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A taxonomy of ecopreneurship in small manufacturing firms: A multidimensional cluster analysis

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Abstract

This study presents a multidimensional taxonomy of "ecopreneurship" for small manufacturing firms. Based on a cluster analysis of 312 Swedish firms, four distinct clusters are identified: pioneers, green dumpers, overlookers, and recyclers. These clusters are compared regarding their level of entrepreneurial orientation and firm performance. Based on the results, and because of the resource constraints associated with small firms, managers of such companies are advised to examine the economic consequences of specific environmental business practices and to adopt a less aggregated approach to ecopreneurship. This study illustrates the usefulness of a multidimensional scale when researching environmental behaviors and is a response to the lack of an empirically based classification of ecopreneurship configurations.

KEYWORDS

cluster analysis, ecopreneurship, performance, small manufacturing firms, taxonomy

1 | INTRODUCTION

Owing to societal trends, ecological and environmental awareness, and pressures from consumers and customers, sustainability has emerged as an increasingly important issue for small firms (Andersén, Jansson, & Ljungkvist, 2020; Halme & Korpela, 2014; Kuckertz & Wagner, 2010; Shepherd & Patzelt, 2011). This suggests an emphasis on the sustainability of small firms' environmental practices (e.g., in production, product development, and waste management) as well as supply chains (Zhu, Sarkis, & Lai, 2008).

Shepherd and Patzelt (2011, p. 142) defined sustainable entrepreneurship as "the preservation of nature, life support, and community in the pursuit of perceived opportunities to bring into existence future products, processes, and services for gain, where gain is broadly construed to include economic and non-economic gains to individuals, the economy, and society." The concept of sustainable entrepreneurship integrates social and environmental aspects (Cohen, Smith, & Mitchell, 2008; Cohen & Winn, 2007; Kuckertz & Wagner, 2010; Larson, 2000). To explain and categorize the multifaceted concept of sustainable entrepreneurship, several typologies and taxonomies have been developed. Such classifications are important because they provide an overview of how entrepreneurship and various environmental practices are actually manifested in firms and various firm classifications; for example, the Miles and Snow (1978) typology has had a great impact on various areas of business and management research and practice. However, most classifications of environmental sustainability are dominated by a unidimensional approach, that is, that companies are classified based on their overall focus on environmental issues at an aggregated level (e.g., Klewitz & Hansen, 2014; Paulraj, 2009; Roome, 1992; Runhaar, Tigchelaar, & Vermeulen, 2008; Walker, Ni, & Dyck, 2015).

To deepen our understanding of the specific relationship between environmental entrepreneurship and economic performance, the "ecopreneurial" perspective is appropriate (Jolink & Niesten, 2015). The concept of ecopreneurship can be regarded as a subcategory of sustainable entrepreneurship that concentrates on ecological and economical sustainability, meaning that the core motivation for ecopreneurs is "to earn money through contributing to solving

environmental problems" (Schaltegger & Wagner, 2011, p. 223). In this study, we define ecopreneurs as "profit oriented and environmentally concerned at the same time" (Jolink & Niesten, 2015, p. 388). Several typologies of ecopreneurship, or related concepts, have been developed, though most of them are based on one (e.g., Pastakia, 1998; Schick, Marxen, & Freimann, 2002) or two dimensions (e.g., Abdelkafi & Hansen, 2018; Linnanen, 2002; Schaltegger, 2002; Walley & Taylor, 2002). The main criticism of ecopreneurship typologies is that they often overlap and that almost all are based on case studies, making them speculative and empirically vague (Gibbs, 2009; Kearins & Collins, 2012). There is clearly a need to develop quantitatively derived taxonomies (Galkina & Hultman, 2016; Santini, 2017).

To address the lack of empirical, multidimensional typologies, the purpose of this study is to develop a contemporary multidimensional taxonomy of ecopreneurship for small manufacturing firms, leading to the following research question: What characterizes clusters of small manufacturing companies from an ecopreneurial perspective? Moreover, as the positive relationship between small business, economic growth, and employment has been verified and highlighted in numerous studies (Gibb & Li, 2003; Tether & Storey, 1998), studying the present group of businesses is justified from an ecopreneurial perspective (Galkina & Hultman, 2016; Isaak, 2002; Jolink & Niesten, 2015; Schaltegger & Wagner, 2011), examining the relationships between environmental variables, entrepreneurial behavior, and economic variables such as growth and profitability. For example, small firms, that is, with 10–49 employees and turnovers below EUR 10 million (the European Union definition), employ more than 22% of private-sector workers in Sweden (Statistics Sweden, 2019). Furthermore, the need to research the entrepreneurial mechanism in the interest of sustaining the environment while delivering economic improvement (Shepherd & Patzelt, 2011) has been stated in recent calls (Andersén et al., 2020; Hall, Daneke, & Lenox, 2010).

2 | FRAME OF REFERENCE

2.1 | Ecopreneurship

The concept of ecopreneurship emphasizes environmentally friendly operations and is closely related to that of sustainable entrepreneurship. As the umbrella concept of sustainable entrepreneurship has "the potential to not only generate entrepreneurial rents, but also to simultaneously reduce the market imperfection, move markets towards equilibrium and improve global environmental conditions" (Cohen & Winn, 2007, p. 31), it encompasses the concept of ecopreneurship. However, several differences exist. An ecopreneur's core business does not necessarily focus exclusively on sustainability performance but often stresses goals such as gaining new market shares and increased growth (Schaltegger & Wagner, 2011). Moreover, the concept differs from that of sustainable entrepreneurship in that it does not cover nonprofit organizations, communities, and social issues as distinct from environmental ones (Cohen, 2006; Jolink & Niesten, 2015; Shepherd & Patzelt, 2011).

When environmental issues intersect with a company's financial interests, "eco-efficiency" value creation can arise as an outcome of enviro-economic objectives (Dyllick & Hockerts, 2002). In this manner, the reduction of environmental problems as well as financial returns is central to the ecopreneurs' value creation process (Cohen et al., 2008; Pastakia, 1998), meaning that economic goals appear as both means and ends (Jolink & Niesten, 2015). By means of their local knowledge, ecopreneurs are characterized by their insights into and knowledge of environmental problems and practices, "enabl[ing] them to foresee a demand for fundamental innovations also in traditional markets" (Schaltegger & Wagner, 2011, p. 228). For example, by questioning outdated take–make–waste systems and an emphasis on short-term profits (Hawken, Lovins, & Lovins, 1999), new eco-oriented business opportunities and practices can arise (Cohen et al., 2008). On the other hand, the large short-term investment costs for sustainability can drive ecopreneurs away from their environmental practices (Pacheco, Dean, & Payne, 2010). However, "ecopreneurs contribute to the expansion of the green and sustainable economy and provide new solutions and practices that can be adopted by the industry" (Santini, 2017, p. 492), although they must constantly balance and prioritize between financial and environmental aims (O'Neill & Gibbs, 2016).

2.1.1 | Classifications of ecopreneurship

Although studies of ecopreneurial practices are limited (Jolink & Niesten, 2015), several relevant classifications and typologies have been developed. However, these have been criticized in several ways. First, a major criticism of the ecopreneurship classifications and typologies is their lack of empirical evidence (Fong, Wolfgramm, & Shepherd, 2014; Gibbs, 2009). The supporting research has been theoretical, meaning that further "empirical investigations on a larger scale would significantly improve this research field" (Santini, 2017, p. 492). These ecopreneurship classifications and typologies are heavily based on case studies, often with relatively few cases and using anecdotal reasoning (Galkina & Hultman, 2016; Gibbs, 2009; Kearins & Collins, 2012). For example, Isaak (2002) described two types of ecopreneurs by citing just a few brief examples, and Pastakia (1998) used six examples to identify two groups of ecopreneurs. Second, these ecopreneurship typologies tend to overlap, often being based on personal and structural dimensions with similar implications (Gibbs, 2009). For example, Schick et al.'s (2002) "eco-dedicated" type strongly overlaps with Walley and Taylor's (2002) "ethical maverick." Third, the ecopreneurial classifications also tend to focus on individuals, often described as charismatic or pioneering, and categorized according to certain types of behavior (O'Neill & Gibbs, 2016). This criticism highlights the necessity of a quantitatively derived taxonomy that focuses on the firm level.

