Exploring the role of entrepreneurial orientation in clean technology ventures

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Abstract: While the positive impact of entrepreneurial orientation on business performance is broadly acknowledged, it is uncertain whether this effect also holds for sustainable performance indicators. This paper explores the moderating effects of environmental mission, stakeholder influence and firm age on the relationship between entrepreneurial orientation and environmental performance and contrasts this with the effects on business performance. Data from 150 clean technology ventures supports that entrepreneurial orientation increases environmental performance. The effect of entrepreneurial orientation on environmental performance is significantly higher in the context of a strong environmental mission and strong stakeholder influence. While no significant interaction between entrepreneurial orientation and firm age exists with regard to environmental performance, this study finds that the younger the firm, the higher the leverage that entrepreneurial orientation has on its business performance. The results offer important insights on the role of entrepreneurial orientation in sustainable business contexts.

Keywords: entrepreneurship; sustainability; sustainable entrepreneurship; environmental entrepreneurship; ecopreneurship; entrepreneurial orientation; clean technology; environmental performance.

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Biographical notes: Petra Dickel is an Assistant Professor in Entrepreneurship at the Institute for Innovation Research at the Christian-Albrechts-University of Kiel. Her research focuses on sustainable entrepreneurship and entrepreneurship education. Further research topics deal with academic spin-offs and entrepreneurial behaviour in established organisations.

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1 Introduction

Clean technology (cleantech) ventures are young firms that are involved in developing, commercialising or manufacturing environmental technologies, such as renewable energy, waste management and recycling, sustainable water management, sustainable mobility,
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material efficiency and energy efficiency. These firms are particularly important for the rise of a green economy, as they turn unresolved market opportunities into eco-friendly products and services (Cohen and Winn, 2007; Meek et al., 2010; Shrivastava, 1995) and are regarded as the driving forces for disruptive environmental innovations (Erzurumlu and Erzurumlu, 2013). Start-ups make up a large part of the cleantech sector and they have been broadly acknowledged for their significant societal benefits not only in terms of eco-friendly innovation but also for job creation and economic development (Marra et al., 2015). Not surprisingly, the cleantech industry has increasingly received attention from researchers, investors and policy makers during the last few years, indicated by increasing investments, government support programmes and a growing number of academic publications (Doganova and Karnøe, 2015).

Although the cleantech industry exhibited high growth rates during the last few years (BMU, 2014, Marra et al., 2015), recent developments show that cleantech firms often struggle to succeed (Bazilian et al., 2013). This can be attributed to specific barriers that these firms must overcome. Cleantech firms are associated with higher uncertainty and risk due to high upfront investments, long research and development cycles and uncertain returns (Erzurumlu and Erzurumlu, 2013; Marra et al., 2015; Bocken, 2015). Also they have to cope with potential goal conflicts in pursuing economic and sustainability-oriented objectives (Moss et al., 2011, Lumpkin et al., 2013) and increased complexity resulting from the interconnected nature and long-term perspective of green innovations (Hart, 1995). These firms further have greater difficulties in getting funding because investors are hesitant to invest in the risky cleantech sector (de Lange, 2016; Bocken, 2015). Therefore, cleantech ventures often depend on government subsidies and public-private partnerships, particularly in the early stages of technology development (Buerer and Wuestenhagen, 2009). Further, uncertainties may exist due to changing environmental regulations that affect the adoption of clean technologies (del Río González, 2005). Finally, challenges of cleantech firms stem from strong incumbents, notably the fossil fuel industry, and an increasing global competition (de Lange, 2016).

Understanding the drivers and barriers of cleantech ventures is important to promote the transition towards a green economy. Research on the organisational antecedents that foster or hinder the performance of cleantech ventures is still in its infancy. This paper argues that cleantech ventures have to think and act entrepreneurially to succeed against all odds. Entrepreneurial orientation (EO) is typically regarded as a major and positive predictor of new venture performance, which is largely supported in the context of traditional ventures (see Rauch et al., 2009; Rosenbusch et al., 2013). However, it is uncertain whether the effect of EO is similar for outcomes that are unique to a sustainable entrepreneurship context (Lumpkin et al., 2013). Although some studies in this research area show a positive relationship between EO and organisational performance (e.g., Pearce et al., 2010), others could not confirm a significant link (e.g., Morris et al., 2007) or found positive and negative associations between EO dimensions and revenues (Voss et al., 2005).

As the mixed findings might be due to different contingent factors that influence the direction and strength of EO on performance, a contingency approach is applied to tease out the conditions under which the EO-performance relationship is manifested in sustainable ventures. Drawing on Lumpkin et al.’s (2013) conceptual paper, the paper specifically proposes that the effect of EO on performance is likely to vary with mission orientation, stakeholder influence and firm age. As performance in sustainability contexts
is related to economic, environmental and/or social impact, the analysis integrates both business and environmental performance as outcome variables.

Survey data from 150 cleantech ventures indicates that a high level of EO increases environmental performance. A strong environmental mission and strong stakeholder influence increase the impact of EO on environmental performance. While no significant interaction effect of EO and firm age on environmental performance was found, the results reveal that younger firms are significantly better at translating the benefits of EO into superior business performance than older firms.

This paper makes four important contributions: First, the paper extends research on sustainable entrepreneurship (e.g., Binder and Belz, 2015; Wagner, 2015; Schaltegger and Wagner, 2011; Wagner and Schaltegger 2010; Shepherd and Patzelt, 2011; Hockerts and Wuestenhagen, 2010; Hansen and Schaltegger, 2013; Hoerisch, 2015). Researchers broadly agree that sustainable entrepreneurship is central for generating disruptive innovations (Hart and Milstein, 1999; Schaper, 2002; Schaltegger and Wagner, 2011; Schaltegger, 2002; Cohen and Winn, 2007; Hockerts and Wuestenhagen, 2010). Hockerts and Wuestenhagen (2010) argue that it is typically new and small firms that pursue radical sustainable innovations and that larger, established firms will follow the successful early entrants and take the innovations to a broader market. This interplay of ‘Davids’ and ‘Goliaths’ will stipulate significant change in existing markets towards greater sustainability. Previous research highlighted the key role of individual entrepreneurs (e.g., Schaltegger, 2002; Isaak, 2002; Schaper, 2002; Kuckertz and Wagner, 2010), as they treat sustainability issues as central to their business and link environmental progress to market success (Schaltegger and Wagner, 2011) This paper adopts this notion at the organisational level, it focuses on EO as the key strategic orientation in entrepreneurship (Covin and Slevin, 1989; Lumpkin and Dess, 1996) and links it to a sustainability context. By teasing out how EO influences the performance of cleantech ventures, this study grants a better understanding of what spurs the successful development and growth of these innovative firms.

