◯
Press/media	◯	◯	◯	◯	◯
The local population	◯	◯	◯	◯	◯

3. How do you rate the profitability of your firm compared to your competitors?

Please rate on a scale from 1, much worse, to 5, much better. You can use the values in between to grade.

	1	2	3	4	5	
Much worse	◯	◯	◯	◯	◯	Much better

4. What are your firm's growth ambitions for the next five years?

Please rate on a scale from 1, Low growth ambitions, to 5, High growth ambitions. You can use the values in between to grade.

On request: Declining sales/low sales growth can result, for example, from the sale of parts of the company or a declining market volume. High sales growth can result, for example, from expansion of the company in terms of new locations or product groups.

	1	2	3	4	5	
Low growth ambitions	◯	◯	◯	◯	◯	High growth ambitions

5. By which year does your firm plan to be CO_2-neutral in terms of its own CO_2?

Please refer in your answer to those CO_2-emissions that are caused directly in the company (e.g., from combustion in own furnaces) as well as to those emissions that are caused indirectly in the generation of purchased energy (i.e., electricity, steam, heating, and cooling).

◯ We are already CO_2-neutral
◯ Till 2025 or earlier
◯ Between 2026 and 2030
◯ Between 2031 and 2035
◯ Between 2036 and 2040
◯ Between 2041 and 2045
◯ Between 2046 and 2050
◯ After 2050
◯ We have not yet set a specific target year.

Appendix B: Additional Analyses

Tables 5, 6, and 7

Table 5 Linear regressions for family-owned firms subsample

	Decarbonization Strategies	Substantive decarbonization strategies	Symbolic decarbonization strategies
H4a: Stakeholder pressures	0.23*** (0.07)		
H4b: Internal stakeholder pressures		0.26*** (0.06)	0.05 (0.10)
H4c: External stakeholder pressures		0.09 (0.06)	0.01 (0.09)
Age (log)	0.14* (0.08)	0.10 (0.08)	0.25* (0.13)
Employees 2018 (log)	0.06 (0.06)	0.00 (0.06)	0.14 (0.10)
Profitability *(dummy)*	0.11 (0.09)	0.15 (0.09)	0.04 (0.16)
Growth ambitions *(dummy)*	−0.08 (0.09)	−0.02 (0.10)	−0.10 (0.16)
CO_2-neutrality target *(dummy)*	0.58*** (0.10)	0.57*** (0.10)	0.54*** (0.17)
NACE 21-Pharmaceuticals	0.02 (0.33)	−0.23 (0.34)	0.50 (0.56)
NACE 22-Rubber and plastics	−0.06 (0.21)	0.06 (0.22)	−0.38 (0.36)
NACE 23-Non-metallic mineral products	0.09 (0.25)	0.06 (0.25)	0.10 (0.42)
NACE 24-Basic metals	−0.36 (0.28)	−0.15 (0.29)	−0.71 (0.48)
NACE 25-Fabricated metal products	−0.10 (0.20)	−0.02 (0.20)	−0.31 (0.33)
NACE 26-Computer, electronic & optical products	−0.45* (0.25)	−0.28 (0.25)	−0.96** (0.42)
NACE 27-Electrical equipment	−0.12 (0.24)	−0.04 (0.24)	−0.23 (0.41)
NACE 28-Machinery	−0.29 (0.20)	−0.18 (0.20)	−0.56* (0.33)
NACE 29-Motor vehicles	−0.15 (0.31)	−0.11 (0.32)	−0.07 (0.54)
NACE 30-Other transport equipment			
Constant	1.89*** (0.38)	3.22*** (0.38)	1.02 (0.63)
Observations	241	241	241
R^2	0.28	0.31	0.14

Standard errors in parentheses. *$p<0.1$, **$p<0.05$, ***$p<0.01$. Variable NACE 20-Chemicals dropped

