Environmental responsibility and performance in small and medium-sized enterprises

An institutional framework on the drivers and performance benefits of environmental management system adoption for SMEs

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Abstract

In the last few decades, an increasingly growing awareness of environmental issues has emerged. Although SMEs contribute heavily to this problem, these organizations do not recognize the problem as theirs and are less likely to engage in environmental management. In addition, SMEs don't recognize the potential benefits that environmental management could entail. Although researchers adopted various theoretical perspectives to explore SMEs and their environmental behaviour, the subject is less researched from an institutional perspective. This research therefore takes an institutional view to examine the drivers and potential benefits of environmental management systems in SMEs. The effects of various institutional and external support drivers on the adoption of environmental management systems are examined, as well as the profitability of such systems for SMEs. Data of more than 13.000 SMEs from Europe, Israel and the United States is used. The results of the binary logistic regression and ordinal logistic regression analyses show that SMEs are only influenced by regulative pressures to adopt an EMS. At the same time, cognitive pressures moderate the relationship between EMS adoption and performance: EMS adoption only benefits performance when SMEs perceive cognitive pressures. This therefore hides an interesting opportunity for SMEs in practice.

Key words: small and medium-sized enterprises, institutional theory, environmental management, environmental management system, legitimacy, performance

Preface

This thesis marks an end of my master's specialization in Strategic Management at the Radboud University in Nijmegen. I really enjoyed diving into the subject of environmental management, an important theme that is rapidly evolving in our daily lives. The process of conducting this research and writing this thesis was, although not always easy, exciting. Now, at the end of my master's specialization, I discovered what academic research really entails. I can therefore truly say that I learned a lot from this thesis.

This thesis would not be where it is right now without the help of a few individuals. First, I really want to thank dr. ir. Ziggers for his time, patience and feedback during our discussion meetings on Skype. I further want to thank my parents for always keeping me motivated, my friends and roommates for keeping me company in the library and Chiara for always being there for me when I needed to spout my ideas and doubts.

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List of abbreviations

EMAS: Eco-Management and Audit Scheme

EMS: Environmental management system

CSR: Corporate social responsibility

ISO: International Organization for Standardization

MNO: Multinational organization

SME: Small and medium-sized enterprise

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1. Introduction

In the last few decades, an increasingly growing awareness of environmental issues by governments, policy makers, advocacy groups, organizations and society as a whole has emerged (Banerjee, 2002; Elkington, 2013; Gadenne, Kennedy, & McKeiver, 2009; Haffar & Searcy, 2019). Issues as global warming, air and water pollution, ozone depletion, soil erosion and deforestation can no longer be ignored. Hence, environmental issues are becoming increasingly dominant in organization theory and practice, influencing strategic management theory as well as organizations' strategies (Banerjee, 2001). Organizations are expected to go beyond legal requirements by abating pollution, minimizing waste, recycling and reducing emissions (Haffar & Searcy, 2019; McWilliams & Siegel, 2001; Walley & Whitehead, 1994).

Corporate social responsibility (CSR) literature predominantly focussed on multinational organizations (MNOs) (Williamson, Lynch-Wood, & Ramsay, 2006), since most large organizations in practice today devote substantial time and resources to environmental management (Brammer, Hoejmose, & Marchant, 2012; Buysse & Verbeke, 2003). Moreover, more specific environmental management research has barely been focussing on small and medium-sized enterprises (SMEs), since SMEs are not interested in going further than regulatory compliance (Sharma & Vredenburg, 1998), society is barely interested in SMEs (Aragon-Correa, Hurtado-Torres, Sharma, & Garcia-Morales, 2008) and the gathering of data from SMEs is difficult (Aragon-Correa, 1998; Rutherfoord et al., 2000). Previous researchers state that an extension of more specific environmental management research on SMEs is however crucial in developing a comprehensive understanding of the business world's engagement with the environment (Lindgreen & Swaen, 2010; Murillo & Lozano, 2006; Thornton & Byrd, 2013; Williamson et al., 2006).

SMEs are defined as "enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million" (European Commission, 2003, p. 39). Research on SME participation in environmental issues is highly relevant since SMEs form 99% of European business, created 85% of new European jobs in the past five years, and provided two-third of all employees in the European private sector (Brammer et al., 2012; European Commission, 2003). Morsing and Perrini (2009, p.2) therefore contend that "an improved understanding of current CSR practices in SMEs has the potential of stimulating a high impact for the global economy and society as well as for the SMEs themselves". Even more important, SMEs account for approximately 70% of the environmental pollution in the world (Hillary, 2004; Shashi,

Cerchione, Centobelli, & Shabani, 2018), therefore having a significant role in solving global environmental issues.

Despite these figures, SMEs are less likely to engage in environmental management (Yadav, Gupta, Rani, & Rawat, 2018). First of all, SMEs are said to perceive stakeholder expectations towards environmental issues as a burden or threat (Morsing & Perrini, 2009). Moreover, SMEs lack the awareness and expertise to engage in environmental management (Perez-Sanchez, Barton, & Bower, 2003) or have constrained or inadequate resources, which may make engagement in environmental initiatives at the expense of their competitiveness (Maloni & Brown, 2006; Yacob, Wong, & Khor, 2019; Zorpas, 2010). Additionally, smaller organizations are less visible, thereby gaining little recognition from environmental initiatives (Udayasankar, 2008).

Contrary to the abovementioned reluctance towards environmental issue solutions, SMEs could benefit from the use of environmental management. Multiple scholars considered the strategic relevance of environmental management in organizations in general (Beddewela & Fairbrass, 2016; Du & Vieira, 2012; Saiia, 2001). Environmental management has the potential to be "much more than a cost, a constraint, or a charitable deed, but a source of opportunity, innovation, and competitive advantage" (Porter & Kramer, 2006, p. 2). Likewise, there are indications from previous studies that SMEs could benefit from the use of environmental practices due to improved efficiency (Biondi, Frey, & Iraldo, 2000), the development of innovative products and services and exploitation of niche markets (Jenkins, 2009) or enhanced reputation (Nejati, Quazi, Amran, & Ahmad, 2017). Despite the difficulties, SMEs might gain a competitive advantage by adopting environmental good practices (Simpson, Taylor, & Barker, 2004). These practices are frequently accompanied by the adoption of an internationally compliant environmental management system (EMS). These systems ensure that an organization's environmental impact is monitored and managed systematically (Walley & Whitehead, 1994). Considering the abovementioned contradiction, it would be interesting to further explore SMEs' environmental management and examine if environmental management systems could be beneficial for SMEs.