Second, this study contributes to cleantech research, which is still at an early stage (see e.g., Schiederig et al., 2012; Bjornali and Ellingsen, 2014; de Lange, 2016). Among the few empirical studies, research on cleantech firms is mostly focused on external factors (Bjornali and Ellingsen, 2014), particularly governmental policies and incentives (Meek et al., 2010; Veugelers, 2012; Hoppmann et al., 2013) and factors related to network partners (Meyskens and Carsrud, 2013; Hansen, 2014; Doganova and Karnøe, 2015). Among others, the research indicates that cleantech ventures depend upon a complex network of actors with multiple interests (Meyskens and Carsrud, 2013; Hansen, 2014). This paper adds theoretical arguments and empirical evidence on this research stream by investigating the role of EO and its interplay with environmental mission, stakeholder influence and firm age on the performance of cleantech ventures. Thereby it follows recent calls to examine the firm-specific factors of cleantech ventures (Bjornali and Ellingsen, 2014). Marra et al. (2015, p.17) note that “any empirical-based attempt to detect the pattern of technological innovation in the [cleantech] industry is challenging”. Obtaining reliable information about factors that leverage the performance of cleantech companies is fundamental not only for founders but also for investors and policy makers in order to ensure the continued growth of this sector. As previous research on cleantech ventures is often based on small samples (e.g., Meyskens and Carsrud, 2013) or cases (e.g., Doganova and Karnøe, 2015), this paper contributes with empirical evidence from a larger scale
study and thus increases the generalisability of the findings regarding success factors in cleantech ventures.

Third, relating EO to non-business indicators extends the EO literature (e.g., Rauch et al., 2009, Rosenbusch et al., 2013; Wales et al., 2013; Saeed et al., 2014). Empirical evidence on the effect of EO on sustainability performance indicators is scarce, which might be attributed to the inherent complexity of these measures compared to financial indicators (Delmas et al., 2013). In showing a positive link between EO and environmental performance, this study adds insights to the controversial discussion and empirical findings on the role of EO in sustainability contexts (Voss et al., 2005; Morris et al., 2007; Pearce et al., 2010; Morris et al., 2011; Lumpkin et al., 2013).

Fourth, the study follows recent calls to extend research on organisational contingency factors on the EO – performance relationship (Wales et al., 2013) by analysing the moderating role of environmental mission, stakeholder influence and firm age on the EO – performance relationship. As previous research provides little insights on potential goal conflicts that mission-driven firms face this study sheds light on the tensions inherent in sustainable firms and the effect of these tensions on performance (e.g., Moss et al., 2011; Parrish, 2010; Doherty et al., 2014).

The outline of the rest of the paper is as follows. Building on the contingency approach, hypotheses are developed on the interaction effect of environmental mission, stakeholder influence and firm age on the EO – business performance link and the EO – environmental performance link. The hypotheses are tested using data from 150 cleantech ventures. The theoretical and practical implications of the results are discussed accordingly.

2 Theoretical background and hypotheses

2.1 Entrepreneurial orientation

EO represents a firm’s organisational capability to discover and exploit opportunities (Covin and Slevin, 1989) and indicates how ventures transform initial resources to a desired end. It connotes a firm’s strategic posture in terms of its innovativeness, proactiveness and propensity to take risks (Miller, 1983; Covin and Slevin, 1989). Innovativeness describes a firm’s tendency to embrace creativity and experimentation in order to develop and introduce new products, services, or technological processes. Proactiveness implies opportunity-seeking, forward-looking behaviour that is characterised by anticipating market changes and acting ahead of competitors. Risk-taking involves committing significant resources to costly projects with higher risks of failure and taking bold actions under uncertainty (Miller, 1983; Lumpkin and Dess, 1996).

In contrast to the largely supported positive effect of EO on business performance (e.g., Rauch et al., 2009; Saeed et al., 2014), the role of EO on environmental performance is less evident. Environmental performance is ‘the outcome of a firm’s strategic activities that manage (or not) its impact on the natural environment’ [Walls et al., (2012), p.891]. Thus, environmental performance is rooted in more than compliance implementations of products, processes and policies that improve a firm’s impact on the natural environment, such as by reducing energy consumption and waste and using environmentally friendly resources.
Lumpkin et al. (2013) point out that theoretical arguments exist for positive and negative relationships between EO and sustainability outcomes. This paper expects innovativeness and proactiveness to be positively related to sustainable performance as more creativity and experimentation are required to compensate for a lack of resources (Lumpkin et al., 2013). In a similar vein, Menguc and Ozanne (2005) argue that EO enables a firm to better address challenges arising from environmental pollution. As EO involves non-traditional problem-solving and out-of-the-box thinking, entrepreneurial firms may be more likely to find and exploit promising environmental business chances (Lumpkin et al., 2013; Dean and McMullen, 2007) and transfer these opportunities into green innovations (Hart, 1995). In contrast, risk-taking behaviour is argued to be constrained in sustainable firms because they focus on long-term solutions (Weerawardena and Mort, 2006). In the case of failure, damage would not only affect the firm but also the interest of the larger society, such as by failing to reduce pollution and/or waste. In contrast to this notion, Lumpkin et al. (2013) argue that sustainable ventures may be more likely to take risks, as they must commit resources to pushing the firm forward.

Adopting the outlined arguments on the increased necessity for sustainable firms to be innovative, proactive and risk-taking in order to realise green innovations, this paper assumes a positive relationship between EO and environmental performance.

Hypothesis 1 The higher a venture’s EO, the better the venture’s environmental performance.