2.1.2 | Firm size and ecopreneurship

How firm size influences environmental initiatives is the subject of academic debate (Hockerts & Wüstenhagen, 2010). Large firms generally have a wider resource base, allowing for more research and development (Kamien & Schwartz, 1982), indirectly supporting innovation and the development of ecopreneurship. Damanpour (1992) noted that this relationship is stronger in the manufacturing than the service sectors, as the latter tends to emphasize the implementation rather than the development of innovations. On the other hand, research frequently refers to small businesses as more flexible with less organizational inertia (Burgelman, 2002; Ljungkvist & Boers, 2016) and path dependency (Schreyögg & Kliesch-Eberl, 2007), providing opportunities for ecopreneurial initiatives (Thompson, Kiefer, & York, 2011). The relationship between firm size and ecopreneurship is also affected by the company's ability to absorb government policies, that is, the ability to understand and access tax-funded programs supporting the commercialization of sustainable innovations and development (Galkina & Hultman, 2016; Hockerts & Wüstenhagen, 2010). As small firms are more limited in their administrative functions, the risk of overlooking such nonmarket government-subsidized strategies for ecopreneurship is greater in these firms. Summing up, and as argued by, for example, Brammer et al. (2012), the literature gives no single answer, as when it comes to developing environmentally friendly management, small firms have both advantages (e.g., flexibility) and disadvantages (e.g., lack of ability and resources) that likely differ from those of large firms. This highlights the importance of examining how ecopreneurship is materialized in firms of specific sizes.

2.1.3 | The sustainability dimensions of ecopreneurship

In practice, environmental sustainability has several dimensions and concerns a number of practices within firms (Dean & McMullen, 2007; Schaltegger & Wagner, 2011). Zhu et al. (2008) comprehensively summarized various environmental practices, and based on their classification, in this paper, we will address green new product development (NPD), waste management, and green supply chain management (SCM). *Green NPD* is about considering environmental issues in terms of, for example, energy and material consumption when developing new products, whereas *waste management* concerns sales and investment-recovery strategies for used and excess material and components. *Green SCM* is about cooperation with customers and suppliers regarding environmental issues. Moreover, for manufacturing firms, production processes per se are of course an important environmental issue (Chen, Lai, & Wen, 2006), making green production processes a crucial dimension for environmentally friendly manufacturing firms (Ansari & Kant, 2017). *Green production* processes are characterized by manufacturing that, compared with that of competitors, produces fewer hazardous substances and that requires less energy and raw material (Chen et al., 2006).

As illustrated by the above summary of some key environmental practices, ecopreneurship is a highly multifaceted construct (Galkina & Hultman, 2016). However, larger firms can have problems with path dependency (Schreyögg & Kliesch-Eberl, 2007), for example, a highly specialized core competence without an environmental focus (Burgelman, 2002), that make the development of environmental practices unattractive. Yet smaller manufacturing firms have more limited resources and could face difficulties excelling in all environmental practices (Brammer et al., 2012).

Moreover, given that decision making regarding environmental practices in small- and medium-sized enterprises (SMEs) is heavily dependent on the chief executive officer's (CEO's) and the owners' personal values (Hemingway & Maclagan, 2004; Kirkwood & Walton, 2010), these companies are characterized by their relatively informal management and by significant differences between their environmental practices (Merritt, 1998). Moreover, most owners and managers of SMEs often regard themselves as moderately or highly environmentally oriented, which in turn generates improvements in environmental practices (McKeiver & Gadenne, 2005). Nevertheless, they have often difficulties estimating costs and long-term investments, meaning that SMEs often fail to see the economic advantages of environmental practices such as waste management, recycling, cleaner product development, and green supply management (Brammer et al., 2012; Williams & Schaefer, 2013). Besides, many of these companies have problems integrating environmental systems into the existing manufacturing system (Hillary, 2004) owing to limited resources in terms of time and skills (Ciliberti, Pontrandolfo, & Scozzi, 2008). However, Simpson et al. (2004) argued that SMEs can gain considerable competitive advantages by implementing environmental practices but that these companies are often unprepared to make such investments.

Another important sustainability issue for small firms is the support from the surrounding context. The so-called conformist path operates in a supportive social context, whereas the insurgent path works against an establishment characterized by lack of support for sustainability ideals (Muñoz & Dimov, 2015). However, as the latter can be motivated by strong sustainability intentions, among others, this path goes beyond the assumptions of ecopreneurship (Jolink & Niesten, 2015).

Although it could be possible to classify firms according to a unidimensional "environmental sustainability scale" encompassing all environmental practices, it is plausible that some firms might excel in certain practices while lagging in others. A unidimensional approach to ecopreneurship in small manufacturing firms could therefore oversimplify the actual conditions. This highlights the relevance of examining how firms actually address environmental issues in all four environmental management dimensions (i.e., green production, green NPD, green SCM, and waste management) of ecopreneurship. Clustering firms based on these dimensions could provide a more nuanced and accurate description of how firms actually address environmental issues, and a related taxonomy could provide an overview of common ways to handle environmental issues.

2.1.4 | The entrepreneurial dimension of ecopreneurship

As argued by, for example, Shepherd and Patzelt (2011), research on sustainability that "does not involve the recognition, evaluation and exploitation of opportunities" cannot be classified as sustainable entrepreneurship research (Muñoz & Cohen, 2018, p. 317). The core issue in the field of ecopreneurship is "how individuals recognize, exploit, and create economic growth while simultaneously creating environmental benefits" (Thompson et al., 2011, p. 222). A highly established operationalization of such entrepreneurial processes is the entrepreneurial orientation (EO) construct (Rauch, Wiklund, Lumpkin, & Frese, 2009; Saeed, Yousafzai, & Engelen, 2014) developed by Miller (1983) and Covin and Slevin (1989). EO concerns the overall strategic posture of a firm in terms of its entrepreneurial behavior and comprises three interrelated concepts: innovativeness, risk-taking, and proactiveness. Although some scholars advocate treating the three dimensions as separate variables (Kreiser, Marino, & Weaver, 2002; Lumpkin & Dess, 1996), most studies of EO have a unidimensional approach (Andersén, 2017; Rauch et al., 2009) and "empirically speaking, it is not wrong to employ the Miller/Covin and Slevin EO scale in its entirety" (Covin, Green, & Slevin, 2006, p. 81).

The EO dimension of *innovativeness* concerns the firm's inclination to develop new ideas and solutions, realizing new products and new market solutions (e.g., business models) (Lumpkin & Dess, 1996; Rauch et al., 2009). Innovativeness is therefore often categorized as comprising technological innovations (i.e., industrial product and process innovations) and product-market innovations (i.e., inventive organizational arrangements and product design development) (Lumpkin & Dess, 1996). The *risk-taking* dimension relates extensively to financial risk, which entails the failure of investments (Miller & Friesen, 1978), thereby relating to strategic risk. According to Baird and Thomas (1985), this kind of risk-taking can be classified into three ways: the first concerns investments in unknown markets, the second concerns the size of the investment relative to one's total assets, and the third concerns how much is borrowed. Lastly, the *proactiveness* dimension captures the propensity to identify and act upon opportunities (Zellweger & Sieger, 2012). Proactivity builds on forward thinking and emanates from the anticipation of future demands (Dess & Lumpkin, 2005). Proactivity nurtures and supports the idea of first-mover advantage when launching new products and market solutions (Lieberman & Montgomery, 1988). Yet to apply a first-mover strategy successfully, it is important to analyze what market trends are advantageous and sustainable (Choi & Shepherd, 2004) and not just react to volatile market fluctuations.

Mainstream EO studies measure entrepreneurial behavior at a specific time and have been criticized as snapshot based and static (Zellweger & Sieger, 2012). Another criticism stresses that EO research only measures outcomes, not the underlying processes, and does not provide a holistic understanding of EO (Randerson, 2016). Furthermore, Andersén et al. (2015) argued that EO is generally measured on the generic level, that is, the overall EO of the firm, ignoring fluctuations following the business model components of the firm. Nevertheless, the EO measurements do estimate behavioral practices, forming patterns over time, in turn forming the basis for the firm's strategic decision making (Rauch et al., 2009). Registered levels of EO can therefore foster insight into how and why business clusters form.

Furthermore, EO is also related to firm size (Eddleston, 2008; Ljungkvist, Boers, & Samuelsson, 2019; Miller & Le Breton-Miller, 2011; Wright, Hoskisson, Busenitz, & Dial, 2000). As a basis for EO, Eddleston (2008) and Ljungkvist and Boers (2016) have emphasized small firms' personal closeness to staff and their local contextual understanding, promoting opportunity recognition and proactivity. Ljungkvist et al. (2019) contextualized changes in EO and related them to growth in firm size. In small firms, EO is characterized by the founder's attributes, identity (Miller & Le Breton-Miller, 2011), and personal ideas, resulting in relatively high innovativeness and proactivity but limited risk-taking. However, when a firm is growing, EO is propelled by remote management control, efficiency, and control-based expansion, limiting innovativeness and risk-taking (Wright et al., 2000) but fostering fairly high proactivity (Ljungkvist et al., 2019).