Although research so far has applied a variety of perspectives to study SMEs' engagement in environmental practices, relatively few academics have approached the issue from an institutional perspective (Delmas & Toffel, 2004; Lindgreen & Swaen, 2010; Wang, Li & Zhao, 2018). When considering the organization's environment, institutions are however found to be highly important: multiple entities impose different institutional pressures on

organizations, thereby influencing the organization's attitude towards environmental issues (Delmas & Toffel, 2004; Jennings & Zandbergen, 1995; Wang et al., 2018). However, in their meta-analyses on this subject, Soundararajan, Jamali, and Spence (2018) found that empirical research regarding the institutional pressures on SMEs' environmental management is still scarce.

Concluding on the beforementioned arguments, there lies an opportunity to examine the potential strategic benefits of environmental management for SMEs by taking an institutional perspective. This research therefore adopts an institutional view to examine what the influence of institutional pressures towards environmental issues is on the adoption of EMSs by SMEs, and if these EMSs could be beneficial for SME performance. To address these aims, I pose the following research questions:

(1) What is the influence of institutional pressures towards environmental issues on SMEs' adoption of environmental management systems?

(2) Could the use of environmental management systems enhance SME performance?

This research contributes to theory and practice in several ways. First, by answering the research questions, this study will provide more scientific evidence and thereby contribute to theory by expanding environmental management research to the field of SMEs. This will contribute to a more comprehensive understanding of the business world's engagement with the environment (Lindgreen & Swaen, 2010; Murillo & Lozano, 2006; Thornton & Byrd, 2013; Williamson et al., 2006). Furthermore, by taking an institutional perspective, this study aims to fill the knowledge gap that Soundararajan et al. (2018) described on the institutional context of SMEs' environmental management.

Secondly, this study could be of significant value for SMEs in practice since it will give scientific evidence if and how environmental management can benefit to their performance. In addition, SMEs in practice can derive knowledge from this research about the institutional context that will be useful in their organization. Specifically, outcomes of this research can help SMEs to understand their own institutional context, thereby improving their responsiveness towards environmental issues.

The following chapter explains the theoretical lens and relevant concepts of this research. Thereafter, chapter three provides a literature review on the most pivotal theoretical perspectives recently used by scholars to examine environmental management by SMEs, as well as the institutional perspective that is used in this research. Based on the literature review several hypotheses are drawn and the conceptual framework is developed. Chapter four subsequently outlines the research method used. Finally, the results of this analysis are presented in chapter five and discussed and concluded in chapter six.

2. Theoretical framework

This chapter provides the theoretical framework of this research. First, institutional theory will be outlined as this is the theoretical lens of this research. Subsequently, the context and relevant concepts of this research will be defined.

2.1 Institutional theory

Institutional theory focusses on the social context in which organizations operate, thereby trying to explain the social structures surrounding the organization (Scott, 2013). Central in institutional theory is that organizations are influenced by institutional logics (Greenwood, Raynard, Kodeih, Micelotta, & Lounsbury, 2011). Social reality is constructed by these institutional logics by forming an overarching set of principles (Greenwood et al., 2011) and cultural beliefs (van Kranenburg & Voinea, 2017). Specifically, institutional logics "provide guidelines on how to interpret and function in social situations" (Greenwood et al., 2011, p. 318). Organizations are therefore influenced by their environment to behave in certain ways. In contrast to early management theory that defines organizations as rational entities that always try to achieve the optimal outcome and profit maximization (Mintrom, 2015), institutional theory argues that organizations are not fully rational, but bounded by institutional logics, so called institutions, that shape their behaviour (Oliver, 1991; Scott, 2013).

2.1.1 Institutions

Institutions were firstly defined by North (1990, p. 3) as: "the rules of the game in a society or, more formally, … the humanly devised constraints that shape human interaction". North described these constraints as being divided in formal institutions and informal institutions. Where formal institutions are identified in laws, regulations and rules, informal institutions are based on norms, culture and religion. Scott (2008) offered an alternative distinction by dividing institutions in regulative, normative and cognitive elements, based on DiMaggio and Powell's (1983) institutional processes; coercive, normative and mimetic processes. These elements would guide behaviour and provide stability and meaning to life. Institutions therefore influence organizations with these elements by exerting institutional pressures on them, shaping organizational behaviour (Meyer & Rowan, 1977). Based on these elements, Scott defined a new definition of institutions: "institutions are comprised of regulative, normative and cultural-cognitive elements that, together with associated activities and resources, provide stability and meaning to social life" (Scott, 2008, p. 48). Specific examples of institutions are "public

opinion, educational systems, laws, courts, professions, ideologies, regulatory structures, awards and prizes, certification and accreditation bodies, governmental endorsements and requirements" (Scott, 1987, p. 498). Consequent with these three specific elements, institutions exert their influence via pressures on organizations.

2.1.2 Institutional pressures

Pressures from institutions can be categorized in regulative, normative and cognitive pressures. Regulative pressures consist of formal and explicit rules that constrain the organization's behaviour. Characteristic rules are property rights, patents law, tax structures, trade laws and legal systems. Normative pressures originate from the organization's direct environment, and guide the organization towards societal values, beliefs, expectations, duties, codes of conduct, responsibilities, norms and values. Finally, cognitive pressures take the form of shared meanings and common beliefs of individual actors, via socio-cultural symbols such as words, concepts, myths, signs and gestures. These are generally used to establish meaning to everything, thereby leading to pressures of perceived correctness of actions (Scott, 2013). Organizations tend to conform to these institutional pressures in order to attain organizational legitimacy and, eventually, survive and be successful (DiMaggio & Powell, 1983; Meyer & Rowan, 1977; Oliver, 1991).