2.2 Contextual influences on the EO – performance relationship

Contingency theory posits that the strength and direction of an independent variable on a dependent variable depends on context (Burns and Stalker, 1961; Chandler, 1962; Galbraith, 1973). The value of adopting a contingency approach to explain the differences in the strengths of the EO – performance relationship has increasingly been recognised in EO research (Rauch et al., 2009; Saeed et al., 2014). Lumpkin et al. (2013) contend that entrepreneurial processes in sustainability contexts differ mainly due to the venture’s mission, the presence of multiple stakeholders and differential access to resources. This paper builds on these theoretical arguments and develops hypotheses on the interaction effects of environmental mission, stakeholder influence and firm age as a proxy for a firm’s access to resources.

2.2.1 Environmental mission

An organisational identity reflects the enduring, unique and distinctive attributes of an organisation (Albert and Whetten, 1985) and affects the interpretation of strategic issues and decision-making practices within a firm (Dutton and Dukerich, 1991). Particularly in sustainable contexts, firms may have multiple identities that conflict with one another (Mair and Marti, 2006; Parrish, 2010; Moss et al., 2011). Moss et al. (2011) show that social ventures exhibit dual identities in terms of a utilitarian (i.e., entrepreneurial, product-oriented) identity and a normative (i.e., social, people-oriented) organisational identity. A utilitarian identity implies that a firm is governed by financial objectives, such as profit maximisation, growth and cost minimisation. A normative identity is manifested in ideologies and high organisational commitment that are not built on economic rationality but on deeper beliefs, values and norms (Moss et al., 2011). As one
organisational identity can be detrimental to the other (Albert and Whetten, 1985), firms either need to balance their identities or favour one identity over the other.

A people-oriented perspective that places the fulfilment of a social mission above financial returns is one of the distinguishing features of social enterprises (Austin et al., 2006). Similarly, cleantech ventures possess a mixture of environmentally and profit-oriented missions that shape how they set priorities and make decisions. As it is often difficult to separate the organisational identity from that of the entrepreneurs and their personalities, attitudes and actions (Longenecker et al., 1998), this paper defines environmental mission as a normative identity that governs founders’ decision-making practices and places the improvement of environmental aspects over financial returns. Although social mission is regarded as the major distinguishing factor of social enterprises (Austin et al., 2006), environmental mission is less of an ‘either/or’ decision factor in cleantech ventures. Rather, the underlying assumption is that the extent of the environmental mission differs among cleantech ventures as these hybrid firms are likely to be positioned at both ends of the profit-oriented versus mission-oriented spectrum (Alter, 2007).

Sustainable ventures typically pursue multiple goals, such as economic, social and/or environmental goals (Dacin et al., 2010). Tensions are often involved in the course of pursuing these partly conflicting goals. In this respect, the allocation of resources and attention is subject to the founders’ priority (Mair and Martí, 2006). Environmental mission reflects the values and priority that entrepreneurs place on environmental aspects; this mission governs founders’ awareness, evaluation of alternatives and decision-making practices. Founders with a weak environmental mission are likely to prioritise financially promising projects over pursuing activities that maximise environmental or social performance. A strong environmental mission, in turn, implies that environmental aspects will be prioritised, even if they have detrimental effects on business performance. For example, to implement environmental standards, substantial financial investments are often required that may weaken firms’ cost structure and profitability (Mathur and Mathur, 2000). Founders characterised by a strong environmental mission and strong innovativeness may display higher creativity in developing innovative solutions that involve superior environmental gains but may be less attractive from a financial perspective. The combination of high proactiveness and a strong environmental mission might also place a greater sense of urgency on solving environmental problems instead of pursuing profitable opportunities. The propensity to take risks in the context of environmentally mission-oriented firms is also likely associated with a stronger focus on rapidly solving pressing environmental problems and subordinating financial objectives to creating environmental value.

In sum, a strong environmental mission can be assumed to foster innovations, proactive behaviour and the propensity to take risks if they serve the mission. Accordingly, this paper hypothesises a positive interaction effect of EO and environmental mission on environmental performance. In turn, it proposes a negative interaction effect of EO and environmental mission on business performance.

Hypothesis 2a The level of the environmental mission negatively moderates the effect of EO on the business performance.

Hypothesis 2b The level of the environmental mission positively moderates the effect of EO on the environmental performance.
2.2.2 Stakeholder influence

Stakeholder theory suggests that firms’ ability to manage their stakeholder relationships is positively linked to performance (Freeman, 1984; Donaldson and Preston, 1995). Stakeholders are “any group or individual who can affect or is affected by the achievement of the organisations’ objectives” [Freeman, (1984), p.46]. Managers interpret and evaluate stakeholder influence based on their own perceptions (Banerjee, 2001; Donaldson and Preston, 1995). Accordingly, stakeholder influence can be defined as the perceived power that another actor or group can exert on a firm in pursuing environmental activities and realising environmentally friendly solutions (Agle et al., 1999; Darnall et al., 2010).

Stakeholders can be classified into primary and secondary stakeholders (Freeman, 1984). Primary stakeholders include value chain participants, such as customers and suppliers, as well as internal organisational members, such as managers and employees. Secondary stakeholders, such as lobbyists and industry and trade associations, do not have a direct stake in the company but can indirectly influence a company’s objectives, activities and performance, for example by establishing policies and regulations or by shaping public opinion.

Previous research supports the significant influence of stakeholders on a firm’s environmental objectives, activities and performance. Henriques and Sadorsky (1996) provide empirical evidence that the extent of stakeholder pressure is positively linked to the formulation of environmental plans in the context of established firms. Darnall et al. (2010) showed that smaller firms are more responsive to stakeholder pressure with regard to adopting environmental practices.

Although the role of stakeholders has been broadly investigated (e.g., Agle et al., 1999; Mitchell et al., 1997; Henriques and Sadorsky, 1999; Darnall et al., 2010), few researchers have focused on the link between stakeholders and a firm’s EO. Focusing on proactiveness as a specific dimension of EO, in a study of 144 small and medium-sized enterprises, Tang et al. (2014) report that high proactiveness decreases government-firm power difference as well as media-firm power difference. In a non-profit context, Voss et al. (2005) indicate that a positive relationship exists between creative and philanthropic stakeholder support and EO dimensions, whereas customer stakeholder support has no or even a negative effect on EO dimensions. Their results further show that the level of current EO influences future stakeholder support. Although innovativeness is positively associated with stakeholder support, mixed results are found regarding the link between stakeholder support and proactiveness and risk-taking depending on the type of stakeholder support.