Table 6 Linear regressions for non-family-owned firms subsample

	Decarbonization Strategies	Substantive decarbonization strategies	Symbolic decarbonization strategies
H4a: Stakeholder pressures	0.38*** (0.07)		
H4b: Internal stakeholder pressures		0.22*** (0.07)	0.17 (0.13)
H4c: External stakeholder pressures		0.11** (0.05)	0.44*** (0.10)
Age (log)	0.01 (0.10)	−0.05 (0.10)	0.14 (0.18)
Employees 2018 (log)	−0.05 (0.06)	−0.03 (0.06)	−0.07 (0.11)
Profitability *(dummy)*	0.28*** (0.10)	0.29*** (0.10)	0.18 (0.18)
Growth ambitions *(dummy)*	0.13 (0.10)	0.05 (0.10)	0.27 (0.19)
CO_2-neutrality target *(dummy)*	0.24** (0.10)	0.25** (0.11)	0.16 (0.20)
NACE 21-Pharmaceuticals	−0.39 (0.40)	−0.30 (0.40)	−0.80 (0.73)
NACE 22-Rubber and plastics	−0.12 (0.23)	0.16 (0.23)	−0.57 (0.41)
NACE 23-Non-metallic mineral products	−0.45* (0.26)	−0.15 (0.26)	−0.97** (0.48)
NACE 24-Basic metals	0.07 (0.28)	0.15 (0.29)	−0.29 (0.52)
NACE 25-Fabricated metal products	−0.38* (0.21)	−0.15 (0.21)	−0.71* (0.39)
NACE 26-Computer, electronic, & optical products	−0.37 (0.24)	−0.22 (0.24)	−0.59 (0.44)
NACE 27-Electrical equipment	−0.54** (0.24)	−0.30 (0.24)	−0.92** (0.44)
NACE 28-Machinery	−0.36* (0.21)	−0.08 (0.21)	−0.83** (0.38)
NACE 29-Motor vehicles	−0.40 (0.32)	0.03 (0.32)	−1.12* (0.59)
NACE 30-Other transport equipment	−0.09 (0.36)	−0.03 (0.36)	−0.13 (0.66)
Constant	2.80*** (0.48)	4.01*** (0.47)	2.90*** (0.85)
Observations	202	202	202
R^2	0.28	0.22	0.21

Standard errors in parentheses. *$p < 0.1$, **$p < 0.05$, and ***$p < 0.01$. Variable NACE 20—Chemicals dropped

Table 7 Linear regressions for substantive and symbolic decarbonization strategies for subsample of firms with CO_2-neutrality target

	Substantive decarbonization strategies		Symbolic decarbonization strategies	
	(1)	(2)	(3)	(4)
H2: Internal stakeholder pressures	0.15*** (0.05)	0.09 (0.08)	0.05 (0.14)	0.12 (0.20)
H3: External stakeholder pressures	0.08* (0.05)	0.13** (0.07)	0.32** (0.12)	0.72*** (0.17)
Family ownership *(dummy)*	0.17* (0.09)	0.15 (0.10)	−0.05 (0.23)	0.17 (0.25)
H4b: Family ownership *(dummy)* × Internal stakeholder pressures		0.10 (0.11)		−0.14 (0.27)
H4c: Family ownership *(dummy)* × External stakeholder pressures		−0.10 (0.09)		−0.80*** (0.23)
Age (log)	0.01 (0.07)	0.01 (0.07)	0.24 (0.19)	0.16 (0.19)
Employees 2018 (log)	−0.02 (0.05)	−0.03 (0.05)	0.12 (0.13)	0.18 (0.13)
Profitability *(dummy)*	0.15* (0.09)	0.15* (0.09)	−0.02 (0.23)	0.04 (0.22)
Growth ambitions *(dummy)*	0.01 (0.09)	0.03 (0.09)	0.15 (0.23)	0.15 (0.22)
NACE 21-Pharmaceuticals	−0.53* (0.28)	−0.52* (0.27)	−0.71 (0.72)	−0.50 (0.70)
NACE 22-Rubber and plastics	−0.14 (0.18)	−0.15 (0.18)	−0.53 (0.48)	−0.50 (0.46)
NACE 23-Non-metallic mineral products	−0.27 (0.23)	−0.26 (0.23)	−1.49** (0.60)	−1.50** (0.58)
NACE 24-Basic metals	0.05 (0.25)	0.08 (0.25)	−0.86 (0.66)	−0.76 (0.63)
NACE 25-Fabricated metal products	−0.17 (0.17)	−0.16 (0.17)	−0.99** (0.43)	−0.89** (0.42)
NACE 26-Computer, electronic, & optical products	−0.23 (0.19)	−0.23 (0.19)	−1.02** (0.50)	−0.89* (0.49)
NACE 27-Electrical equipment	−0.08 (0.19)	−0.05 (0.19)	−1.36*** (0.48)	−1.26*** (0.47)
NACE 28-Machinery	−0.01 (0.16)	0.02 (0.17)	−1.07** (0.43)	−0.98** (0.42)
NACE 29-Motor vehicles	0.27 (0.26)	0.26 (0.26)	−1.28* (0.68)	−1.32** (0.66)
NACE 30-Other transport equipment	−0.39 (0.56)	−0.44 (0.57)	−2.21 (1.45)	−1.52 (1.44)
Constant	4.19*** (0.33)	4.23*** (0.33)	2.16** (0.86)	1.97** (0.84)
Observations	162	162	162	162
R^2	0.19	0.20	0.16	0.23