2.1.3 Legitimacy

Legitimacy is one of the most crucial concepts in institutional theory. In order to succeed, organizations must be perceived as legitimate to those institutions and individuals with which they hope to engage in exchanges (Tornikoski & Newbert, 2007). Organizations thereby require a legitimized position towards their stakeholders in society in order to attain and maintain their 'social license to operate' (Deegan, 2002). Improving organizational legitimacy translates into receiving more business opportunities, accessible resources and less unsystematic risk (Bansal & Roth, 2000), and achieving long-term sustainability and employee satisfaction (Bansal & Roth, 2000; Zheng, Luo, & Maksimov, 2015). For these reasons, organizational legitimacy is directly linked with organizational performance (Deephouse, 1996; Díez-Martín, Prado-Roman, & Blanco-González, 2013). Legitimacy therefore represents a key factor in understanding organizational growth and survival (Meyer and Rowan, 1977; Zucker, 1987).

2.2 Organizational performance

Multiple criteria and components are used in strategic management to express and measure the operational and financial performance in organizations (Hudson, Smart, & Bourne, 2001). The balanced scorecard, developed by Kaplan and Norton, is probably the most famous measurement of performance, complementing financial performance with operational performance indicators like customer satisfaction, internal processes and innovation (Kaplan & Norton, 2005). However, traditional accounting-based figures such as profitability, growth and occasionally productivity remain the most common chosen output measures in SMEs as well as in larger organizations (McKiernan & Morris, 1994). Since SMEs are relatively small organizations, growth is seen as an important indicator for their performance, as will be explicated in the following section.

2.2.1 Organizational growth

Growth is a typical indicator used as performance measures for the evaluation of organizational success (Johnsen & McMahon, 2005). Growth in this sense could refer to an increase in employees, turnover, sales or assets. Growth in particular is seen as an important indicator for performance in SME, since size is a positive predictor of organizational survival (Quatraro & Vivarelli, 2015; Wiklund & Shepherd, 2005). Hence, from an institutional perspective, SMEs will only be able to establish organizational growth when they are perceived as legitimate by their stakeholders.

2.3 SMEs and their environmental orientation

As mentioned earlier, a growing awareness of environmental issues by governments, policy makers, advocacy groups, organizations and society as a whole has emerged (Banerjee, 2002; Elkington, 2013; Gadenne et al., 2009; Haffar & Searcy, 2019). Organizations are therefore increasingly expected to account for the environmental consequences of their business activities (Banerjee, 2002; Porter & Kramer, 2006). Nevertheless, many SMEs believe that "environmental issues are global in nature, and therefore beyond their ability to resolve" (Johannson, 1997, p. 9). According to Merritt (1998), this is the reason why current environmental awareness and practices of SMEs differ significantly from larger organizations.

2.3.2 Environmental management strategies and practices

How organizations recognize the legitimacy and importance of environmental issues is shown in their environmental orientation and environmental management strategy (Banerjee, 2002;

Chan, He, Chan, & Wang, 2012). This is reflected in their environmental management practices, which are actions undertaken by organizations to "reduce the environmental impact of their operations" (Gadenne et al., 2009, p. 45). Organizations are expected to go beyond legal requirements for sustainability by abating pollution, minimizing waste, recycling and reducing emissions (Haffar & Searcy, 2019; McWilliams & Siegel, 2001; Walley & Whitehead, 1994). To achieve this, organizations for example adapt their policy, formal training programs or audits to be more environmental responsible (Delmas & Toffel, 2004). These practices are frequently accompanied by the adoption of an internationally compliant environmental management system. These systems ensure that an organization's environmental impact is monitored and managed systematically (Walley & Whitehead, 1994).

2.3.4 Environmental management systems

To secure that environmental management practices are conducted, environmental standards have been established since the early 1990's by means of environmental management systems by organizations as the European Commission, the British Standards Institute (BSI) and the Organization of Standardization (ISO) (Sroufe, Montabon, Narasimhan, & Wang, 2002). The British Standards Institute defined an EMS as: "the organizational structure, responsibilities, practices, procedures, processes and resources for determining and implementing environmental policy" (BSI, 2003). Organizations may voluntarily adopt a certified EMS, such as the eco-management and audit scheme (EMAS) and multiple systems developed by the International Organization of Standardization such as ISO 14001 (general environmental management systems), ISO14064 (greenhouse gases), ISO16000 (energy management systems), or use the organizations' own 'in-house' system (Zorpas, 2010).

EMSs have already proved their efficacy in the sustainability field by showing significant improvements in the environmental performance of SMEs (Biondi et al., 2000). However, does the adoption of these systems also contribute to the SMEs business case and improve overall performance?

2.3.5 The profitability of an EMS for SMEs

Although it is claimed that all types of EMSs are applicable for SMEs, SMEs still hesitate and lack to adopt them (Brammer et al., 2012; Hillary, 2004; Zeng et al., 2011). SMEs are said to be less motivated to engage in environmental management practices, since they are very focussed on day-to-day activities, whereas environmental issues are seen as somewhat inferior,

secondary issues (Studer, Tsang, Welford, & Hills, 2008), and partially because SMEs' resources are often limited to the issues that concern their core business (Biondi et al., 2000; Brammer et al., 2012). Consequently, SMEs fail to see the potential economic benefits of investing in environmental management (Revell & Blackburn, 2007). Literature however suggests that environmental management, when strategically implemented, could be of value for organizations (Porter & Kramer, 2006; Saiia, 2001). This offers some interesting opportunities for SMEs. The following chapter will therefore give a literature review on the diverse range of perspectives used in research to explain the relationship between environmental management systems and performance in SMEs.