Despite these partly conflicting findings, this paper proposes that overall, EO is positively correlated with stakeholders influence when it serves the firm’s environmental mission. In the context of strong stakeholder influence, it is assumed that cleantech ventures with a high level of innovativeness have a higher incentive to fulfil stakeholder expectations and transform environmentally friendly ideas into actual solutions in order to increase their reputation and legitimacy (Menguc et al., 2010). Highly proactive ventures are likely to devote even more attention and urgency to responding to environmental conditions if stakeholder influence is high. In this sense, stakeholders shape managers’ prioritisation in the decision-making process (Agle et al., 1999). Regarding risk-taking, the relationship of EO and stakeholder influence is ambiguous, as stakeholders can strengthen or weaken a firm’s propensity to take risks, depending on the specific stakeholder
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demands. Taking the combined effect of the three EO dimensions into account, this paper hypothesises an overall positive moderator effect of stakeholder influence on the EO – environmental performance relationship. As stakeholders shift founders’ attention and priorities toward pursuing environmental activities instead of maximising financial objectives, a converse effect is expected on business performance.

Hypothesis 3a The level of stakeholder influence negatively moderates the effect of EO on the business performance.

Hypothesis 3b The level of stakeholder influence positively moderates the effect of EO on the environmental performance.

2.2.3 Firm age

Although firm age is often used as a control variable in EO research, it has long been overlooked as a potential moderator (Anderson and Eshima, 2013). Researchers recently proposed that firm age is a theoretically meaningful indicator of a firm’s internal characteristics in terms of resources, knowledge, processes and structures (Thornhill and Amit, 2003; Rosenbusch et al., 2011; Naldi and Davidsson, 2014).

Younger firms are characterised by weak organisational structures and they often lack access to network partners and know-how (Stinchcombe, 1965). In the context of EO, these liabilities of newness could also be regarded in a positive sense – namely, that younger firms are less bound by established processes and routines, which implies higher openness to new approaches and higher flexibility in pursuing and implementing entrepreneurial solutions and thus innovativeness (Lumpkin et al., 2006). In addition, market knowledge in younger firms is of greater temporal salience than in older firms that have already built on a stock of market intelligence and are less able to adapt to new insights that might contradict previous knowledge (Anderson and Eshima, 2013). Scarce resources may also stimulate younger firms to become more creative in developing ideas for alternative solutions as well as urge them to act more proactively to get ahead of competitors. In contrast, older firms are increasingly characterised by established structures, processes and routines that are associated with higher inertia and slower adaptation to the changing environment (Hannan and Freeman, 1984). However, proactive behaviour also requires resources to anticipate trends and to leverage the benefits of environmental conditions (Lumpkin et al., 2006), which implies that older firms might benefit more strongly from an entrepreneurial posture in terms of proactiveness.

As uncertainties in terms of technology and markets are typically higher at the early stage of technology ventures (Bond and Houston, 2003), the need to take higher risks can be assumed to be stronger in younger firms than in older firms (Anderson and Eshima, 2013). In turn, continuously high levels of risk-taking could also be detrimental to firms (Lumpkin et al., 2006). Anderson and Eshima (2013) test the interaction effect of firm age and EO on firm growth, finding empirical support that younger firms are better able to transform EO into firm growth than older firms. Another study by Lumpkin et al. (2006) reports mixed results. Although younger firms profit more from innovativeness and risk-taking than older firms, a higher level of proactiveness and competitive aggressiveness is associated with higher performance as firms age.
Although a younger firm age theoretically works in favour of the exploitation of EO for better business performance, opposing arguments can be put forward regarding the translation of EO into environmental performance. As older firms operate in an environment with decreasing market uncertainty and thus higher competitive intensity (Porter, 1980), the need to differentiate from competitors increases, which can be achieved, for example, by concentrating on environmental benefits. In addition, older firms face fewer resource restrictions than younger firms and are built on more established structures, processes and routines. These organisational conditions could work in favour of older firms as the higher availability of slack resources allows a stronger focus on non-economic goals (Stevens et al., 2015). In turn, younger firms typically have few slack resources and thus cannot afford to pursue resource-intensive environmental strategies to the same extent (Aragón-Correa et al., 2008). Accordingly, environmental aspects might be secondary to business success in the early stages of firms. In turn, it can be assumed that this prioritisation changes as firm age and come to possess a more comfortable ‘resource cushion’ (Bourgeois, 1981).

Figure 1 Conceptual model
Overall, theoretical arguments and empirical findings on the moderating role of firm age on the EO – performance relationship are mixed. Focusing on younger firms’ advantages in terms of higher flexibility and more salient market knowledge, this paper assumes that younger firms are better positioned to transfer entrepreneurial opportunities into superior business performance. Accordingly, this paper proposes that a stronger effect of EO on business performance exists among younger firms than it does among older firms. Conversely, the effect of EO on environmental performance is assumed to be stronger in the context of older firms.

Hypothesis 4a Firm age negatively moderates the effect of EO on the business performance.

Hypothesis 4b Firm age positively moderates the effect of EO on the environmental performance.

The conceptual model used in this paper is summarised in Figure 1.

3 Methodology

3.1 Sample and data collection

Data on cleantech ventures were collected to test the hypotheses. Addresses were derived from the GreenTech Made in Germany 3.0 database. This database is published by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety and contains information on around 2,000 cleantech companies that are active in the areas of renewable energy, energy efficiency, waste management and recycling, sustainable water management, sustainable mobility and material efficiency (BMU, 2012). Additional addresses were collected from cleantech online directories. To be included in the database, firms had to be

1 not older than 12 years
2 independent, that is, not a corporate start-up or a subsidiary
3 involved in developing, commercialising, or manufacturing environmental technologies.

A total of 456 companies were identified that met these criteria. Founders were pre-contacted by phone, 221 of which agreed to participate in the study (48.5% response rate). Four weeks after the phone agreement, a follow-up email was sent to the founders who had not yet participated. A total of 150 founders filled out the standardised online questionnaire, which corresponds to a 32.9% response rate. The ventures in the sample have an average age of 7.4 years, 6.8 employees and an annual turnover of €0.9 million, which is comparable to other studies on young technology-based firms (Steffensen et al., 1999).