3 | METHOD

3.1 | Sample

The collected data sample covers 312 small Swedish manufacturing firms with 10–50 employees each. Sweden is renowned for its emphasis of environmental issues (Lee, Herold, & Yu, 2016), and compared with other European SMEs, Swedish SMEs are more involved in corporate social responsibility activities (European Commission, 2002). Considering the increased global interest in environmental issues, Sweden and Swedish firms could provide a useful context and examples of environmental management and ecopreneurship. With the use of the Bisnode InfoTorg Företag database, all Swedish firms in the following manufacturing industries were identified and included: basic metals, chemicals and chemical products, fabricated metal products, machinery and equipment, nonmetallic mineral products, and manufacturers of rubber and plastic products. These industries were chosen for two reasons: (1) these industries contain sufficient numbers of small firms; and (2) firms in these industries are normally subsuppliers and are therefore vital parts of their industries' processing chains. Incongruent companies, for example, conglomerate subsidiaries or companies with recently closed operations, were removed from the sample. The online e-mail survey, which was sent to 2,188 firms, was followed up with two reminders. The response rate was 14.26%, generating 312 useable completed surveys. The sample characteristics are presented in Table 1.

Several actions were taken to ensure that the sample truly represents the population and to ensure the reliability of the measures. First, as suggested by Armstrong and Overton (1977), if the answers of early respondents are congruent with those of late respondents, this could indicate that the answers of responders and nonresponders are similar. We therefore compared the answers of respondents answering our first e-mail with those of respondents answering the

TABLE 1 Sample characteristics

	Number	Percentage
Respondent gender		
Women	21	7
Men	291	93
Total	312	100
Respondent age, years		
20–30	4	1
31–40	40	13
41–50	100	32
51–60	122	39
61–70	42	13
>70	4	1
Total	312	99
Firm age, years		
3–10	39	13
11–20	63	20
21–30	98	31
31–40	41	13
41–50	34	11
51–60	19	6
61–70	7	2
>70	11	4
Total	312	100
Number of employees		
10–19	160	51
20–29	70	22
30–39	48	15
40–49	34	11
Total	312	99
Industry		
Chemicals and chemical products	14	4
Rubber and plastic products	39	13
Other nonmetallic mineral products	24	8
Basic metal products	13	4
Fabricated metal products	152	49
Machinery and equipment	70	22
Total	312	100

remainders and found no significant differences. Second, EO has been examined in previous studies of Swedish SMEs, and the mean EO value of our sample is similar to that found in other studies of Swedish SMEs (Andersén, 2019; Wales, Patel, Parida, & Kreiser, 2013; Wiklund & Shepherd, 2005). Third, the distribution of answers between industries and key variables such as percentage of female CEOs in the industries, number of employees, and firm age corresponds well with the overall population as gauged from the public records of Statistics Sweden (i.e., the official Swedish statistical agency). Finally, complementary objective data for validation (i.e., return on asset [ROA]) were compiled from the Bisnode InfoTorg Företag database, which combines data from different Swedish official institutions, such as the Swedish Tax Agency and the Swedish Companies Registration Office. The accuracy of the subjective profitability measure was controlled by comparison with corresponding figures from the annual reports of 20 sampled companies, and all figures were strongly correlated.

All estimated data were collected using the survey. In this way, CEO assessments of environmental issues concerning new products, production, customers, suppliers, and waste were assembled. The respondents also answered validating questions about EO, allowing the companies' proactivity, innovation, and risk-taking (Lumpkin & Dess, 1996) to be estimated. To further validate the results, the CEOs were asked to estimate the companies' growth and profitability.

3.2 | Selection of cluster variables

A critical step in all cluster analyses is the selection of variables (Fiegenbaum & Thomas, 1995; Miller, 1996). As this study focuses on developing a multidimensional taxonomy of ecopreneurship for small manufacturing firms, several relevant environmental variables for the investigated population needed to be used. To achieve high theoretical congruence with the concept of ecopreneurship (Galkina & Hultman, 2016), which is especially important in cluster analysis (Ketchen & Shook, 1996), we used a modified scale relating to the variables developed by Zhu et al. (2008). This holistic scale covers the life-cycle management supply chain, extending from green purchasing to customer cooperation. However, Zhu et al. (2008) concentrated on larger corporations, and as illustrated in the questionnaire (see Appendix), some modifications were made to adapt the scale to better reflect the reality of small manufacturing firms. Specifically, we did not use the internal environmental management variable because it mainly captures practices, such as cross-functional cooperation and support from midlevel managers, which are rarely applicable to small firms. Moreover, we made some modifications of the green SCM variable. For example, in a Swedish context, eco-labeling is usually associated with consumer products or food, and small manufacturing firms rarely audit their customers' and suppliers' internal environmental systems.

3.3 | Measurement of cluster variables

As this study is concerned with ecopreneurship, environmental variables connected to new products, production, customers, suppliers, and waste were used in clustering the manufacturing firms. A 7-point Likert scale, with the extrema “not at all agree” and “agree completely,” was used to measure estimated environmental practices and behaviors. The full battery of survey questions is presented in the

Appendix. The main features of the respective environmental variables are as follows:

- Green NPD: When developing new products, avoiding pollution and reducing the consumption of materials and energy are emphasized. The Cronbach alpha for this variable was 0.89.
- Green SCM: Having a close relationship with the supply chain regarding environmental issues concerning materials, NPD, production, transport, packaging, and subcontractors is emphasized. The Cronbach alpha for this variable was 0.90.
- Green production: Recycling materials and components as well as avoiding or reducing pollution are emphasized. The Cronbach alpha for this variable was 0.90.
- Waste management: Sales of excess material and components as well as investments in recovery strategies (i.e., sales of replaced production equipment and lines) are emphasized. The Cronbach alpha for this variable was 0.87.

3.4 | Validating variables

A central part of cluster analysis is validation by variables other than those used to create the clusters, allowing differences between these clusters to be analyzed (Andersén, 2012; Khelil, 2016). For this reason, *three* different validating variables were used. First, as ecopreneurship has a strategic as well as an entrepreneurial posture, it is naturally related to the concept of EO (Rauch et al., 2009). To deepen our understanding of the relationship between strategy, EO, and environmental management, the variables innovativeness, risk-taking, and proactiveness were used to reveal differences between the clusters. A 7-point Likert scale was used to measure EO. Innovativeness was measured by asking about the frequency of NPD and the focus on NPD and innovation. Questions concerning preferences for risky projects, aggressive market actions, and bold decision making were used to measure risk-taking, and proactivity was evaluated by questions about tendencies to react to competitors' moves, introduce new products, and avoid conflict. The complete questionnaire regarding EO builds on Covin and Slevin's (1989) scale and is shown in the Appendix. The Cronbach alpha value for the aggregated EO measure was 0.825.

As growth and profitability have implications for EO as well as environmental practices, these variables were used to further validate the clusters. By using the scale developed by Ingram et al. (2017), the performance measures for firm growth (regarding sales and market shares) and profitability were measured using a 7-point Likert scale. The survey questions for these two variables are shown in the Appendix. The Cronbach alpha was 0.925 for firm growth and 0.970 for profitability.

3.5 | Cluster analysis

As this study builds on continuous quantitative variables (i.e., environmental variables), which are combined with mixed types of validating variables (i.e., EO, firm growth, and profitability), the two-step cluster analysis method is used (Bacher, Wenzig, & Vogler, 2004; Martín-Ruiz & Rondán-Cataluña, 2008). The two methodological steps clarify the difference between the clustering and the statistical calculations added by the validating variables, deepening our understanding of the cluster characteristics. Moreover, this cluster analysis automatically determines the number of clusters with high accuracy (Bacher et al., 2004).

4 | RESULTS

Descriptive statistics and bivariate correlations of the variables are presented in Table 2.

By applying two-step cluster analysis, four distinct clusters regarding environmental practices were identified, providing a more nuanced and accurate description of the green practices of small manufacturing companies. Moreover, the cluster quality threshold for coherence and separation was significantly passed, and the size ratio between the largest and smallest clusters was 2.22, validating the comparability (Cherng & Lo, 2001).

4.1 | Cluster characteristics

Confirmed by analysis of variance (ANOVA), the four identified clusters displayed significant differences; that is, $p < 0.001$, and the

TABLE 2 Descriptive statistics, reliability measures, and correlation statistics

				Correlation statistics					
Variable	Mean	Standard deviation	Cronbach's alpha	1	2	3	4	5	6
1. Green new product development	4.99	1.55	0.89						
2. Green supply chain management	3.73	1.29	0.93	0.64**					
3. Green production	5.27	1.32	0.90	0.72**	0.55**				
4. Waste management	4.70	1.67	0.87	0.38**	0.23**	0.44**			
5. Entrepreneurial orientation	4.22	0.95	0.83	0.21**	0.21**	0.12*	0.08		
6. Growth	4.82	1.21	0.93	0.19**	0.22**	0.28**	0.03	0.30**	
7. Profitability	4.66	1.44	0.95	0.13**	0.12*	0.22**	.04	0.14*	0.63**

*$p < 0.05$. **$p < 0.01$.