3. Literature review and hypotheses development

Scholars used multiple perspectives to explain environmental management and its relationship with performance in SMEs. The two most pivotal perspectives, resource-based theory and stakeholder theory, will be shortly explained in this chapter. Thereafter, the relationship between environmental management systems and performance in SMEs is further examined using institutional theory, from which hypotheses for this research are drawn. This chapter concludes with the conceptual model displaying these hypotheses.

3.1 Theoretical perspectives

According to resource-based theory, organizations achieve sustainable competitive advantage from the valuable, rare, imperfectly imitable, and non-substitutable resources and capabilities the organization possesses (Barney, 2001). Multiple studies in this perspective found that firm size has a significant effect on the degree of environmental proactiveness, showing that larger organizations are more inclined to proactively exert environmental practices (Aragón-Correa, 1998; Buysse & Verbeke, 2003; Russo & Fouts, 1997; Sharma, 2000). Research adopting a resource-based perspective generally argues that SMEs only entail a passive approach in environmental management (Torugsa, O'Donohue, & Hecker, 2012). Once SMEs have complied to legal requirements, they have limited resources left to engage in environmental management practices. SMEs are therefore said to be less likely to benefit from the advantages of environmental management. These arguments have led researchers to assume that SMEs' restricted resources impede them from implementing environmental strategies, and that such implementation may even reduce their profitability (Gadenne et al., 2009; Russo & Fouts, 1997; Rutherfoord et al., 2000; Schaper, 2002; Tilley, 1999).

Contrastingly, other studies that adopted a resource-based perspective found that SMEs are able to adopt a proactive attitude towards environmental management, and that this adoption could help create and manage specific resources and capabilities. In turn, this could lead to competitive advantage and better financial performance for SMEs (McWilliams, Siegel, & Wright, 2006). Aragon et al. (2008) and Torugsa et al. (2012) for example argued that SMEs' specific flexible capabilities such as shared vision, strategic proactivity and good stakeholder management mediate the relationship between environmental practices and performance. Jorge, Madueño, Martinez-Martinez, and Sancho (2015) found that environmental practices provide SMEs with another competitive advantage. SMEs' proximity to stakeholders allows them to

transform these practices into strategies which can be used for relational marketing and public image.

Concluding, the resource-based perspective presents us with an ambiguous answer to the question if the SMEs proactive environmental management will lead to performance. A second frequently used perspective to study SMEs behaviour in environmental management is stakeholder theory.

Stakeholder theory is developed as a popular heuristic to clarify the environment of organizations (Mitchell, Agle, & Wood, 1997). From this perspective, the organizational environment, as well as the organization itself, consists of stakeholders. Stakeholder theory addresses the importance of stakeholders in SMEs' development of environmental management (Buysse & Verbeke, 2003). Organizations have to simultaneously take the interest of multiple stakeholders into account in order to develop a successful environmental strategy (Donaldson & Preston, 1995; Freeman & McVea, 2001). The expectations from different stakeholders thereby influence whether and how SMEs engage in environmental practices (Gadenne et al., 2009). In order of importance, stakeholder theory sees customers, the local government, the local community, regulators and employees as the most prominent stakeholders driving SMEs to adopt environmental management systems (Hillary, 2004; Mitchell et al., 1997). Additionally, Gadenne et al. (2009) and Jenkins (2006) found indications that environmental management could benefit performance through reduced transaction costs with stakeholders.

Although these perspectives on SMEs environmental management have enriched literature, taking an institutional perspective would broaden our understanding of the incentives for environmental management by SMEs. The way SMEs conduct environmental management is continuously influenced by institutions. However, relatively few academics have approached the issue from an institutional perspective (Delmas & Toffel, 2004; Lindgreen & Swaen, 2010). The next section will therefore provide a review on the institutional literature so far that elaborates on SMEs and environmental management. From there, hypotheses for this relationship will be drawn.

3.2 Institutional theory

This section discusses relevant prior literature on environmental management in SMEs from an institutional perspective. After elaborating on some of the most significant research contributions in this field, hypotheses are drawn for this research.

3.2.1 Two themes in institutional theory literature

To understand the relationship between environmental management systems and performance in SMEs from an institutional perspective, it is important to understand what incentivizes SMEs to implement such systems. Institutional literature on SMEs and environmental management can generally be grouped into two subthemes: first, one group of researchers discusses the effects that the institutional context has on the adoption of environmental management practices by SMEs. The second group of researchers discussed the subsequent outcomes and effects that environmental management, as a response to the pressures from the institutional context, has for SMEs. These two themes are highly intertwined, as will become apparent in the following discussion.

3.2.2 Drivers for EMS adoption

The first theme in institutional theory focusses on the question why organizations would implement environmental practices. As explained in the previous chapter, research in institutional theory thereby argues that organizations are affected by institutions, which can be divided into three types of pressures. Besides these pressures, various scholars argued that EMS adoption weighs heavily on SMEs resources. External support is therefore argued to be of interest as well. The following sections will give an overview of the relevant drivers for SMEs to adopt an EMS.

3.2.2.1 Regulative pressures

Governments and regulators impose regulative pressures towards the environmental responsibility of organizations via environmental laws and regulations. Multiple scholars found evidence that such regulative institutional pressures are among the most important drivers of the adoption of environmental strategies by organizations. Delmas (2002) for example showed that governments function as a coercive force by actively promoting their approval of ISO 14001 standards by improving the reputation of adopters. Moreover, governmental regulations were the most frequently quoted source of pressures for the adoption of environmental management practices in the study of Henriques and Sadorsky (1996). Wang et al. (2018) argue, in their study on Chinese organizations, that regulative pressures, exerted for the benefit of climate change and environmental quality, stimulate organizations to adopt environmental practices, since the relevant regulative agencies have the ability to punish and sanction non-complying organizations or even deny their existence. A significant number of studies agree on

these findings and conclude that regulative pressures have a clear positive effect on environmental management efforts (Alberini & Segerson, 2002; Ervin, Wu, Khanna, Jones, & Wirkkala, 2013; Henriques & Sharma, 2005; Jones, 2010; Khanna, 2001; Stoeckl, 2004; Delmas & Toffel, 2008). Moreover, other scholars found that organizations are willing to voluntary adopt environmental practices, if this gives them the potential to prevent and influence future environmental regulations (Segerson & Miceli, 1998). The implementation of an EMS could therefore benefit the SME via fewer environmental incidents, reducing the risks of breaking the law and ensuring better relationships with their regulators (Zorpas, 2010). Based on the previous arguments, I hypothesize the following.