To examine the likelihood of non-response bias, early responses were compared to firms that responded after the follow-up email as recommended in the literature (Armstrong and Overton, 1977). A t-test was used to compare the two groups in terms of the mean responses for the variables EO, environmental mission, stakeholder influence, firm age, environmental performance, sales and firm size. The results show no significant
differences between early and later responses (Wilk’s lambda = 0.970, p > 0.50); therefore, non-response bias is a minor concern in this study.

3.2 Operationalisation of variables

A standardised online questionnaire was developed and pre-tested on five firms. Measurement scales were taken from the literature and adapted for this study. The items of the main variables are listed in the appendix.

Sales growth, which is a traditional measure in entrepreneurship research (Murphy et al., 1996), reflects the market acceptance and development of new firms (Walter et al., 2011) and was used as an indicator of business performance. Due to their small size, new ventures often do not have to disclose accounting data; thus, researchers often rely on subjective performance measurements (e.g., Chan et al., 2012; Menguc et al., 2010; Clemens, 2006). Although a significant positive correlation between subjective and objective criteria has been shown (Geringer and Herbert, 1991), a subjective measure still has a higher risk of potential bias. To reduce the risk of common method bias, the present study uses actual sales figures for the years 2010–2013 to measure sales growth. A total of 95 firms provided sales data for all four business periods. The logarithm of the averaged growth rates 2010–2013 was used to compensate for skewness.

Measuring environmental performance is difficult due to the complex and partly intangible nature of environmental issues (Banerjee, 2002). To date, no universally accepted measure of environmental performance exists. Particularly in new venture contexts, there is a clear lack of databases with unbiased third-party evaluations of firms’ environmental impacts and sustainability indicators (Tang and Tang, 2012). Accordingly, many studies have employed subjective indicators to measure environmental performance (e.g., Clemens, 2006; Pujari et al., 2003; Judge and Douglas, 1998; Tang and Tang, 2012). Among these indicators, the scale based on Kinder, Lydenberg, Domini and Company’s (KLD) environmental ratings is regarded as a valid measure for environmental performance and has been applied in numerous studies (see Delmas et al., 2013), mainly in the context of established firms (e.g., Walls et al., 2012) but also in entrepreneurship research (Tang and Tang, 2012). As the scale is applicable for use in multiple industries, it can be replicated in empirical studies in various contexts. Typically, the KLD rating refers to environmental strengths and concerns. Because the pilot study showed that cleantech ventures (by definition) barely have environmental weaknesses, this study focused on KLD environmental strengths, measured on a seven-point Likert scale, as an indicator of environmental performance and omitted items about environmental concerns due to low discriminatory power. This approach is consistent with Walls et al. (2012) who split environmental performance into environmental strengths and environmental concerns and show that they are two independent factors.

EO items capture the extent to which a venture acts in an innovative fashion, demonstrates a propensity to take risks and is proactive in terms of opportunity-seeking and forward-looking behaviour. The nine-item scale developed by Miller (1983) and validated by Covin and Slevin (1989) was adapted for this study by using a seven-point Likert scale, as applied in earlier research (e.g., Menguc et al., 2010). Environmental mission was operationalised with a single item in which founders were asked to select the relevance of environmental aspects in comparison to sales and profit goals (Hoff, 2012). The measure of stakeholder influence was adopted from Darnall et al. (2010) and
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consisted of six items to capture the extent to which customers, suppliers, employees, environmental groups, industry or trade organisations and investors can exert power over a firm’s environmental activities. Firm age was measured as the number of years since the venture was founded.

Finally, differences in competition, regulation and maturity of technology typically exist within industries and may affect performance (Walter et al., 2006). To control for industry effects, technological uncertainty, technological dynamism, competitive intensity and a dummy variable on a firm’s type of business (service versus manufacturing sector) were entered as control variables in the statistical analyses. One item on technological uncertainty was used to control for the start-ups’ ability to accurately predict the future in terms of technology commercialisation (Lynn and Akgun, 1998). Technological dynamism was operationalised using three items that captured the perceived speed and magnitude of change in technology within the industry. This variable draws on Jaworski and Kohli (1993) and has been similarly used by Atuahene-Gima and Murray (2007). For competitive intensity, a three-item measure also adapted from Jaworski and Kohli (1993) and previously employed by Chan et al. (2012) was used.

3.3 Common method bias and multicollinearity

Due to the difficulty in collecting data on cleantech ventures, self-reported survey data was primarily used. Several measures were employed to reduce the risk of common method bias. First, objective data was used to measure performance as much as possible. In this respect, actual sales data for four business periods each were used as business performance indicators. Because the firms’ founders provided information on actual sales, these data were compared with secondary sales data from the Creditreform and the Bureau van Dijk’s Dafne databases. Correlations between the primary and secondary data were very high ($r = 0.91–0.99$ for the respective years, $p < 0.001$) and showed a low risk of common method bias.

To validate the environmental performance variable, the existence of environmental awards (measured by one item whether the venture had received an award for positively contributing to environmental problems or not) served as an objective indicator as used by Klassen and McLaughlin (1996). Bivariate correlation among these variables was significantly positive but weak ($r = 0.18$, $p < 0.05$). A possible explanation for the low correlation is that environmental awards refer to a single discrete event and thus do not fully reflect that environmental gains are the result of a longer period (Klassen and McLaughlin, 1996). However, a stronger correlation would have been desirable; thus, common method bias in this case cannot be fully excluded.

Harman single factor analysis was conducted by entering all items into one exploratory factor analysis. Principal component analysis with varimax rotation showed that the first factor only accounted for 11.6% of the total variance, that is, no single factor accounted for the majority of the covariance of the measures; thus, the one-factor model can be rejected. Overall, common method bias is only a minor concern in this study.