F values extended from 103.45 to 205.09. Moreover, according to the 7-point Likert scale, most of the companies reported high values for environmental practices, especially among two of four clusters (more than 160 companies). Figure 1 presents the four identified clusters and the number of companies in each. Furthermore, to clarify the cluster differences, each cluster variable is compared with the centroid, representing the mean value of all four clusters. A description of the characteristics of each cluster follows.

- *Pioneers* (*n* = 111). This cluster has the most members. Concerning the variables for environmental practices and behaviors, these firms were reportedly considerably above average in all four areas. The waste management variable is the most significant, indicating high performance in sales of excess material, recycling, and sales of replaced production equipment. Overall, these companies clearly emphasize environmentally supportive behaviors.
- *Green dumpers* (*n* = 50). Regarding environmental issues concerning green NPD, green production, and green SCM, these companies perform well, indicating support as well as capacity for environmentally friendly management. However, their environmental practices regarding waste management are significantly below average. Considering that their green production performance is average, their component recycling and pollution reduction are in line with those of comparable manufacturing firms. This indicates that this group of companies consciously emphasizes sales of excess materials and components as well as investment-recovery strategies considerably less than do the other clusters of small manufacturing firms.
- *Recyclers* (*n* = 93). The environmental practices of this group are characterized by their wide range. This group stresses waste management, that is, sales and recycling of used material and components. However, their environmental performance concerning the development of new products (green NPD) and especially green SCM is below average. Their relationships with suppliers and customers do not emphasize common environmental considerations about choice of material, NPD, transportation, packaging, and so forth. However, their green production performance is slightly above average, indicating that this cluster performs in line with comparable manufacturing companies in recycling components and avoiding pollution.
- *Overlookers* (*n* = 58). This group of companies was significantly below average in all measured environmental aspects, especially green NPD and green production processes. This means that related pollution, material consumption, and recycling were, from an environmental perspective, largely disregarded. Regarding waste management, these firms performed just slightly below average.

4.2 | Cluster validation

A crucial step in the cluster analysis is the validation of variables other than those used as a basis for the environmental clustering. This allows a deeper and more nuanced understanding of the environment cluster structure to be reached by relating it to entrepreneurship and its basic incentives in terms of growth and profitability. The ANOVA test of the validating variables is summarized in Table 3. As shown, all three variables are at or below the significance level of 0.01.

Regarding the entrepreneurship measure EO, there are consistent and significant differences between the groups. This means that the pioneers had the highest EO value (4.42), representing proactivity, innovation, and risk-taking; the clusters then followed one another in declining order, with the overlookers having the lowest EO value (3.94). On a unidimensional scale of ecopreneurship, considering just environmental practices and EO, the pioneers appear as the positive extreme point (as an archetype for ecopreneurship), whereas the

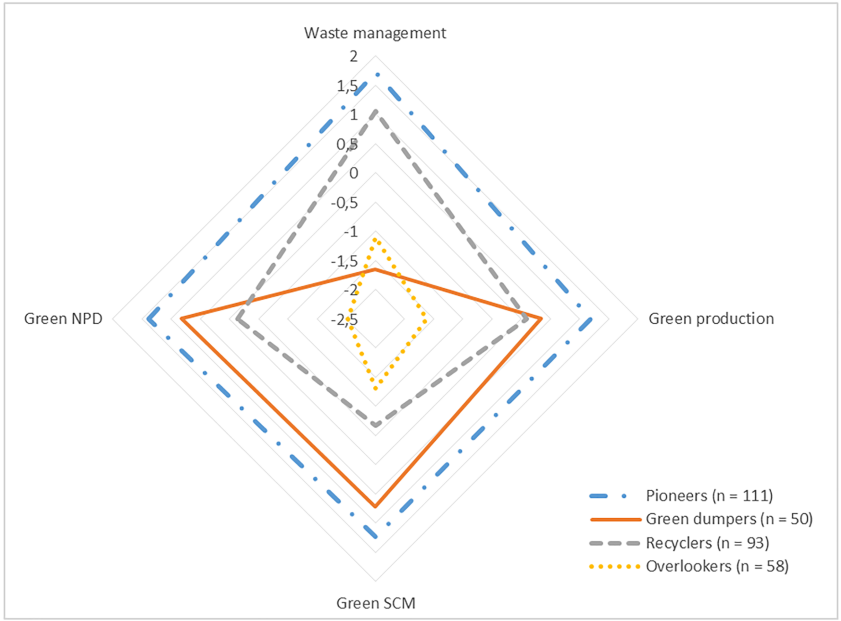

FIGURE 1 Cluster characteristics regarding environmental practices [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE 3 Validating variables

	EO	Growth	Profitability
Pioneers	4.42	5.05	4.76
Green dumpers	4.27	5.13	4.96
Recyclers	4.12	4.69	4.62
Overlookers	3.94	4.30	4.03
F value	3.800	6.735	5.102
Significance	0.011	0.000	0.002

Abbreviation: EO, entrepreneurial orientation.

overlookers correspond to the negative extreme point. Between these, the green dumpers and the recyclers are positioned with EO values of 4.27 and 4.12, respectively, providing additional support for the notion of examining ecopreneurship from a multidimensional approach.

Concerning the performance measures, the green dumper cluster stands out. This cluster had the highest growth and profitability, clearly differentiating it from the other clusters, while having the second highest EO values. Furthermore, after the green dumpers, the growth and profitability values declined from the pioneers (the highest value) to the overlookers (the lowest value).

5 | DISCUSSION

In response to recent calls for more detailed empirical classifications of ecopreneurship (O'Neill & Gibbs, 2016; Santini, 2017), the present taxonomy offers a more nuanced understanding of the environmental practices of small manufacturing companies. Our multidimensional cluster analysis reveals specific cluster profiles regarding environmental practices, EO, and economic performance, illustrating the heterogeneity of these practices and demonstrating the managerial benefits of applying a less aggregated approach.

Regarding the ecopreneurship cluster analysis, four distinct clusters could be identified among the small manufacturing firms. Besides the waste variable, each cluster's environmental (Chen et al., 2006; Zhu et al., 2008) and EO (Lumpkin & Dess, 1996) variables follow one another in declining order, with the pioneers at the top (the highest values) and the overlookers at the bottom (the lowest values). Moreover, as most of the investigated companies had high estimated values regarding both environmental practices and EO, our study indicates that ecopreneurship is a reality even for small manufacturing companies. However, the cluster analysis also revealed that the group of small firms that had the highest overall values for both the four environmental variables and the EO variables (the pioneers) did not achieve the highest financial results.

The small manufacturing businesses with the highest growth and profitability values are those with the lowest values for waste management practices, even though they have relatively high values for the other three environmental variables. This indicates that the green dumpers are addressing environmental variables not only in response to their environmental awareness (Kuckertz & Wagner, 2010) but also from the perspective of expansion and profit. This indicates the presence of a "mixed gamble" (Boers, Ljungkvist, Brunninge, & Nordqvist, 2017) regarding environmental and economic awareness. The small manufacturing businesses with the highest growth and profitability act according to a "good enough" attitude, that is, their low values for waste management are compensated for by relatively high values in the three other measured environmental areas, indicating that waste management incurs relatively high costs.

However, the two clusters with the highest EO values (i.e., the pioneers and green dumpers) also reported the best financial figures, which, reasonably, also explain their relatively high environmental engagement. Analyzed from an ecopreneurial perspective, in which economic goals appear as both means and ends (Jolink & Niesten, 2015), the environmental practices are likely driven by higher levels of proactivity, innovativeness, and risk-taking (cf. Damanpour, 1992), which in turn were motivated by financial incentives. In this way, space was created for environmental investments and practices.

5.1 | Implications for ecopreneurship classifications

In comparison with previous ecopreneurship classifications, our taxonomy has both similarities and differences. For example, the pioneers' high values for environmental practices and financial performance recall Linnanen's (2002) "successful odealist" category, and the overlookers' low figures for these values can be related to Schick et al.'s (2002) "ecoreluctant" type. Yet the present taxonomy does not cover nonprofit (Linnanen, 2002; Santini, 2017) or social forms of ecopreneurship (de Bruin, 2016; Pastakia, 1998), and unlike previous unidimensional (Pastakia, 1998; Schick et al., 2002) and two-dimensional (Abdelkafi & Hansen, 2018; Linnanen, 2002; Schaltegger, 2002; Walley & Taylor, 2002) ecopreneurial typologies, our study is multidimensional. Moreover, the present taxonomy focuses solely on the company level, and not on the ecopreneur's personal motives (Kirkwood & Walton, 2010; Walley & Taylor, 2002), desires to change the world or make money (Linnanen, 2002), or personal business goals (Schaltegger, 2002). Instead, four types of applied environmental practices and their relationships to EO and finance are the focus here.