H1a: Regulative pressures towards environmental issues positively affect the adoption of an EMS by SMEs.

3.2.2.2 Normative pressures

Apart from regulative pressures, numerous theorists argue that normative pressures from the environment are also influencing SMEs. The prevalence of sustainable activities and environmental management practices in the SMEs direct environment thereby increase normative pressures towards SMEs (Wang et al., 2018). A high degree of such embeddedness will increase the effects of standards and norms on SMEs practices, pushing SMEs beyond regulatory requirements. Nishitani (2001), as well as Delmas and Montiel (2009), found that customers encourage organizations to adopt the ISO 140001 system, since environmentally conscious customers are more inclined to consider buying from organizations with good environmental practices. The study of Khanna and Anton (2002) confirms this, showing that organizations that face more customer pressures are more likely to adopt more comprehensive environmental management systems.

The influence of suppliers and other stakeholders within the industry is also recognized in literature. Organizations are inclined to imitate the behaviour of other organizations that are linked with them through networks (Guler, Guillén, & Macpherson, 2002). SMEs for example face significant pressures from larger organizations in their supply chain, imposing them to adopt appropriate environmental practices, otherwise excluding them from doing business. A proactive orientation will give them a positive advantage over other companies who are slower to react (Jenkins, 2006). Hence, improved image was found to be an important driver for SMEs implementing the EMAS-system (Hillary, 2004). Based on the previous arguments, I hypothesize the following.

H1b: Normative pressures towards environmental issues positively affect the adoption of an EMS by SMEs.

3.2.2.3 Cognitive pressures

Scott (2013) described cognitive pressures as the shared meaning and common beliefs of individual actors in the environment, leading to pressures of perceived correctness of actions. Firstly, SMEs perceive these pressures towards environmental issues from successful competitors in their direct environment, resulting in imitative behaviour: when successful competitors in the direct environment of the SME adopt environmental practices, SMEs are inclined to mimic these practices (Delmas & Toffel, 2010). Competitor pressures can therefore also encourage the adoption of EMS (Bremmers, Omta, Kemp, & Haverkamp, 2007). In addition, the employees of an SME play an important role in the shared beliefs, taken for-granted practices and generally accepted appropriate behaviour of organizations (Geels, 2004). An environmental conscious workforce is therefore likely to influence SMEs' environmental policy. Based on the previous arguments, I hypothesize the following.

H1c: Cognitive pressures towards environmental issues positively affect the adoption of an EMS by SMEs.

Besides these institutional drivers of SMEs environmental management, various types of external support are also argued to be highly significant for SMEs, as will be explained in the following section.

3.2.2.4 External support

The adoption of an EMS can be very costly in terms of both start-up and operating costs. Moreover, the costs associated with certifying an internal EMS, rather than adopting an already existing EMS, may also be subject to significant fixed transaction costs (Johnstone & Labonne, 2009). Hence, SMEs may face legislative regulation to be more burdensome and perceive environmental issues as threats instead of opportunities (Brammer et al., 2012), since regulatory systems and certifications weigh heavily on SMEs resources (Hillary, 2004; Zorpas, 2010). Multiple studies found that costs are therefore the most significant barrier for SMEs to implement environmental management measures (Bendell & Kearins, 2005; Ervin et al., 2013; Johnstone & Labonne, 2009; Jones, 2010; Stoeckl, 2004).

Bianchi and Noci (1998) argue that, when financial resources are scarce, support for environmental initiatives by external stakeholders has a key function in inducing SMEs to introduce environmental management practices. Besides financial resources, environmental activities are highly dependent on employee involvement (Brammer et al., 2012). The implementation of environmental management requires "a complex coordination of human and technical resources and skills" (López-Gamero et al., 2009, p. 3112). SMEs however frequently lack the availability of such human resources (Aragon-Correa et al., 2008; Ciliberti, Pontrandolfo, & Scozzi, 2008). SMEs therefore appear to need support and guidance when dealing with environmental issues (Hillary, 2004), especially for sector specific experiences on environmental problems and management (Perez-Sanchez et al., 2003). As such, the type and amount of support received is expected to matter a great deal in the decision to adopt or certify an EMS (Potoski & Prakash, 2005). Based on the previous arguments, I hypothesize the following:

H2a: External financial support for environmental initiatives stimulates EMS adoption by SMEs.

H2b: External non-financial support for environmental initiatives stimulates EMS adoption by SMEs.

Now that is elaborated on the first theme in institutional literature, which focusses on how institutional influences affect EMS adoption by SMEs, the following section will consider the second theme, which outlines how environmental management practices affect SME performance.