Standard errors in parentheses; *$p<0.1$, **$p<0.05$, and ***$p<0.01$. Variable NACE 20—Chemicals dropped; Eqs. (1) and (3) are estimated using Stata's mvreg command, which also estimates the between-equation covariances allowing us to test coefficients across equations

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References

Adomako, S., Amankwah-Amoah, J., Danso, A., & Dankwah, G. O. (2021). Chief executive officers' sustainability orientation and firm environmental performance: Networking and resource contingencies. *Business Strategy and the Environment, 30*(4), 2184–2193.

Allen, N. J., & Meyer, J. P. (1990). The measurement and antecedents of affective, continuance and normative commitment to the organization. *Journal of Occupational Psychology, 63*(1), 1–18.

Alt, E., Díez-de-Castro, E. P., & Lloréns-Montes, F. J. (2015). Linking employee stakeholders to environmental performance: The role of proactive environmental strategies and shared vision. *Journal of Business Ethics, 128*(1), 167–181.

Amato, S., Patuelli, A., Basco, R., & Lattanzi, N. (2023). Family firms amidst the global financial crisis: A territorial embeddedness perspective on downsizing. *Journal of Business Ethics, 183*(1), 213–236.

Aragòn-Correa, J. A., Marcus, A. A., & Vogel, D. (2020). The effects of mandatory and voluntary regulatory pressures on firms' environmental strategies: A review and recommendations for future research. *Academy of Management Annals, 14*(1), 339–365.

Balasubramanian, S., Shukla, V., Mangla, S., & Chanchaichujit, J. (2021). Do firm characteristics affect environmental sustainability? A literature review-based assessment. *Business Strategy and the Environment, 30*(2), 1389–1416.

Barnett, T., & Kellermanns, F. W. (2006). Are we family and are we treated as family? Nonfamily employees' perceptions of justice in the family firm. *Entrepreneurship Theory and Practice, 30*(6), 837–854.

Bassanini, A., Breda, T., Caroli, E., & Rebérioux, A. (2013). Working in family firms: Paid less but more secure? Evidence from French matched employer-employee data. *ILR Review, 66*(2), 433–466.

Bendell, B. L. (2022). Environmental investment decisions of family firms—An analysis of competitor and government influence. *Business Strategy and the Environment, 31*(1), 1–14.

Berrone, P., Gelabert, L., & Fosfuri, A. (2009). The impact of symbolic and substantive actions on environmental legitimacy. *IESE Business School Working Paper*. https://doi.org/10.2139/ssrn.1349063

Berrone, P., Gomez-Mejia, L. R., & Larraza-Kintana, M. (2010). Socioemotional wealth and corporate responses to institutional pressures: Do family-controlled firms pollute less? *Administrative Science Quarterly, 55*(1), 82–113.

Bhatia, M. S. (2021). Green process innovation and operational performance: The role of proactive environment strategy, technological capabilities, and organizational learning. *Business Strategy and the Environment, 30*(7), 2845–2857.

Block, J. H. (2010). Family management, family ownership, and downsizing: Evidence from S&P 500 firms. *Family Business Review, 23*(2), 109–130.

Block, J. H., Millán, J. M., Román, C., & Zhou, H. (2015). Job satisfaction and wages of family employees. *Entrepreneurship Theory and Practice, 39*(2), 183–207.