By combining the environmental scales (Chen et al., 2006; Zhu et al., 2008) with the EO scale (Covin & Slevin, 1989) and the scales for growth and profitability (Ingram et al., 2017), we can understand ecopreneurship by means of an empirically based multidimensional taxonomy. The clustering of the small manufacturing businesses' environmental practices enables a nuanced understanding of their ecopreneurship. Aggregated and displayed in Figure 1, the cluster relationships among EO, growth, and profitability reveal two major patterns: (a) the pioneers and overlookers have similar cluster profiles, although the former have the highest values for all measured green environmental dimensions, whereas the latter have the lowest.

(b) Regarding the environmental dimensions of green NPD and green production, the green dumper and recycler clusters have relatively high values but have reversed values when it comes to waste management and green SCM. Compared with Brammer et al. (2012), the present study indicates that it is possible for small firms to have relatively high values on all sustainability dimensions but that most have major difficulties doing so or choose to refrain from making the required investments. This cluster analysis highlights the ecopreneurship heterogeneity among small manufacturing firms, with some performing strongly in certain dimensions but weakly in others, providing a multifaceted understanding of the topic.

5.2 | Managerial implications

Our study has several interesting implications for managers. However, considering that some entrepreneurs may aim to improve environmental practices based on their own priorities, irrespective of financial implications (Kuckertz & Wagner, 2010; Muñoz & Dimov, 2015), we argue from an ecopreneurship perspective that financial incentives can motivate (Jolink & Niesten, 2015; Schaltegger & Wagner, 2011) increased EO and the use of environmentally friendly business practices. More specifically, as illustrated by the overlooker cluster, our study shows that not focusing on any environmental practices could harm firm performance. According to the present perspective, managers are therefore advised to address at least some environmental issues. Our study also indicates that focusing on all environmental practices is not always the most beneficial approach for firm performance. Considering that 71% of the collected sample belongs to the industries fabricated metal products, and machinery and equipment (Table 1), this approach should be particularly relevant to small firms in these industries. Although the pioneer firms excelled in all dimensions of ecopreneurship (i.e., all environmental dimensions as well as EO), they were outperformed by firms in the green dumper cluster. This indicates that, from an ecopreneurial standpoint, managers of small manufacturing firms striving solely to maximize firm performance might benefit the most from focusing on environmental issues other than waste management, as supported by the correlation matrix in Table 2. A wider implication of this finding is that managers are advised to examine the economic consequences of specific environmental business practices and apply a less aggregated approach to ecopreneurship.

5.3 | Avenues for future ecopreneurship research

The differences between the small manufacturing companies clustered by environmental practices are ultimately rooted in individual or group decisions that are more or less linked to innovation, risk-taking, and proactivity. In addressing ecopreneurship decisions and driving forces (Galkina & Hultman, 2016; Santini, 2017), the relationship between the EO and ethical and moral values (i.e., the moral component) merits further investigation (Muñoz & Cohen, 2018). Based on the context of the present study, that is, the four identified clusters, future research should more deeply explore the incentives for ecopreneurship and the development of environmental practices. Muñoz and Dimov (2017) used the concept of moral intensity, arguing that individuals can only use their previous knowledge to pursue a sustainability opportunity when facing a high level of moral intensity. By examining the clusters on the basis of the moral intensity variable, the extent to which investment in and the development of environmental practices are driven by economic or moral incentives can be rendered empirically observable; furthermore, the relationship between the individual EO variables (Covin & Slevin, 1989) and moral intensity can thereby be clarified. If a strong relationship between risk-taking and moral intensity exists, future research can pursue and investigate the associated motives and consequences.

Another central issue for future research is the relationship between territorial embeddedness and environmental management (Shrivastava & Kennelly, 2013). Regarding how cultural differences between cities, rural areas, and different geographical regions affect SMEs' entrepreneurship (Davidsson, 1995; Ljungkvist & Boers, 2016), future research could explore how these different embeddings affect ecopreneurship and environmental practices in different industries (Santini, 2017). For example, this could be examined using the concepts of the conformist and insurgent paths (Muñoz & Dimov, 2015), highlighting the importance of the surrounding context. Furthermore, as 90% of all firms in Sweden can be classified as family firms (Andersson, Johansson, Karlsson, Lodefalk, & Poldahl, 2018), and as the entrepreneurial mindset is transmitted within families and across generations (Habbershon, Nordqvist, & Zellweger, 2010), it is also important to study how ethical values regarding the development of ecopreneurship evolve across family generations (cf. Muñoz & Cohen, 2018). With this knowledge, relevant public policies can be developed that support the implementation of environmental practices.

5.4 | Limitations

The above section discussing avenues for future research highlights a limitation of this study, namely, that it did not consider dimensions of entrepreneurship other than EO when exploring ecopreneurship. However, this study has some additional limitations as well. As the study was conducted in a Swedish context, the specific national culture could have affected the propensity for environmental practices (Zhu et al., 2008), innovativeness, risk-taking, and proactivity (Randerson, 2016). For example, the low levels of power distance and uncertainty avoidance characterizing Sweden (Hofstede, 1984) could have influenced EO behaviors. Furthermore, the developed taxonomy does not consider the age factor, ignoring the implication that young firms tend to be more flexible and entrepreneurial than old ones (Mintzberg, 1980). To make the analysis less static and to better understand EO, growth, and ecopreneurship among small manufacturing companies, the company age variable needs to be considered. Moreover, this study does not consider management issues, for

example, top-management changes (Carney, Van Essen, Gedajlovic, & Heugens, 2015) and management style (Martens, Lacerda, Belfort, & Freitas, 2016), or other social processes. Lastly, the openness when selecting variables in the cluster analysis method tends to emphasize subjectivity more than do other statistical methods (Andersén, 2012), a matter that scholars should be aware of.

6 | CONCLUSIONS

Theoretically, this paper deepens our understanding of the environmental practice landscape among small manufacturing businesses and of the connection between these practices, EO, and financial results. Four clusters of firms were distinctly identified, and most of these firms reported high self-estimated values for environmental practices and EO.

This study shows that a cluster's level of environmental performance is associated with its level of EO and its financial results, implying that high-EO activities positively affect environmental practices as well as financial results. However, the factor balance within each cluster appears to be sensitive. Regardless of EO, a low level of one of the environmental variables can result in better financial results, implying a mixed gamble (Boers et al., 2017) in which several companies (i.e., a cluster) have identified the value of not developing a particular type of costly environmental practice, resulting in higher growth and profitability.

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REFERENCES

Abdelkafi, N., & Hansen, E. G. (2018). Ecopreneurs' creation of user business models for green tech: An exploratory study in e-mobility. *International Journal of Entrepreneurial Venturing*, *10*(1), 32–55. https://doi.org/10.1504/IJEV.2018.090978

Andersén, J. (2012). A resource-based taxonomy of manufacturing MSMEs. *International Journal of Entrepreneurial Behavior & Research*, *18*(1), 98–122. https://doi.org/10.1108/13552551211201394

Andersén, J. (2017). What about the employees in entrepreneurial firms? A multi-level analysis of the relationship between entrepreneurial orientation, role ambiguity, and social support. *International Small Business Journal*, *35*(8), 969–990. https://doi.org/10.1177/0266242617690797

Andersén, J. (2019). Resource orchestration of firm-specific human capital and firm performance: The role of collaborative human resource management and entrepreneurial orientation. Advance online publication. *The International Journal of Human Resource Management*., 1–33. https://doi.org/10.1080/09585192.2019.1579250

Andersén, J., Jansson, C., & Ljungkvist, T. (2020). Can environmentally oriented CEOs and environmentally friendly suppliers boost the growth of small firms? *Business Strategy and the Environment*, *29*(2), 325–334. https://doi.org/10.1002/bse.2366

Andersén, J., Ljungkvist, T., & Svensson, L. (2015). Entrepreneurially oriented in what? A business model approach to entrepreneurship. *Journal of Small Business and Enterprise Development*, *22*(3), 433–449. https://doi.org/10.1108/JSBED-11-2013-0170

Andersson, F. W., Johansson, D., Karlsson, J., Lodefalk, M., & Poldahl, A. (2018). The characteristics of family firms: Exploiting information on ownership, kinship, and governance using total population data. *Small Business Economics*, *51*(3), 539–556. https://doi.org/10.1108/JEC-12-2014-0028/full/html