3.2.3 The EMS adoption to performance relation

Various scholars in institutional literature have contributed to the theory that organizations can take a reactive and pro-active strategy in response to the aforementioned institutional pressures concerning environmental issues. A reactive environmental strategy is focused on conformance, thereby complying to regulations and standard industry practices. Organizations could however go beyond regulatory requirements, and adopt a proactive environmental strategy by voluntary implementing environmental management practices (Buysse & Verbeke, 2003; Delmas & Toffel, 2004; McWilliams & Siegel, 2001; Sharma, 2000). Several studies in this field have examined the relationship between environmental management and performance

in SMEs. Institutional theory states that organizational performance is directly linked to the legitimacy an organization receives from the entities in its environment (Díez-Martín et al., 2013; Meyer & Rowan, 1977). The integration of sustainability into their practices could help SMEs establish legitimacy for their organizational operations in the institutional environment (Luken & Stares, 2005; Tilley, 1999). Delmas and Toffel (2010) for example found that governments give their approval of ISO 14001 by enhancing the reputation of adopters. EMS adoption will also enhance customer legitimacy, since customers are more inclined to consider buying from organizations with good environmental practices (Nishitani, 2010). Jenkins (2006) found that SMEs that implement environmental management will have a positive advantage over other companies who do not engage in environmental management, since they will find larger business partners in their supply chain. The adoption of an EMS could thus be viewed as a means to improve the organizations' alignment with environmental issues and is therefore an indicator of a proactive environmental strategy. In conclusion, the adoption of an EMS may yield the SMEs with more legitimacy and subsequently better performance. I therefore hypothesize the following:

H3: The adoption of an EMS will enhance the performance of SMEs.

3.2.4 The institutional context

Since the relationship between EMS adoption and performance of SMEs relies on legitimacy, this relationship might be influenced by the institutional context as well. Multiple studies found indications for such moderating effects. Zhu and Sarkis (2007) for example argued that competitor pressures positively moderate the relationship between green supply chain management and economic performance in Chinese manufacturing organizations, since SMEs mimic the behaviour of successful competitors. Similar results were obtained by Hornsby, Kuratko, Naffziger, LaFollette, and Hodgetts (1994), showing that the degree of employees addressing ethical issues stimulates the effects that CSR activities have on financial performance. From a normative stance, Niehm , Swinney, and Miller (2008) found that the degree of embeddedness of smaller organizations in their community correlates with the relationship between its' CSR-actions and performance. The closer a SME is related to its community, the more environmental practices will contribute to overall performance. The proximity of such ties therefore might indicate a moderating effect.

Alternatively, the study of Aguilera-Caracuel and Ortiz-de-Mandojana (2013) found convincing opposite results for regulative pressures. They showed that stringent environmental

regulations negatively moderate the relationship between green innovation intensity and financial performance in green innovative organizations. Higher regulations will prevent SMEs from obtaining better financial advantages from their green innovations. This may be caused by the SMEs' lack of resources, as referred to in section 3.2.3.

Concludingly, the demandingness and intensity of the institutional context might determine in what degree EMS adoption will yield legitimacy and thus performance, with stronger pressures leading to a stronger relationship. Regulative pressures however differ from normative and cognitive pressures, causing a negative moderating effect. I therefore hypothesize the following:

H4a: Regulative pressures towards environmental issues negatively moderate the effect of EMS adoption on SME performance.

H4b: Normative pressures towards environmental issues positively moderate the effect of EMS adoption on SME performance.

H4c: Cognitive pressures towards environmental issues positively moderate the effect of EMS adoption on SME performance.

3.5 Conceptual model

The hypotheses drawn in the previous sections are presented below in the conceptual model of this research (figure 1). The various institutional drivers together influence EMS adoption (H1a, H1b, H1c). Additionally, the degree of external (non-)financial support is influencing EMS adoption as well (H2a, H2b). EMS adoption in turn is supposed to have a positive effect on the performance of the SMEs (H3). This relationship is however moderated by the institutional context (H4a, H4b, H4c).

As is visualised in the conceptual model, this research contains two endogenous variables. Therefore, two separate analysis will be conducted. The first analysis considers 'EMS adoption' as the dependent variable, whereas the second analysis considers 'Performance' as the dependent variable. This will be further explained in section 4.5.

Figure 3.1: Conceptual model
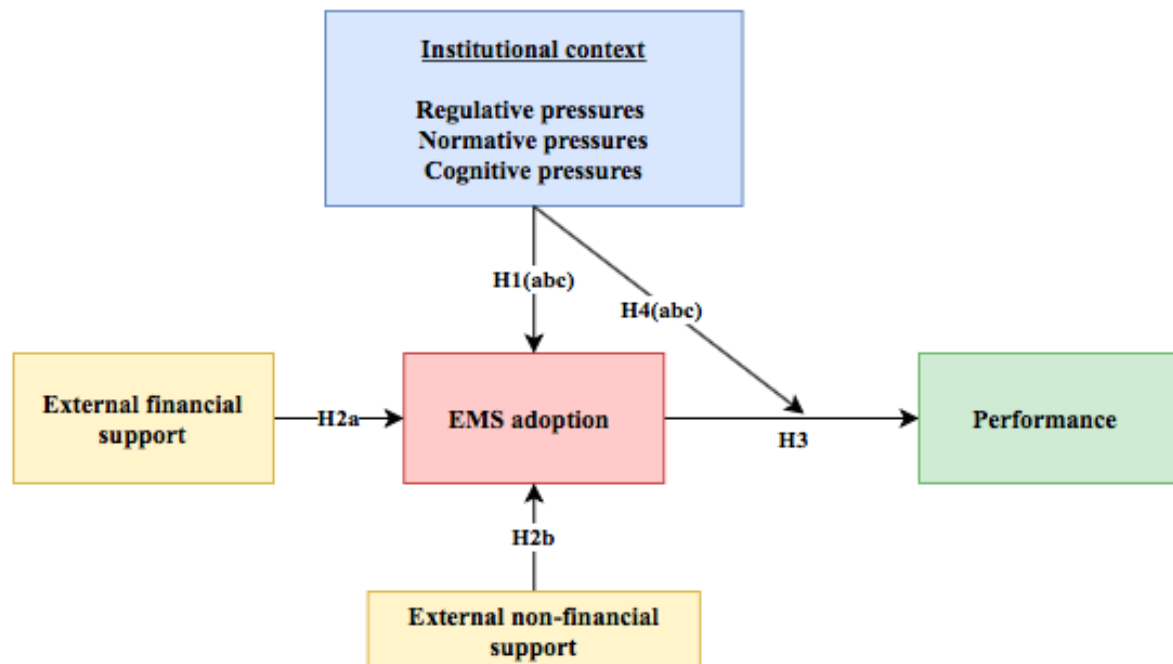
4. Methodology

This chapter comprises the research method used in this study. The research approach is discussed first. Thereafter, the sample and data source are outlined followed by the operationalization of the variables. Subsequently, the statistical approach for the analysis of the data will be explained. The chapter will be concluded by the research ethics and an explanation of the reliability and validity of this research.