Block, J. H., & Wagner, M. (2014). The effect of family ownership on different dimensions of corporate social responsibility: Evidence from large US firms. *Business Strategy and the Environment, 23*(7), 475–492.

Böttcher, C. F., & Müller, M. (2015). Drivers, practices and outcomes of low-carbon operations: Approaches of German automotive suppliers to cutting carbon emissions. *Business Strategy and the Environment, 24*(6), 477–498.

Broccardo, L., Truant, E., & Zicari, A. (2019). Internal corporate sustainability drivers: What evidence from family firms? A literature review and research agenda. *Corporate Social Responsibility and Environmental Management, 26*(1), 1–18.

Brulhart, F., Gherra, S., & Quelin, B. V. (2019). Do stakeholder orientation and environmental proactivity impact firm profitability? *Journal of Business Ethics, 158*(1), 25–46.

Buettner, S. M., Schneider, C., Konig, W., Mac Nulty, H., Piccolroaz, C., & Sauer, A. (2022). How do German manufacturers react to the increasing societal pressure for decarbonization. *Applied Sciences, 12*(2), 543.

Busch, T., & Schwarzkopf, J. (2013). Carbon management strategies—A quest for corporate competitiveness. *Progress in Industrial Ecology, 8*(1–2), 4–29.

Buysse, K., & Verbeke, A. (2003). Proactive environmental strategies: A stakeholder management perspective. *Strategic Management Journal, 24*(5), 453–470.

Buzzao, G., & Rizzi, F. (2021). On the conceptualization and measurement of dynamic capabilities for sustainability: A systematic literature review. *Business Strategy and the Environment, 30*(1), 135–175.

Cadez, S., & Czerny, A. (2016). Climate change mitigation strategies in carbon-intensive firms. *Journal of Cleaner Production, 112*, 4132–4143.

Cadez, S., Czerny, A., & Letmathe, P. (2019). Stakeholder pressures and corporate climate change mitigation strategies. *Business Strategy and the Environment, 28*(1), 1–14.

Campopiano, G., & De Massis, A. (2015). Corporate social responsibility reporting: A content analysis in family and non-family firms. *Journal of Business Ethics, 129*(3), 511–534.

Carroll, A. B., & Näsi, J. (1997). Understanding stakeholder thinking: Themes from a Finnish conference. *Business Ethics: A European Review, 6*(1), 46–51.

Cennamo, C., Berrone, P., Cruz, C., & Gomez-Mejia, L. R. (2012). Socioemotional wealth and proactive stakeholder engagement: Why family-controlled firms care more about their stakeholders. *Entrepreneurship Theory and Practice, 36*(6), 1153–1173.

Chen, Y. S. (2008). The driver of green innovation and green image—Green core competence. *Journal of Business Ethics, 81*(3), 531–543.

Chrisman, J. J., Chua, J. H., Pearson, A. W., & Barnett, T. (2012). Family involvement, family influence, and family-centered non-economic goals in small firms. *Entrepreneurship: Theory and Practice, 36*(2), 267–293.

Chua, J. H., Chrisman, J. J., & Sharma, P. (1999). Defining the family business by behavior. *Entrepreneurship Theory and Practice, 23*(4), 19–39.

Clauß, T., Kraus, S., & Jones, P. (2022). Sustainability in family business: Mechanisms, technologies and business models for achieving economic prosperity, environmental quality and social equity. *Technological Forecasting and Social Change, 176*, 121450.

Combs, J. G., Jaskiewicz, P., Ravi, R., & Walls, J. L. (2023). More bang for their buck: Why (and when) family firms better leverage corporate social responsibility. *Journal of Management, 49*(2), 575–605.

Cruz, C., Larraza-Kintana, M., Garcés-Galdeano, L., & Berrone, P. (2014). Are family firms really more socially responsible? *Entrepreneurship Theory and Practice, 38*(6), 1295–1316.

Dahlmann, F., Branicki, L., & Brammer, S. (2019). Managing carbon aspirations: The influence of corporate climate change targets on environmental performance. *Journal of Business Ethics, 158*(1), 1–24.

Damert, M., & Baumgartner, R. J. (2018). Intra-sectoral differences in climate change strategies: Evidence from the global automotive industry. *Business Strategy and the Environment, 27*(3), 265–281.