Regarding multicollinearity, correlations greater than 0.80, variance inflations factors (VIFs) greater than ten and condition indices (CIs) greater than 30 indicate serious multicollinearity. The regression analyses described in the next section reveal VIFs less than 1.6 and CIs less than 4.7 in all of the analyses conducted. These values together with the relatively low correlation coefficients as reported in Table 1 indicate that multicollinearity is unlikely to be an issue.
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<td></td>
</tr>
<tr>
<td>Environmental performance</td>
<td>0.10</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>EO</td>
<td>0.39**</td>
<td>0.32**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental mission</td>
<td>0.13</td>
<td>0.27**</td>
<td>–0.00</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stakeholder influence</td>
<td>–0.01</td>
<td>0.36**</td>
<td>0.27**</td>
<td>0.25**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firm age</td>
<td>–0.35**</td>
<td>–0.02</td>
<td>–0.26**</td>
<td>0.01</td>
<td>–0.12</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competitive intensity</td>
<td>–0.28**</td>
<td>0.04</td>
<td>0.10</td>
<td>–0.18*</td>
<td>0.02</td>
<td>–0.07</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service sector (dummy)</td>
<td>–0.24*</td>
<td>–0.18*</td>
<td>–0.41**</td>
<td>0.03</td>
<td>–0.09</td>
<td>0.31**</td>
<td>–0.08</td>
<td>1.00</td>
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<tr>
<td>Technological dynamism</td>
<td>0.05</td>
<td>0.32**</td>
<td>0.38**</td>
<td>0.12</td>
<td>0.30**</td>
<td>–0.11</td>
<td>0.26**</td>
<td>–0.18*</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Technological uncertainty</td>
<td>–0.03</td>
<td>0.06</td>
<td>0.35**</td>
<td>–0.05</td>
<td>0.05</td>
<td>–0.07</td>
<td>0.09</td>
<td>–0.43**</td>
<td>0.27**</td>
<td>1.00</td>
</tr>
</tbody>
</table>

N 95 150 150 150 150 150 150 150 150 150
Mean 0.14 3.17 3.43 2.73 3.30 7.37 4.09 0.60 3.93 3.27
S.D. 0.25 1.11 1.30 0.62 1.30 2.90 1.51 0.49 1.47 2.03

Notes: **p < 0.01; *p < 0.05 (two-tailed correlations).
4 Empirical results

Moderated regression analyses were carried out to test the hypotheses on business performance (sales growth) and environmental performance. To reduce the risk of multicollinearity, all independent variables were mean-centred as recommended by Aiken and West (1991). Table 1 shows the means, standard deviations and correlations of the research variables.

The regression results on business performance are depicted in Table 2 (models 1–6). In model 1, the control and dummy variables were entered into the equation, showing a significant negative effect of firm age, competitive intensity and service sector on sales growth. The significant influence of the service sector is superimposed by the inclusion of additional variables in the regression equation, whereas a negative effect of stakeholder influence on business performance appears in all equations but model 1. In model 2, EO was included as the main independent variable. The results indicate a positive and significant effect of EO on business performance. The interaction terms are entered in models 3, 4 and 5. The moderator effects of environmental mission and stakeholder influence on the EO–business performance relationship are both negative but not significant; thus, Hypotheses 2a and 3a must be rejected. Hypothesis 4a is supported, as the results show that firm age significantly weakens the EO–business performance relationship.

The regression results on environmental performance are also depicted in Table 2 (models 7–12). Regarding the control variables, firm age, environmental mission, stakeholder influence and technological dynamism significantly increase environmental performance. Significant negative effects exist with respect to technological uncertainty and the service sector dummy. Regarding the hypothesised positive effect of EO on environmental performance, Hypothesis 1 is supported. Regarding the moderator variables, the results also support Hypotheses 2b and 3b: high levels of environmental mission and stakeholder influence strengthen the effect of EO on environmental performance. However, the interaction of firm age and EO on environmental performance is not significant; thus, hypothesis 4b must be rejected.

The significant interaction terms were plotted as proposed by Aiken and West (1991). The first plot in Figure 2 illustrates that younger firms are better able to transfer the benefits of EO into superior business performance (b = 0.12, p < 0.01). In the context of older firms, the business performance effect of EO does not significantly change (b = −0.00, n.s.). The findings indicate that EO is particularly important for younger firms with regard to superior business performance. In comparison, EO has less leverage in older firms, which could be explained by a shifting emphasis ‘to stabilising the product configurations or behaviour patterns that contributed to early successes’ [Lumpkin et al., (2006), p.6]. In contrast, early-stage ventures have a stronger need for innovativeness, proactiveness and risk-taking behaviour and thus significantly profit from a high entrepreneurial posture.
<table>
<thead>
<tr>
<th>Control variables</th>
<th>Business performance (n = 93)</th>
<th>Environmental performance (n = 150)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
</tr>
<tr>
<td>Constant</td>
<td>0.226**</td>
<td>0.191**</td>
</tr>
<tr>
<td>(0.046)</td>
<td>(0.045)</td>
<td>(0.046)</td>
</tr>
<tr>
<td>Firm age</td>
<td>-0.031**</td>
<td>-0.024**</td>
</tr>
<tr>
<td>(0.010)</td>
<td>(0.010)</td>
<td>(0.010)</td>
</tr>
<tr>
<td>Environmental mission</td>
<td>0.027</td>
<td>0.039</td>
</tr>
<tr>
<td>(0.040)</td>
<td>(0.038)</td>
<td>(0.039)</td>
</tr>
<tr>
<td>Stakeholder influence</td>
<td>-0.014</td>
<td>-0.026†</td>
</tr>
<tr>
<td>(0.018)</td>
<td>(0.018)</td>
<td>(0.018)</td>
</tr>
<tr>
<td>Competitive intensity</td>
<td>-0.059**</td>
<td>-0.052**</td>
</tr>
<tr>
<td>(0.017)</td>
<td>(0.016)</td>
<td>(0.016)</td>
</tr>
<tr>
<td>Service sector (dummy)</td>
<td>-0.122*</td>
<td>-0.072</td>
</tr>
<tr>
<td>(0.057)</td>
<td>(0.057)</td>
<td>(0.058)</td>
</tr>
<tr>
<td>Technological dynamism</td>
<td>0.022</td>
<td>0.007</td>
</tr>
<tr>
<td>(0.017)</td>
<td>(0.017)</td>
<td>(0.017)</td>
</tr>
<tr>
<td>Technological uncertainty</td>
<td>-0.013</td>
<td>-0.014</td>
</tr>
<tr>
<td>(0.014)</td>
<td>(0.013)</td>
<td>(0.013)</td>
</tr>
<tr>
<td>Main effects</td>
<td>0.061**</td>
<td>0.061**</td>
</tr>
<tr>
<td>(0.020)</td>
<td>(0.020)</td>
<td>(0.020)</td>
</tr>
<tr>
<td>Interaction effects</td>
<td>-0.005</td>
<td>-0.035</td>
</tr>
<tr>
<td>(0.028)</td>
<td>(0.029)</td>
<td>(0.029)</td>
</tr>
<tr>
<td>EO × environmental mission</td>
<td>-0.004</td>
<td>0.001</td>
</tr>
<tr>
<td>(0.012)</td>
<td>(0.012)</td>
<td>(0.012)</td>
</tr>
<tr>
<td>EO × stakeholder influence</td>
<td>-0.023**</td>
<td>-0.026**</td>
</tr>
<tr>
<td>(0.007)</td>
<td>(0.007)</td>
<td>(0.007)</td>
</tr>
</tbody>
</table>