4.1 Research approach

The objective of this research is to examine how SMEs' EMS adoption is influenced by the institutional context, and what the relationship is between EMS adoption and performance in SMEs. Data is collected from the Flash Eurobarometer 381 dataset, including information on SMEs, resource efficiency and green markets. Data is analysed using a binary logistic regression as well as an ordinal logistic regression. This way, the different hypotheses of this research can be examined.

4.2 Research sample and data source characteristics

In order to test the hypotheses of this research the dataset Flash Eurobarometer 381: Small and Medium Enterprises, Resource Efficiency and Green Markets (wave 2) was used. These data stem from a survey conducted in 2013 by TNS Political & Social Network, nowadays named Kantar, upon the request of the European Commission Directorate-General for Enterprise and Industry and was coordinated by the Directorate-General for Communication.

Data is collected from a sample of 13.509 European SMEs, employing fewer than 250 employees in the retail, manufacturing, services and industry sector. Apart from the EU-member states, the survey was also carried out in Turkey, the Former Yugoslav Republic of Macedonia, Iceland, Norway, Serbia, Israel, Albania, Montenegro, Liechtenstein and the US, where the same target group was interviewed. Whenever a company was eligible, the selected respondent had to be a general manager, a financial director or a significant owner. All interviews were carried out using the TNS e-Call centre (the centralized CATI system). The sample was selected from an international database, with additional samples from local sources where necessary. Quotas were applied on both company size (using three different ranges: 1-9 employees, 10-49 employees, 50- 249 employees) and sectors (Retail, Services, Manufacturing and Industry). These quotas were adjusted according to the country's universe but were also

reasoned in order to ensure that the sample was large enough in every cell. This approach is consistent across all countries.

4.3 Operationalization of the variables

Multiple items considering green practices, products and services which were included in the Flash Eurobarometer survey are used for the operationalization of this study. An overview of the variables and their operationalization can be found in Appendix 1.

4.3.1 Performance

In order to measure the performance of SMEs, turnover growth was used as the main indicator. This seems to be a good indicator of performance since size is argued to be a positive predictor of organizational survival (Quatraro & Vivarelli, 2015; Wiklund & Shepherd, 2005). For this reason, multiple previous studies used turnover growth to measure SME performance (Edoho & Akinboade, 2015; Lu & Beamish, 2006; McMahon, 2001). This approach therefore seems appropriate for this research as well. Respondents were asked if their company's annual turnover had increased, decreased or remained unchanged over the past two years, resulting in a dependent variable with three categories.

4.3.2 Environmental management systems

To measure the adoption of an EMS, respondents were asked whether they adopted the EMAS, ISO 140001, ISO 14064 (greenhouse gases), ISO 16000 (energy management system), another national or regional EMS or any other EMS. These systems were mentioned specifically, since these are the most common types for environmental management in the business field (Zorpas, 2010). Respondents were allowed to give multiple answers. The variable was operationalized as a dichotomous variable: in case the SME indicated to adopt one or more of the beforementioned systems, the variable was coded with 1. No indication of the adoption of any of the beforementioned EMS options was coded with 0.

4.3.3 Regulative pressures

The SME's perception of regulative pressures was measured using one indicator: compliance to laws and regulations. Multiple studies examined the effects of regulative pressures on environmental management by measuring the influence of enforced legislation and regulations on organizations (Delmas and Montes-Sancho, 2010; Delmas, 2002; Majumdar and Marcus, 2001; Rugman and Verbeke, 1998). A similar measurement was used in this study. Respondents

were asked what the main reasons are for their company to offer green products or services. If the respondent's answer included 'compliance with national, regional or local laws', this indicated the presence of regulative pressures. Vice versa, in case the respondent indicated *not* to offer green products or services, they were asked what the main reasons are for their company *not* to offer green products or services. If the respondent's answers included 'is not relevant in terms of compliance with national, regional or local laws', this indicated that regulative pressures are relevant for SMEs *not* to offer green products or services.

In both cases, a binary variable was computed to indicate the presence of regulative pressures, where '(Is not relevant in terms of) compliance with national, regional or local laws' was indicated with 1, and all other answers with 0. Since combining both items will possibly neutralize the effect of this variable, this research will control for this variable to make sure differences in information between these groups are not lost.

4.3.4 Normative pressures

The SME's perception of normative pressures was measured using two indicators. The first indicator was measured as 'demand from customers', since multiple researchers distinguished customer demand as one of the most important normative pressures (Delmas & Toffel, 2004; Delmas & Toffel, 2008; Khanna & Anton, 2002). Moreover, normative pressures from larger organizations in their supply chain were also identified as relevant (Jenkins, 2006). The studies of Wang et al. (2018) and Zhu and Sarkis (2007) therefore used image as their core measurement of normative pressure from the organization's direct environment. The second indicator of normative pressures was consequently operationalised as 'company's image'. Respondents were asked what the main reasons are for their company to offer green products or services. If the respondent's answer included 'demand from customers' or 'company's image', this indicated the presence of normative pressures.

Vice versa, in case the respondent indicated *not* to offer green products or services, they were asked what the main reasons are for their company *not* to offer green products or services. If the respondent's answers included 'insufficient demand from customers' or 'Does not fit with or is not important for your company's image', this indicated that normative pressures are relevant for SMEs *not* to offer green products or services.

In both cases, a binary variable was computed to indicate the presence of normative pressures. The two beforementioned answers were coded with 1, all other answers with 0. Since combining both items will possibly neutralize the effect of this variable, this research will

control for this variable to make sure differences in information between these groups are not lost.