Ansari, Z. N., & Kant, R. (2017). Exploring the framework development status for sustainability in supply chain management: A systematic literature synthesis and future research directions. *Business Strategy and the Environment*, *26*(7), 873–892. https://doi.org/10.1002/bse.1945

Armstrong, J. S., & Overton, T. S. (1977). Estimating nonresponse bias in mail surveys. *Journal of Marketing Research*, *14*(3), 396–402. https://doi.org/10.1177/002224377701400320

Bacher, J., Wenzig, K., & Vogler, M. (2004). *SPSS TwoStep Cluster: A first evaluation* (working paper 2004-2). Nürnberg: Universität Erlangen-Nürnberg. https://nbn-resolving.org/urn:nbn:de:0168-ssoar-327153

Baird, I. S., & Thomas, H. (1985). Toward a contingency model of strategic risk taking. *Academy of Management Review*, *10*(2), 230–243. https://doi.org/10.5465/amr.1985.4278108

Boers, B., Ljungkvist, T., Brunninge, O., & Nordqvist, M. (2017). Going private: A socioemotional wealth perspective on why family controlled companies decide to leave the stock-exchange. *Journal of Family Business Strategy*, *8*(2), 74–86. https://doi.org/10.1016/j.jfbs.2017.01.005

Brammer, S., Hoejmose, S., & Marchant, K. (2012). Environmental management in SMEs in the UK: Practices, pressures and perceived benefits. *Business Strategy and the Environment*, *21*(7), 423–434. https://doi.org/10.1002/bse.717

Burgelman, R. A. (2002). Strategy as vector and the inertia of coevolutionary lock-in. *Administrative Science Quarterly*, *47*(2), 325–357. https://doi.org/10.2307/3094808

Carney, M., Van Essen, M., Gedajlovic, E. R., & Heugens, P. P. M. A. R. (2015). What do we know about private family firms? A meta-analytical review. *Entrepreneurship Theory and Practice*, *39*(3), 513–544. https://doi.org/10.1111/etap.12054

Chen, Y.-S., Lai, S.-B., & Wen, C.-T. (2006). The influence of green innovation performance on corporate advantage in Taiwan. *Journal of Business Ethics*, *67*(4), 331–339. https://doi.org/10.1007/s10551-006-9025-5

Cherng, S., & Lo, M. J. (2001, November). A hypergraph based clustering algorithm for spatial data sets. In *Proceedings 2001 IEEE International Conference on Data Mining*, 83–90. IEEE. https://doi.org/10.1109/ICDM.2001.989504

Choi, Y. R., & Shepherd, D. A. (2004). Entrepreneurs' decisions to exploit opportunities. *Journal of Management*, *30*(3), 377–395. https://doi.org/10.1016/j.jm.2003.04.002

Ciliberti, F., Pontrandolfo, P., & Scozzi, B. (2008). Investigating corporate social responsibility in supply chains: A SME perspective. *Journal of Cleaner Production*, *16*(15), 1579–1588. https://doi.org/10.1016/j.jclepro.2008.04.016

Cohen, B. (2006). Sustainable valley entrepreneurial ecosystems. *Business Strategy and the Environment*, *15*(1), 1–14. https://doi.org/10.1002/bse.428

Cohen, B., Smith, B., & Mitchell, R. (2008). Toward a sustainable conceptualization of dependent variables in entrepreneurship research. *Business Strategy and the Environment*, *17*(2), 107–119. https://doi.org/10.1002/bse.505

Cohen, B., & Winn, M. I. (2007). Market imperfections, opportunity and sustainable entrepreneurship. *Journal of Business Venturing*, *22*(1), 29–49. https://doi.org/10.1016/j.jbusvent.2004.12.001

Covin, J. G., Green, K. M., & Slevin, D. P. (2006). Strategic process effects on the entrepreneurial orientation–sales growth rate relationship. *Entrepreneurship Theory and Practice*, *30*(1), 57–81. https://doi.org/10.1111/j.1540-6520.2006.00110.x

Covin, J. G., & Slevin, D. P. (1989). Strategic management of small firms in hostile and benign environments. *Strategic Management Journal*, *10*(1), 75–87. https://doi.org/10.1002/smj.4250100107

Damanpour, F. (1992). Organizational size and innovation. *Organization Studies*, *13*(3), 375–402. https://doi.org/10.1177/017084069201300304

Davidsson, P. (1995). Culture, structure and regional levels of entrepreneurship. *Entrepreneurship and Regional Development*, *7*(1), 41–62. https://doi.org/10.1080/08985629500000003

de Bruin, A. (2016). Towards a framework for understanding transitional green entrepreneurship. *Small Enterprise Research*, *23*(1), 10–21. https://doi.org/10.1080/13215906.2016.1188715

Dean, T. J., & McMullen, J. S. (2007). Toward a theory of sustainable entrepreneurship: Reducing environmental degradation through entrepreneurial action. *Journal of Business Venturing*, *22*(1), 50–76. https://doi.org/10.1016/j.jbusvent.2005.09.003

Dess, G. G., & Lumpkin, G. T. (2005). The role of entrepreneurial orientation in stimulating effective corporate entrepreneurship. *Academy of Management Perspectives*, *19*(1), 147–156. https://doi.org/10.5465/ame.2005.15841975

Dyllick, T., & Hockerts, K. (2002). Beyond the business case for corporate sustainability. *Business Strategy and the Environment*, *11*(2), 130–141. https://doi.org/10.1002/bse.323

Eddleston, K. A. (2008). Commentary: The prequel to family firm culture and stewardship: The leadership perspective of the founder. *Entrepreneurship Theory and Practice*, *32*(6), 1055–1061. https://doi.org/10.1111/j.1540-6520.2008.00272.x

European Commission. (2002). *European SMEs and social and environmental responsibility (Observatory of European SMEs 2002/no.4)*. Brussels: Enterprise Publications.

Fiegenbaum, A., & Thomas, H. (1995). Strategic groups as reference groups: Theory, modeling and empirical examination of industry and competitive strategy. *Strategic Management Journal*, *16*(6), 461–476. https://doi.org/10.1002/smj.4250160605

Fong, N., Wolfgramm, R., & Shepherd, D. (2014). Ecopreneurs as change agents; opportunities, innovations and motivations. *Quarterly Journal of Economics*, *84*, 488–500.

Galkina, T., & Hultman, M. (2016). Ecopreneurship: Assessing the field and outlining the research potential. *Small Enterprise Research*, *23*(1), 58–72. https://doi.org/10.1080/13215906.2016.1188716

Gibb, A., & Li, J. (2003). Organizing for enterprise in China: What can we learn from the Chinese micro, small, and medium enterprise development experience. *Futures*, *35*(4), 403–421. https://doi.org/10.1016/S0016-3287(02)00089-7

Gibbs, D. (2009). Sustainability entrepreneurs, ecopreneurs and the development of a sustainable economy. *Greener Management International*, *2009*(55), 63–78. https://www.jstor.org/stable/pdf/greemanainte.55.63.pdf?seq=1

Habbershon, T. G., Nordqvist, M., & Zellweger, T. (2010). Transgenerational entrepreneurship. In M. Nordqvist, & T. Zellweger (Eds.), *Transgenerational entrepreneurship: Exploring growth and performance in family firms across generations* (pp. 1–38). Cheltenham, UK: Edward Elgar. 10.4337/9781849805469.00009

Hall, J. K., Daneke, G. A., & Lenox, M. J. (2010). Sustainable development and entrepreneurship: Past contributions and future directions. *Journal of Business Venturing*, *25*(5), 439–448. https://doi.org/10.1016/j.jbusvent.2010.01.002

Halme, M., & Korpela, M. (2014). Responsible innovation toward sustainable development in small and medium-sized enterprises: A resource perspective. *Business Strategy and the Environment*, *23*(8), 547–566. https://doi.org/10.1002/bse.1801

Hawken, P., Lovins, A. B., & Lovins, L. H. (1999). *Natural capitalism: The next industrial revolution*. London, UK: Earthscan.

Hemingway, C. A., & Maclagan, P. W. (2004). Managers' personal values as drivers of corporate social responsibility. *Journal of Business Ethics*, *50*(1), 33–44. https://doi.org/10.1023/B:BUSI.0000020964.80208.c9

Hillary, R. (2004). Environmental management systems and the smaller enterprise. *Journal of Cleaner Production*, *12*(6), 561–569. https://doi.org/10.1016/j.jclepro.2003.08.006

Hockerts, K., & Wüstenhagen, R. (2010). Greening Goliaths versus emerging Davids: Theorizing about the role of incumbents and new entrants in sustainable entrepreneurship. *Journal of Business Venturing*, *25*(5), 481–492. https://doi.org/10.1016/j.jbusvent.2009.07.005

Hofstede, G. (1984). *Culture's consequences: International differences in work-related values*. Thousand Oaks, CA: Sage.