Damert, M., Paul, A., & Baumgartner, R. J. (2017). Exploring the determinants and long-term performance outcomes of corporate carbon strategies. *Journal of Cleaner Production, 160*, 123–138.

Dangelico, R. M., Pujari, D., & Pontrandolfo, P. (2017). Green product innovation in manufacturing firms: A sustainability-oriented dynamic capability perspective. *Business Strategy and the Environment, 26*(4), 490–506.

Darnall, N., Henriques, I., & Sadorsky, P. (2010). Adopting proactive environmental strategy: The influence of stakeholders and firm size. *Journal of Management Studies, 47*(6), 1072–1094.

Darnall, N., Seol, I., & Sarkis, J. (2009). Perceived stakeholder influences and organizations' use of environmental audits. *Accounting, Organizations and Society, 34*(2), 170–187.

De Massis, A., Audretsch, D., Uhlaner, L., & Kammerlander, N. (2017). Innovation with limited resources: Management lessons from the German Mittelstand. *Journal of Product Innovation Management, 35*(1), 125–146.

Deephouse, D. L., & Jaskiewicz, P. (2013). Do family firms have better reputations than non-family firms? An integration of socioemotional wealth and social identity theories. *Journal of Management Studies, 50*(3), 337–360.

Deferne, M., Bertschi-Michel, A., & de Groote, J. (2022). The role of trust in family business stakeholder relationships: A systematic literature review. *Journal of Family Business Strategy,* 100501.

Delgado-Ceballos, J., Aragón-Correa, J. A., Ortiz-de-Mandojana, N., & Rueda-Manzanares, A. (2012). The effect of internal barriers on the connection between stakeholder integration and proactive environmental strategies. *Journal of Business Ethics, 107*(3), 281–293.

Denicolai, S., Zucchella, A., & Magnani, G. (2021). Internationalization, digitalization, and sustainability: Are SMEs ready? A survey on synergies and substituting effects among growth paths. *Technological Forecasting and Social Change, 166*, 120650.

Dhanda, K. K., Sarkis, J., & Dhavale, D. G. (2022). Institutional and stakeholder effects on carbon mitigation strategies. *Business Strategy and the Environment, 31*(3), 782–795.

Dou, J., Su, E., & Wang, S. (2019). When does family ownership promote proactive environmental strategy? The role of the firm's long-term orientation. *Journal of Business Ethics, 158*(1), 81–95.

Driscoll, C., & Starik, M. (2004). The primordial stakeholder: Advancing the conceptual consideration of stakeholder status for the natural environment. *Journal of Business Ethics, 49*(1), 55–73.

Du, X. (2015). Is corporate philanthropy used as environmental misconduct dressing? Evidence from Chinese family-owned firms. *Journal of Business Ethics, 129*(2), 341–361.

Durand, R., Hawn, O., & Ioannou, I. (2019). Willing and able: A general model of organizational responses to normative pressures. *Academy of Management Review, 44*(2), 299–320.

Dzhengiz, T., & Niesten, E. (2020). Competences for environmental sustainability: A systematic review on the impact of absorptive capacity and capabilities. *Journal of Business Ethics, 162*(4), 881–906.

Eikelenboom, M., & de Jong, G. (2019). The impact of dynamic capabilities on the sustainability performance of SMEs. *Journal of Cleaner Production, 235*, 1360–1370.

Ernst, R. A., Gerken, M., Hack, A., & Hülsbeck, M. (2022). SMEs' reluctance to embrace corporate sustainability: The effect of stakeholder pressure on self-determination and the role of social proximity. *Journal of Cleaner Production, 335*, 130273.

Ferreira, J. J., Fernandes, C. I., Schiavone, F., & Mahto, R. V. (2021). Sustainability in family business—A bibliometric study and a research agenda. *Technological Forecasting and Social Change, 173*, 121077.

Fetting, C. (2020). *The European green deal, ESDN Report, December 2020*. ESDN Office.

Flammer, C. (2013). Corporate social responsibility and shareholder reaction: The environmental awareness of investors. *Academy of Management Journal, 56*(3), 758–781.

Freeman, R. E. (1984). *Strategic management: A stakeholder approach*. Pitman.