R² | 0.278 | 0.287 | 0.278 | 0.278 | 0.297 | 0.297 |
R² adjusted | 0.220 | 0.286 | 0.278 | 0.279 | 0.364 | 0.361 |
Δ R² | 0.278** | 0.069** | 0.000 | 0.001 | 0.078** | 0.088** |
F-value | 4.783** | 5.714** | 5.025** | 5.038** | 6.980** | 5.286** |

Notes: Regression coefficients are unstandardised. Standard errors are in parentheses. **p ≤ 0.01; *p ≤ 0.05; †p ≤ 0.10 (one-tailed test of coefficients); VIFs < 1.6, CI < 4.7.
Figure 2  Plots of significant interaction effects on the EO – performance relationship
The second plot shown in Table 2 illustrates that a strong environmental mission in combination with a strong EO leads to superior environmental performance ($b = 0.289$, $p < 0.01$). The slope in the context of a low environmental mission does not significantly change in low versus high EO conditions ($b = 0.104$, n.s.). Similarly, the plot at the bottom of Table 3 shows a significant moderator effect in the context of strong stakeholder influence and a high level of EO ($b = 0.279$, $p < 0.01$). The effect is not significant under the condition of weak stakeholder influence ($b = 0.114$, n.s.). These results indicate that environmental performance can be significantly increased if high levels of entrepreneurial behaviour and environmental mission and/or stakeholder influence exist within new ventures. However, the benefits of EO for environmental performance are not significantly weakened in the context of low environmental mission orientation or low stakeholder influence.

5 Discussions and conclusions

5.1 Key findings and implications

The central purpose of this study was to shed light on the role of EO in sustainable business contexts and to identify the effect of selected moderators on the EO–performance relationship. Survey data from 150 cleantech ventures provides evidence of an overall positive effect of EO on environmental performance. As this relationship has been a matter of debate in the entrepreneurship literature (e.g., Lumpkin et al., 2013; Morris et al., 2011), the present findings shed light on diverging theoretical arguments and scarce empirical evidence regarding the impact of entrepreneurial behaviour in sustainable business contexts. Keeping in mind the specific situation of cleantech ventures regarding their dual identities, it was enlightening to find that an entrepreneurial posture exhibits a positive influence beyond the traditional business performance perspective.

Overall, the study indicates that the context in terms of environmental mission, stakeholder influence and firm age exerts significant influences on the strength of the EO–performance relationship. While a strong environmental mission and strong stakeholder influence increase the influence of EO on environmental performance, firm age is irrelevant for the relationship between EO and environmental performance. Regarding business performance, firm age significantly alters the effect of EO. In this sense, younger firms are more likely to translate the benefits of EO into superior business performance, which can be explained by their greater flexibility, adaptability and possession of more salient market knowledge compared to older firms.

This study shows that EO is crucial for the performance of sustainable ventures – both from a financial and from an ecological perspective. Thus, EO is a meaningful factor that is to be accounted for in future research on sustainable entrepreneurship. The results add empirical evidence to previous arguments on the relevance of entrepreneurship in increasing sustainability (e.g., Schaltegger and Wagner, 2011; Cohen and Winn, 2007; Hockerts and Wuestenhagen, 2010). They also provide insights on the tensions inherent in sustainable firms (e.g., Moss et al., 2011; Doherty et al., 2014) by indicating that EO and sustainability are not contradictory but integral in realising superior performance. This has important implications for education, such as by including entrepreneurship in the
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curricula of sustainable management studies. Likewise, teaching sustainability principles
to business and entrepreneurship students would be beneficial to spawn entrepreneurs and
managers with integrated entrepreneurial and sustainability-oriented mind-sets.

The paper also extends empirical research on cleantech ventures (e.g., Meek et al.,
2010, Veugelers, 2012; Hoppmann et al., 2013; Meyskens and Carsrud, 2013; Doganova
and Karnøe, 2015; Hansen, 2014; del Río González, 2005; Marra et al., 2015). Cleantech
ventures play a decisive role for the development, commercialisation and diffusion of
environmentally friendly innovations. However, those firms have to overcome specific
challenges that stem from technological and market uncertainties inherent in
environmental technologies. Thus, identifying the factors that leverage the performance of
these firms is fundamental for fostering the transition towards a green economy. As
previous research has mostly focused on external factors, this study provides insights on
key antecedents of cleantech venture performance on a firm-specific level as
recommended by Bjornali and Ellingsen (2014). Overall, there is growing demand for
further research in this area, especially given the increasing trend towards sustainability.
Future research could investigate the impact of further organisational factors, such as
market orientation and organisational learning, in order to gain more reliable information
about factors that increase cleantech performance and thus ensure the continued growth of
the cleantech industry.

Finally, the study adds to EO research, particularly regarding the influence of
contingent factors (Rauch et al., 2009; Saeed et al., 2014; Wales et al., 2013). The results
support that environmental mission, stakeholder influence and firm age are meaningful
moderators. However, the relevance of these moderators significantly differs depending on
the outcome variable in question. This calls for more research that investigates contingent
factors on EO for various outcome measures. Thus, it is recommended that future research
replicates the study by additionally focussing on alternative financial performance
measures, such as profit, and alternative sustainability-oriented outcomes, such as social
performance.

5.2 Implications for practice

The findings have several implications for founding and managing cleantech ventures. The
superior role of EO asks for special attention from venture founders, managers, investors
and policy makers in leveraging this strategic orientation. A firm’s EO should be increased
and maintained at a high level as this directly supports venture growth and positively
contributes to realising environmental gains. Entrepreneurially oriented ventures clearly
outperform their peers in term of growth as well as environmental advances.