Ingram, A., Peake, W. O., Stewart, W., & Watson, W. (2017). Emotional intelligence and venture performance. *Journal of Small Business Management*, *57*(3), 780–800. https://doi.org/10.1111/jsbm.12333

Isaak, R. (2002). The making of the ecopreneur. *Greener Management International*, *2002*(38), 81–91. https://doi.org/10.9774/GLEAF.3062.2002.su.00009

Jolink, A., & Niesten, E. (2015). Sustainable development and business models of entrepreneurs in the organic food industry. *Business Strategy and the Environment*, *24*(6), 386–401. https://doi.org/10.1002/bse.1826

Kamien, M. I., & Schwartz, N. L. (1982). *Market structure and innovation*. Cambridge: Cambridge University Press.

Kearins, K., & Collins, E. (2012). Making sense of ecopreneurs' decisions to sell up. *Business Strategy and the Environment*, *21*(2), 71–85. https://doi.org/10.1002/bse.710

Ketchen, D. J., & Shook, C. L. (1996). The application of cluster analysis in strategic management research: An analysis and critique. *Strategic Management Journal*, *17*(6), 441–458. https://doi.org/10.1002/(SICI)1097-0266(199606)17:6<441::AID-SMJ819>3.0.CO;2-G

Khelil, N. (2016). The many faces of entrepreneurial failure: Insights from an empirical taxonomy. *Journal of Business Venturing*, *31*(1), 72–94. https://doi.org/10.1016/j.jbusvent.2015.08.001

Kirkwood, J., & Walton, S. (2010). What motivates ecopreneurs to start businesses? *International Journal of Entrepreneurial Behavior & Research*, *16*(3), 204–228. https://doi.org/10.1108/13552551011042799

Klewitz, J., & Hansen, E. G. (2014). Sustainability-oriented innovation of SMEs: A systematic review. *Journal of Cleaner Production*, *65*, 57–75. https://doi.org/10.1016/j.jclepro.2013.07.017

Kreiser, P. M., Marino, L. D., & Weaver, K. M. (2002). Assessing the psychometric properties of the entrepreneurial orientation scale: A multi-country analysis. *Entrepreneurship Theory and Practice*, *26*(4), 71–94. https://doi.org/10.1177/104225870202600405

Kuckertz, A., & Wagner, M. (2010). The influence of sustainability orientation on entrepreneurial intentions: Investigating the role of business experience. *Journal of Business Venturing*, *25*(5), 524–539. https://doi.org/10.1016/j.jbusvent.2009.09.001

Larson, A. L. (2000). Sustainable innovation through an entrepreneurship lens. *Business Strategy and the Environment*, *9*(5), 304–317. https://doi.org/10.1002/1099-0836(200009/10)9:5<304::AID-BSE255>3.0.CO;2-O

Lee, K. H., Herold, D. M., & Yu, A. L. (2016). Small and medium enterprises and corporate social responsibility practice: A Swedish perspective. *Corporate Social Responsibility and Environmental Management*, *23*(2), 88–99. https://doi.org/10.1002/csr.1366

Lieberman, M. B., & Montgomery, D. B. (1988). First-mover advantages. *Strategic Management Journal*, *9*(S1), 41–58. https://doi.org/10.1002/smj.4250090706

Linnanen, L. (2002). An insider's experiences with environmental entrepreneurship. In M. Schaper (Ed.), *Making ecopreneurs: Developing sustainable entrepreneurship* (pp. 109–124). London, UK: Routledge.

Ljungkvist, T., & Boers, B. (2016). Structural crisis? Regional culture and resilience in family business-dominated regions in Sweden. *Journal of Enterprising Communities: People and Places in the Global Economy*, *10*(4), 425–446. https://doi.org/10.1108/JEC-05-2015-0030

Ljungkvist, T., Boers, B., & Samuelsson, J. (2019). Three stages of entrepreneurial orientation: The founder's role. *International Journal of Entrepreneurial Behavior & Research*, *26*(2), 285–306. https://doi.org/10.1108/IJEBR-10-2018-0630

Lumpkin, G. T., & Dess, G. G. (1996). Clarifying the entrepreneurial orientation construct and linking it to performance. *Academy of Management Review*, *21*(1), 135–172. https://doi.org/10.5465/amr.1996.9602161568

Martens, C. D. P., Lacerda, F. M., Belfort, A. C., & Freitas, H. M. R. D. (2016). Research on entrepreneurial orientation: Current status and future agenda. *International Journal of Entrepreneurial Behavior & Research*, *22*(4), 556–583. https://doi.org/10.1108/IJEBR-08-2015-0183

Martín-Ruiz, D., & Rondán-Cataluña, F. J. (2008). The nature and consequences of price unfairness in services: A comparison to tangible goods. *International Journal of Service Industry Management*, *19*(3), 325–352. https://doi.org/10.1108/09564230810875002

McKeiver, C., & Gadenne, D. (2005). Environmental management systems in small and medium businesses. *International Small Business Journal*, *23*(5), 513–537. https://doi.org/10.1177/0266242605055910

Merritt, J. Q. (1998). EM into SME won't go? Attitudes, awareness and practices in the London Borough of Croydon. *Business Strategy and the Environment*, *7*(2), 90–100. https://doi.org/10.1002/(SICI)1099-0836(199805)7:2<90::AID-BSE141>3.0.CO;2-F

Miles, R. E., & Snow, C. C. (1978). *Organizational strategy, structure, and process*. New York, NY: McGraw-Hill.

Miller, D. (1983). The correlates of entrepreneurship in three types of firms. *Management Science*, *29*(7), 770–791. https://doi.org/10.1287/mnsc.29.7.770

Miller, D. (1996). Configurations revisited. *Strategic Management Journal*, *17*(7), 505–512. https://doi.org/10.1002/(SICI)1097-0266(199607)17:7<505::AID-SMJ852>3.0.CO;2-I

Miller, D., & Friesen, P. H. (1978). Archetypes of strategy formulation. *Management Science*, *24*(9), 921–933. https://doi.org/10.1287/mnsc.24.9.921

Miller, D., & Le Breton-Miller, I. (2011). Governance, social identity, and entrepreneurial orientation in closely held public companies. *Entrepreneurship Theory and Practice*, *35*(5), 1051–1076. https://doi.org/10.1111/j.1540-6520.2011.00447.x

Mintzberg, H. (1980). Structure in 5's: A synthesis of the research on organization design. *Management Science*, *26*(3), 322–341. https://doi.org/10.1287/mnsc.26.3.322

Muñoz, P., & Cohen, B. (2018). Sustainable entrepreneurship research: Taking stock and looking ahead. *Business Strategy and the Environment*, *27*(3), 300–322. https://doi.org/10.1002/bse.2000

Muñoz, P., & Dimov, D. (2015). The call of the whole in understanding the development of sustainable ventures. *Journal of Business Venturing*, *30*(4), 632–654. https://doi.org/10.1016/j.jbusvent.2014.07.012

Muñoz, P., & Dimov, D. (2017). Moral intensity as catalyst for opportunities for sustainable development. In G. Markman, A. Guerber, & W.-T. Su (Eds.), *The world scientific reference on entrepreneurship: Volume 3: Sustainability, ethics, and entrepreneurship* (pp. 225–247). Singapore: World Scientific. 10.1142/9789813220614_0009

O'Neill, K., & Gibbs, D. (2016). Rethinking green entrepreneurship: Fluid narratives of the green economy. *Environment and Planning a: Economy and Space*, *48*(9), 1727–1749. https://doi.org/10.1177/0308518X16650453

Pacheco, D. F., Dean, T. J., & Payne, D. S. (2010). Escaping the green prison: Entrepreneurship and the creation of opportunities for sustainable development. *Journal of Business Venturing*, *25*(5), 464–480. https://doi.org/10.1016/j.jbusvent.2009.07.006

Pastakia, A. (1998). Grassroots ecopreneurs: Change agents for a sustainable society. *Journal of Organizational Change Management*, *11*(2), 157–173. https://doi.org/10.1108/09534819810212142

Paulraj, A. (2009). Environmental motivations: A classification scheme and its impact on environmental strategies and practices. *Business Strategy and the Environment*, *18*(7), 453–468. https://doi.org/10.1002/bse.612

Randerson, K. (2016). Entrepreneurial orientation: Do we actually know as much as we think we do? *Entrepreneurship and Regional Development*, *28*(7–8), 580–600. https://doi.org/10.1080/08985626.2016.1221230