Garcés-Ayerbe, C., Rivera-Torres, P., & Murillo-Luna, J. L. (2012). Stakeholder pressure and environmental proactivity: Moderating effect of competitive advantage expectations. *Management Decision, 50*(2), 189–206.

Garcés-Ayerbe, C., Rivera-Torres, P., Murillo-Luna, J. L., & Suárez-Gálvez, C. (2022). Does it pay more to be green in family firms than in non-family firms? *Review of Managerial Science, 16*(5), 1365–1386.

García-Sánchez, I. M., Martín-Moreno, J., Khan, S. A., & Hussain, N. (2021). Socio-emotional wealth and corporate responses to environmental hostility: Are family firms more stakeholder oriented? *Business Strategy and the Environment, 30*(2), 1003–1018.

Gómez-Mejía, L. R., Haynes, K. T., Núñez-Nickel, M., Jacobson, K. J., & Moyano-Fuentes, J. (2007). Socioemotional wealth and business risks in family-controlled firms: Evidence from Spanish olive oil mills. *Administrative Science Quarterly*, *52*(1), 106–137.

Henriques, I., & Sadorsky, P. (1999). The relationship between environmental commitment and managerial perceptions of stakeholder importance. *Academy of Management Journal, 42*(1), 87–99.

Hiebl, M. R., & Li, Z. (2020). Non-family managers in family firms: Review, integrative framework and future research agenda. *Review of Managerial Science, 14*, 763–807.

Hyatt, D. G., & Berente, N. (2017). Substantive or symbolic environmental strategies? Effects of external and internal normative stakeholder pressures. *Business Strategy and the Environment, 26*(8), 1212–1234.

Institut für Mittelstandsforschung (IfM) Bonn. (2016). SME definition of the IfM Bonn. Retrieved Dec 2022, from https://www.ifm-bonn.org/en/definitions/sme-definition-of-the-ifm-bonn

IPCC. (2018). Summary for policymakers. In V. Masson-Delmotte, P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P. R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, & T. Waterfield (Eds.), *Global Warming of 1.5°C—An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* (pp. 3–24). Cambridge University Press.

Johnson, M. P., Rötzel, T. S., & Frank, B. (2023). Beyond conventional corporate responses to climate change towards deep decarbonization: a systematic literature review. *Management Review Quarterly,* 1–34.

Johnson, G. (1990). Managing strategic change; The role of symbolic action. *British Journal of Management, 1*(4), 183–200.

Kolk, A., & Pinkse, J. (2005). Business responses to climate change: Identifying emergent strategies. *California Management Review, 47*(3), 5–20.

Kulkarni, S. P. (2000). Environmental ethics and information asymmetry among organizational stakeholders. *Journal of Business Ethics, 27*, 215–228.

Lähdesmäki, M., Siltaoja, M., & Spence, L. J. (2019). Stakeholder salience for small businesses: A social proximity perspective. *Journal of Business Ethics, 158*, 373–385.

Le Breton-Miller, I., & Miller, D. (2006). Why do some family businesses out-compete? Governance, long-term orientations, and sustainable capability. *Entrepreneurship Theory and Practice, 30*(6), 731–746.

Lee, S. Y. (2012). Corporate carbon strategies in responding to climate change. *Business Strategy and the Environment, 21*(1), 33–48.

Lefebvre, V. (2023). Layoffs in SMEs: The role of social proximity. *Journal of Business Ethics,* 1–20.

Lopes de Sousa Jabbour, A. B., Vazquez-Brust, D., Chiappetta Jabbour, C. J., & Andriani Ribeiro, D. (2020). The interplay between stakeholders, resources and capabilities in climate change strategy: Converting barriers into cooperation. *Business Strategy and the Environment, 29*(3), 1362–1386.

Mahon, J. F. (2002). Corporate reputation: Research agenda using strategy and stakeholder literature. *Business & Society, 41*(4), 415–445.

Martín-de Castro, G., Amores-Salvadó, J., Navas-López, J. E., & Balarezo-Núñez, R. M. (2020). Corporate environmental reputation: Exploring its definitional landscape. *Business Ethics: A European Review, 29*(1), 130–142.

Meier, O., & Schier, G. (2021). CSR and family CEO: The moderating role of CEO's age. *Journal of Business Ethics, 174*, 595–612.