Cleantech founders and managers are advised to think and act in an entrepreneurial
manner, that is, to proactively pursue and exploit innovative ideas and take well-calculated
risks. Furthermore, suggestions for policy makers and governmental institutions can be
deduced with regard to support for cleantech ventures and starting points for the
development of core competencies of (future) sustainable entrepreneurs. Supporting public
and private organisations should focus on the implementation of an entrepreneurial mind-
set and offer specific education, training and consulting accordingly. Policy makers can
provide incentives for cleantech ventures to engage in such training programmes as an
increased level of EO contributes to a stronger economy in terms of decreased failure risk of cleantech firms and positive societal effects. Such incentives and support programmes should particularly be installed for nascent firms, as results show that the leverage of EO in business performance is higher in younger firms.

Concerning environmental performance, this study shows that a significant leverage on environmental performance can be achieved by the combination of high EO and high environmental mission as well as by high EO and high stakeholder influence. Accordingly, investors and policy makers are advised to focus on these factors, for example with regard to the selection of founders in the allocation of capital and grants. Furthermore, those findings indicate that stakeholders, such as lobbyists and the government, can support the transition towards a green economy by purposefully increasing their pressure on cleantech firms.

5.3 Limitations and outlook

The results of the present research are subject to some limitations that are worth noting. First, data from multiple respondents would have been desirable to decrease common method bias. As founder teams are usually small (the average team size in this study is 1.9 with 44.8% of the ventures started by only one founder), it was difficult to get sufficient data from multiple key informants. Objective data on sales growth and triangulation with secondary data sources were used to minimise the risk of common method bias. For environmental performance, environmental awards were used to validate the subjective performance measure. As positive but only weak correlations existed among awards and environmental performance, future studies are encouraged to use additional indicators of environmental performance and/or to use data from multiple key respondents.

Some studies have found that environmental performance significantly increases business performance (e.g., Clemens, 2006; Russo and Fouts, 1997). This study found only a weak connection in terms of bivariate correlations between environmental performance and sales growth ($r = 0.10$, n.s.). A test for mediation as proposed by Preacher and Hayes (2004, 2008) found no support for a significant mediator relationship among EO, environmental performance and business performance. Future studies with larger sample sizes might give further insights on this aspect.

Finally, the data were derived from a cross-sectional study in one country. As the present study was carried out in Germany, replication and extension of the research in other countries is recommended in order to analyse the role of possible context factors, such as national culture and economic and political systems. It would also be helpful if researchers obtain and use longitudinal data sets to test for potential changes over time.

Beyond these limitations, this study makes important contributions by showing the significant contingent role of environmental mission, stakeholder influence and firm age in EO research and considering both business and environmental outcomes in order to evaluate the effect of EO in a sustainable entrepreneurship context. Future researchers are encouraged to continue testing for additional moderators on the EO – performance relationship, particularly for non-business indicators such as social and environmental performance.
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References


Galbraith, J.A. (1973) Designing Complex Organizations, Reading, Addison-Wesley, Mass..


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Appendix

Measurement scales

**Dependent variables**

<table>
<thead>
<tr>
<th>Sales growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>$= \log \left( \frac{(\text{sales 2011} / \text{sales 2010} + \text{sales 2012} / \text{sales 2011} + \text{sales 2013} / \text{sales 2012})}{3} \right)$</td>
</tr>
</tbody>
</table>

Environmental performance [adopted from Tang and Tang (2012) and Walls et al. (2012)]

*Please indicate the extent to which you agree with the following statements regarding the environmental activities of your company (1 = strongly disagree, 7 = strongly agree).*

1. Our company derives substantial revenue from remediation products, environmental services, or energy-efficient products, or it has developed innovative products/services with environmental benefits.
2. Our company has setup strong pollution prevention programs (including activities to reduce emissions and toxic use).
3. Our company either is a substantial user of recycled materials in its manufacturing processes or is a major factor in the recycling industry.
4. Our company has taken significant measures to reduce its impact on climate change and air pollution through use of renewable energy and clean fuels or through energy efficiency.
5. Our company is a signatory of accredited environmental protection principles, publishes a notably substantive environmental report, or has effective internal communications systems in place for environmental best practices.
6. Our company maintains its property, plant and equipment with above-average environmental performance for its industry.
7. Our company has demonstrated a superior commitment to management systems through DIN EN ISO 14001 certification or other environmental management standards.

*The average score of the seven items was used as the overall measure of environmental performance.*

**Independent variables**

EO [adopted from Miller (1983), Covin and Slevin (1989) Menguc et al. (2010)]

*Please indicate the extent to which you agree with the following statements regarding your company’s attitudes and behaviours (1 = strongly disagree, 7 = strongly agree).*

1. Our company has a strong emphasis on R&D, technological leadership and innovations.
2. Our company has marketed many new products/services within the last three years.
3. Changes in our products/services have usually been quite dramatic.
4. Our company typically initiates actions to which competitors then respond.
5. Our company is often the first business to introduce new products/services, administrative techniques, or operating technologies.
6. Our company typically adopts a very competitive, aggressive posture toward competitors.
7. In general, the senior managers of our company have a strong proclivity for high-risk projects (with chances of very high returns).
In general, the senior managers of our company believe that owing to the nature of the environment, bold, wide-ranging acts are necessary to achieve the company’s objectives.

When confronted with decision-making situations involving uncertainty, our company typically adopts a bold, aggressive posture in order to maximise the exploitation of potential opportunities.

The average score of the nine items was used as the overall measure of EO.

Environmental mission [adopted from Hoff (2012)]

Please indicate which relevance your company places on environmental aspects. (single selection item)

4 = Environmental aspects are more relevant than sales and profit goals.
3 = Environmental aspects are equally relevant as sales and profit goals.
2 = Environmental aspects are less relevant.
1 = Environmental aspects are not relevant at all.

Stakeholder influence [adopted from Darnall et al. (2010)]

Please indicate the extent to which you evaluate the influence of the following stakeholder groups on your companies’ environmental activities (1 = no influence, 7 = strong influence).

1 Customers
2 Suppliers
3 Employees
4 Environmental groups
5 Industry or trade organisations
6 Investors

The average score of the six items was used as the overall measure of stakeholder influence.

Firm age

Please indicate the number of years since your firm was founded.