Rauch, A., Wiklund, J., Lumpkin, G. T., & Frese, M. (2009). Entrepreneurial orientation and business performance: An assessment of past research and suggestions for the future. *Entrepreneurship Theory and Practice*, *33*(3), 761–787. https://doi.org/10.1111/j.1540-6520.2009.00308.x

Roome, N. (1992). Developing environmental management strategies. *Business Strategy and the Environment*, *1*(1), 11–24. https://doi.org/10.1002/bse.3280010104

Runhaar, H., Tigchelaar, C., & Vermeulen, W. J. (2008). Environmental leaders: Making a difference. A typology of environmental leaders and recommendations for a differentiated policy approach. *Business Strategy and the Environment*, *17*(3), 160–178. https://doi.org/10.1002/bse.520

Saeed, S., Yousafzai, S. Y., & Engelen, A. (2014). On cultural and macroeconomic contingencies of the entrepreneurial orientation–performance relationship. *Entrepreneurship Theory and Practice*, *38*(2), 255–290. https://doi.org/10.1111/etap.12097

Santini, C. (2017). Ecopreneurship and ecopreneurs: Limits, trends and characteristics. *Sustainability*, *9*(4), 492. https://doi.org/10.3390/su9040492

Schaltegger, S. (2002). A framework for ecopreneurship. *Greener Management International*, *38*, 4558–4558. https://doi.org/10.9774/GLEAF.3062.2002.su.00006

Schaltegger, S., & Wagner, M. (2011). Sustainable entrepreneurship and sustainability innovation: Categories and interactions. *Business Strategy and the Environment*, *20*(4), 222–237. https://doi.org/10.1002/bse.682

Schick, H., Marxen, S., & Freimann, J. (2002). Sustainability issues for start-up entrepreneurs. *Greener Management International*, *2002*(38), 59–70. https://doi.org/10.9774/GLEAF.3062.2002.su.00007

Schreyögg, G., & Kliesch-Eberl, M. (2007). How dynamic can organizational capabilities be? Towards a dual-process model of capability dynamization. *Strategic Management Journal*, *28*(9), 913–933. https://doi.org/10.1002/smj.613

Shepherd, D. A., & Patzelt, H. (2011). The new field of sustainable entrepreneurship: Studying entrepreneurial action linking "what is to be sustained" with "what is to be developed". *Entrepreneurship Theory and Practice*, *35*(1), 137–163. https://doi.org/10.1111/j.1540-6520.2010.00426.x

Shrivastava, P., & Kennelly, J. J. (2013). Sustainability and place-based enterprise. *Organization & Environment*, *26*(1), 83–101. https://doi.org/10.1177/1086026612475068

Simpson, M., Taylor, N., & Barker, K. (2004). Environmental responsibility in SMEs: Does it deliver competitive advantage? *Business Strategy and the Environment*, *13*(3), 156–171. https://doi.org/10.1002/bse.398

Statistics Sweden. (2019). Structural business statistics. Retrieved from https://www.scb.se/en/finding-statistics/statistics-by-subject-area/business-activities/structure-of-the-business-sector/structural-business-statistics/

Tether, B. S., & Storey, D. J. (1998). Smaller firms and Europe's high technology sectors: A framework for analysis and some statistical evidence. *Research Policy*, *26*(9), 947–971. https://doi.org/10.1016/S0048-7333(97)00053-X

Thompson, N., Kiefer, K., & York, J. (2011). Distinctions not dichotomies: Exploring social, sustainable and environmental entrepreneurship. In

G. T. Lumpkin, & J. A. Katz (Eds.), *Advances in entrepreneurship, firm emergence and growth* (Vol. 13). Social and Sustainable Entrepreneurship. (pp. 205–233). Bingley, UK: Emerald Group.

Wales, W. J., Patel, P. C., Parida, V., & Kreiser, P. M. (2013). Nonlinear effects of entrepreneurial orientation on small firm performance: The moderating role of resource orchestration capabilities. *Strategic Entrepreneurship Journal*, *7*(2), 93–121. https://doi.org/10.1002/sej.1153

Walker, K., Ni, N., & Dyck, B. (2015). Recipes for successful sustainability: Empirical organizational configurations for strong corporate environmental performance. *Business Strategy and the Environment*, *24*(1), 40–57. https://doi.org/10.1002/bse.1805

Walley, E. E., & Taylor, D. W. (2002). Opportunists, champions, mavericks...? *Greener Management International*, *2002*(38), 31–43. https://doi.org/10.9774/GLEAF.3062.2002.su.00005

Wiklund, J., & Shepherd, D. (2005). Entrepreneurial orientation and small business performance: A configurational approach. *Journal of Business Venturing*, *20*(1), 71–91. https://doi.org/10.1016/j.jbusvent.2004.01.001

Williams, S., & Schaefer, A. (2013). Small and medium-sized enterprises and sustainability: Managers' values and engagement with environmental and climate change issues. *Business Strategy and the Environment*, *22*(3), 173–186. https://doi.org/10.1002/bse.1740

Wright, M., Hoskisson, R. E., Busenitz, L. W., & Dial, J. (2000). Entrepreneurial growth through privatization: The upside of management buyouts. *Academy of Management Review*, *25*(3), 591–601. https://doi.org/10.5465/amr.2000.3363522

Zellweger, T., & Sieger, P. (2012). Entrepreneurial orientation in long-lived family firms. *Small Business Economics*, *38*(1), 67–84. https://doi.org/10.1007/s11187-010-9267-6

Zhu, Q., Sarkis, J., & Lai, K.-H. (2008). Confirmation of a measurement model for green supply chain management practices implementation. *International Journal of Production Economics*, *111*(2), 261–273. https://doi.org/10.1016/j.ijpe.2006.11.029

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APPENDIX A.

Environmental and validating survey questions

Item/factor
Green environmental variables (Zhu et al., 2008)
Green new product development
Importance of the following factors when developing new products:
Design of products for reduced consumption of material and/or energy
Design of products for reuse, recycling, and recovery of materials and components
Design of products to avoid or reduce use of hazardous products and/or their manufacturing processes
Green supply chain management
Importance of the following factors within the supply chain:
Suppliers' ability to provide environmentally friendly raw material and/or components
The supplier's focus on environmental issues
Environmental certification of the supplier
The supplier's choice of environmental transportation
Second-tier suppliers' focus on environmental issues
Cooperation with customers to address environmental issues in product development
Cooperation with customers to create environmentally friendly manufacturing processes
Cooperation with customers to address environmental transportation
Cooperation with customers to address environmentally friendly packaging
Waste management
Importance of the following waste factors:
Sales of excess material and/or inventory
Sales of residual products and used materials
Sales of replaced production equipment
Green production (Chen et al., 2006)
Importance of the following factors in the production process:
The reduction of hazardous substances per produced unit
The reduction of spillage per produced unit
The consumption of less energy per produced unit
The reduction of raw material use per produced unit
The reuse of spillage and emissions/energy
Entrepreneurial Orientation (EO), the exact scale of Covin and Slevin (1989)
The extent of innovativeness:
A strong emphasis on the marketing of tried and true products or services 1 to 7 A strong emphasis on R&D, technological leadership, and innovations
No new lines of products or services 1 to 7 Very many new lines of products or services
Changes in product or service lines have been mostly of a minor nature 1 to 7 Changes in product or service lines have usually been quite dramatic
The character and extent of proactivity:
Typically responds to actions which competitors initiate 1 to 7 Typically initiates actions which competitors then respond to
Is very seldom the first business to introduce new products/services, administrative techniques, operating technologies, etc. 1 to 7 Is very often the first business to introduce new products/services, administrative techniques, operating technologies, etc.

(Continues)

Typically seeks to avoid competitive clashes, preferring a "live and let-live" posture 1 to 7 Typically adopts a very competitive, "undo-the-competitors" posture
The extent of risk-taking:
A strong proclivity for low-risk projects (with normal and certain rates of return) 1 to 7 A strong proclivity for high-risk projects (with chances of very high returns)
Owing to the nature of the environment, it is best to explore it gradually via timid, incremental behavior 1 to 7 Owing to the nature of the environment, bold wide-ranging acts are necessary to achieve the firm's objectives
Typically adopts a cautious, "wait-and-see" posture in order to minimize the probability of making costly decisions 1 to 7 Typically adopts a bold, aggressive posture in order to maximize the probability of exploiting potential opportunities
Growth (Ingram et al., 2017)
In relation to your closest competitors:
How has the firm performed regarding sales growth over the last 3 years?
How has the firm performed regarding market share growth over the last 3 years?
Profitability (Ingram et al., 2017)
In relation to your closest competitors:
How has the firm performed regarding profitability over the last 3 years?
How has the firm performed regarding profit margin over the last 3 years?