Mitchell, R. K., Agle, B. R., & Wood, D. J. (1997). Toward a theory of stakeholder identification and salience: Defining the principle of who and what really counts. *Academy of Management Review, 22*(4), 853–886.

Mogoș, R. I., Petrescu, I., Chiotan, R. A., Crețu, R. C., Troacă, V. A., & Mogoș, P. L. (2023). Greenhouse gas emissions and Green Deal in the European Union. *Frontiers in Environmental Science, 11*, 1141473.

Mowday, R. T., Steers, R. M., & Porter, L. W. (1979). The measurement of organizational commitment. *Journal of Vocational Behavior, 14*(2), 224–247.

Murillo-Luna, J. L., Garcés-Ayerbe, C., & Rivera-Torres, P. (2010). Why do patterns of environmental response differ? A stakeholders'

pressure approach. *Strategic Management Journal, 29*(11), 1225–1240.

Nardi, L. (2022). The corporate social responsibility price premium as an enabler of substantive CSR. *Academy of Management Review, 47*(2), 282–308.

Neubaum, D. O., Dibrell, C., & Craig, J. B. (2012). Balancing natural environmental concerns of internal and external stakeholders in family and non-family businesses. *Journal of Family Business Strategy, 3*(1), 28–37.

Okereke, C., & Russel, D. (2010). Regulatory pressure and competitive dynamics: Carbon management strategies of UK energy-intensive companies. *California Management Review, 52*(4), 100–124.

Pahnke, A., Welter, F., & Audretsch, D. B. (2023). In the eye of the beholder? Differentiating between SMEs and Mittelstand. *Small Business Economics, 60*(2), 729–743.

Perez-Batres, L. A., & Doh, J. P. (2014). Stakeholder dynamics as determinants of substantive versus symbolic CSR practices: A macro/micro perspective. In R. Van Tulder, A. Verbeke, & R. Strange (Eds.), *International business and sustainable development, 8* (pp. 249–264). Emerald Publishing.

Perez-Batres, L. A., Doh, J. P., Miller, V. V., & Pisani, M. J. (2012). Stakeholder pressures as determinants of CSR strategic choice: Why do firms choose symbolic versus substantive self-regulatory codes of conduct? *Journal of Business Ethics, 110*(2), 157–172.

Pfeffer, J. (1981). Management as symbolic action: The creation and maintenance of organizational paradigms. In L. L. Cummings & B. M. Staw (Eds.), *Research in organizational behavior, 3* (pp. 1–52). JAI Press.

Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology, 63*, 539–569.

Ramanathan, R., Poomkaew, B., & Nath, P. (2014). The impact of organizational pressures on environmental performance of firms. *Business Ethics: A European Review, 23*(2), 169–182.

Reck, F. S., Fischer, D., & Brettel, M. (2022). Ethical decision-making in family firms: The role of employee identification. *Journal of Business Ethics, 180*(2), 651–673.

Rodrigue, M., Magnan, M., & Cho, C. H. (2013). Is environmental governance substantive or symbolic? An empirical investigation. *Journal of Business Ethics, 114*(1), 107–129.

Röhl, K.-H. (2018). Mid caps: Der große Mittelstand. Die Wirtschaftspolitik berücksichtigt die Relevanz der Mid Caps nicht ausreichend. *IW–Policy Paper, 4*.

Schmitz, E. A., Baum, M., Huett, P., & Kabst, R. (2019). The contextual role of regulatory stakeholder pressure in proactive environmental strategies: An empirical test of competing theoretical perspectives. *Organization and Environment, 32*(3), 281–308.

Schons, L., & Steinmeier, M. (2016). Walk the talk? How symbolic and substantive CSR actions affect firm performance depending on stakeholder proximity. *Corporate Social Responsibility and Environmental Management, 23*(6), 358–372.

Seddon, N. (2022). Harnessing the potential of nature-based solutions for mitigating and adapting to climate change. *Science, 376*(6600), 1410–1416.

Seroka-Stolka, O., & Fijorek, K. (2020). Enhancing corporate sustainable development: Proactive environmental strategy, stakeholder pressure and the moderating effect of firm size. *Business Strategy and the Environment, 29*(6), 2338–2354.

Shabana, K. M., & Ravlin, E. C. (2016). Corporate social responsibility reporting as substantive and symbolic behavior: A multilevel theoretical analysis. *Business and Society Review, 121*(2), 297–327.

Sharma, P. (2001). Stakeholder management concepts in family firms. In *Proceedings of the 12th annual meeting of the International Association for Business and Society*, 483–493.

Sharma, P., & Sharma, S. (2011). Drivers of proactive environmental strategy in family firms. *Business Ethics Quarterly, 21*(2), 309–334.

Sharma, S., & Henriques, I. (2005). Stakeholder influences on sustainability practices in the Canadian forest products industry. *Strategic Management Journal, 26*(2), 159–180.

Sharma, S., & Sharma, P. (2019). *Patient capital: The role of family firms in sustainable business*. Cambridge University Press.

Sharma, S., & Vredenburg, H. (1998). Proactive corporate environmental strategy and the development of competitively valuable organizational capabilities. *Strategic Management Journal, 19*(8), 729–753.

Shrivastava, M., & Tamvada, J. P. (2019). Which green matters for whom? Greening and firm performance across age and size distribution of firms. *Small Business Economics, 52*(4), 951–968.

Sprengel, D. C., & Busch, T. (2011). Stakeholder engagement and environmental strategy—The case of climate change. *Business Strategy and the Environment, 20*(6), 351–364.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal, 18*(7), 509–533.

Terlaak, A., Kim, S., & Roh, T. (2018). Not good, not bad: The effect of family control on environmental performance disclosure by business group firms. *Journal of Business Ethics, 153*(4), 977–996.

Testa, F., Boiral, O., & Iraldo, F. (2018). Internalization of environmental practices and institutional complexity: Can stakeholders pressures encourage greenwashing*?*. *Journal of Business Ethics, 147*(2), 287–307.

Truong, Y., Mazloomi, H., & Berrone, P. (2021). Understanding the impact of symbolic and substantive environmental actions on organizational reputation. *Industrial Marketing Management, 92*, 307–320.

Vallejo, M. C. (2009). The effects of commitment of non-family employees of family firms from the perspective of stewardship theory. *Journal of Business Ethics, 87*(3), 379–390.

Vazquez, P. (2018). Family business ethics: At the crossroads of business ethics and family business. *Journal of Business Ethics, 150*(3), 691–709.

Weinhofer, G., & Hoffmann, V. H. (2010). Mitigating climate change—How do corporate strategies differ? *Business Strategy and the Environment, 19*(2), 77–89.

Wickert, C., Vaccaro, A., & Cornelissen, J. (2017). "Buying" corporate social responsibility: Organisational identity orientation as a determinant of practice adoption. *Journal of Business Ethics, 142*(3), 497–514.

Wimbadi, R. W., & Djalante, R. (2020). From decarbonization to low carbon development and transition: A systematic literature review of the conceptualization of moving toward net-zero carbon dioxide emission (1995–2019). *Journal of Cleaner Production, 256*, 120307.

Yu, Y., Bai, T., Tang, F., & Liu, Y. (2023). The impact of nonfamily CEOs on family firms' pursuit of political connections: the theory of bounded reliability perspective. *Family Business Review, 36*, 315–346.

Yunus, S., Elijido-Ten, E. O., & Abhayawansa, S. (2020). Impact of stakeholder pressure on the adoption of carbon management strategies: Evidence from Australia. *Sustainability Accounting, Management and Policy Journal, 11*(7), 1189–1212.

Zellweger, T. M., Nason, R. S., Nordqvist, M., & Brush, C. G. (2013). Why do family firms strive for nonfinancial goals? An organizational identity perspective. *Entrepreneurship Theory and Practice, 37*(2), 229–248.

Zhao, C., Sun, J., & Zhang, Y. (2022). A Study of the drivers of decarbonization in the plastics supply chain in the post-COVID-19 era. *Sustainability, 14*(23), 15858.

Zhong, M., Zhao, W., & Shahab, Y. (2022). The philanthropic response of substantive and symbolic corporate social responsibility strategies to COVID-19 crisis: Evidence from China. *Corporate Social Responsibility and Environmental Management, 29*(2), 339–355.