4.3.5 Cognitive pressures

The SME's perception of cognitive pressures was measured using two indicators. Since the perception of cognitive pressures is reflected in mimicking their successful competitors by organizations (Delmas & Toffel, 2010), the first indicator for cognitive pressures is 'catching up with main competitors'. Additionally, cognitive pressures defined as 'shared meanings and common beliefs' by Scott (2013) are operationalized with the second indicator 'company's core values'. Respondents were asked what the main reasons are for their company to offer green products or services. If the respondent's answer included 'catching up with main competitors' or 'company's core values', this indicated the presence of cognitive pressures.

Vice versa, in case the respondent indicated *not* to offer green products or services, they were asked what the main reasons are for their company *not* to offer green products or services. If the respondent's answers included 'it is not relevant in terms of catching up with main competitors' or 'it is not important to or in line with our company's core values', this indicated that normative pressures are relevant in order *not* to offer green products or services.

In both cases, a binary variable was computed to indicate the presence of normative pressures. The two beforementioned answers were coded with 1, all other answers with 0. Since combining both items will possibly neutralize the effect of this variable, this research will control for this variable to make sure differences in information between these groups are not lost.

4.3.6 External financial support

The reliance on external financial support was measured using three indicators, based on the description of Bianchi and Noci (1998) and Hillary (2004). Respondents were asked which type of external support their company received for the offering of green products or services. When the respondents answer included 'public funding' (grants, guarantees or loans), 'private funding' (bank, investment company or venture capital fund), or 'funding from friends or relatives', the variable was indicated as present. A binary variable was created to indicate the reliance on any of these types of external financial support. The three beforementioned answers were therefore coded with 1, all other answer options with 0. In case the respondents indicated *not* to rely on any type of external financial support at all for their green products or services, all possible responses were re-coded to 0.

4.3.7 External non-financial support

The reliance on external non-financial support was measured using three indicators, again based on the description of Bianchi and Noci (1998) and Hillary (2004). Respondents were asked which type of external support their company received for the production of green products or services. When the respondent's answer included 'advice or other non-financial assistance from public administration', 'advice or other non-financial assistance from private consulting and audit companies', or 'advice or other non-financial assistance from business associations', the variable was indicated as present. A dummy variable was created to indicate the reliance on any of these types of external non-financial support. The three beforementioned answers were therefore coded with 1, all other answer options with 0. In case the respondents indicated *not* to rely on any type of external non-financial support at all for their green products or services, all possible responses were re-coded to 0.

4.4 Control variables

Several control variables are included in the analysis to exclude any effects from these variables on the results. As mentioned in the operationalization of the institutional variables, this research will control for the offering of green products or services by SMEs. In addition, some characteristics on the industry- and organizational-level are included as control variables to exclude any influence from omitted variable bias (Field, 2013). On the organizational level, this research controls for SME age and SME size. Age is a relevant control variable since this research measures performance in turnover growth. Younger organizations might have more potential than older organizations, leading to larger turnover increases in their early years. Additionally, this research controls for SME size, since researchers argued that larger organizations are capable of gaining comparatively greater benefits from environmental practices (Brammer et al., 2012). Apart from these organizational characteristics, differences might occur between sectors. This control variable was therefore also included in the model.

4.5 Approach of Analysis

This research tries to explain multiple relationships between variables as is visualised in the conceptual model of previous chapter. Regression analysis is a solid dependence technique that can provide explanations for such relationships (Field, 2013). The relationships to be examined in this study can be grouped into two sets of models. The first group of models explains the relationships considering 'Performance' as the dependent variable. The second group of models

explains the relationships considering 'EMS adoption' as the dependent variable. Since this research relies solely on categorical data, and multiple independent variables as well as control variables are present in both models, logistic regression seems to be most suitable methods of analysis (Field, 2013). Since 'Performance' is measured on an ordinal scale using three categories, an ordinal logistic regression is most appropriated for testing these hypotheses. For the models considering 'EMS adoption' as the dependent variable, a binary logistic regression is conducted. Both analyses are conducted using IBM SPSS statistics 25. The syntax of the analysis, as well as the data preparation and transformations can be found in Appendix 3. Before the analyses can be conducted, several assumptions and requirements have to be checked regarding the appropriateness of the data. These can be found in the following chapter.

4.6 Research ethics

Since this research relies on the use of secondary data, research ethics concerning the respondents were beyond the control of the researcher. The following conditions were however considered by TNS Political & Social Network when collecting the data. Interviews were held by phone using the TNS e-call centre and held in the respondent's language. This minimized any uncertainties from misunderstandings surrounding the questions. Prior to the interview, respondents were informed about the goal of the interview and ensured that their participation would remain anonymous. Respondents had the opportunity to answer every question with 'don't know' or 'no answer'.

4.7 Reliability and validity

The reliability of a study is expressed in the ability of the measure to produce the same results when the experiment is repeated (Field, 2013). In order to ensure the reliability of the results of this research, the same sample is used for both the binary as well as the ordinal logistic regression analysis. Data is collected by TNS Political & Social Network, nowadays named Kantar, upon the request of the European Commission, which are both renowned entities. The same standardized survey was presented to all respondents, however translated into their own language. The use of quotas guaranteed that all respondent groups were sufficiently present in the sample. Furthermore, detailed attention was paid to missing data. If necessary, data transformations were conducted.

In terms of the validity of the research, a distinction can be made between internal and external validity. Internal validity was established by ensuring that the operationalization of variables was based on previous research. Furthermore, to be able to rely on the validity of this

research' results, assumptions for both analyses are thoroughly checked. External validity was established since the research sample ensures the presence of respondents from all different types of SMEs and countries. This study's large sample thereby contributes to the generalizability of this research (Field, 2013).

5. Results

This chapter gives an elaboration of the results of this research' analyses. First, the descriptive statistics and missing value analysis of the used sample will be discussed. Thereafter, the assumptions and requirements of the binary logistic regression analysis are tested, after which the results of the analysis are presented. Next, the assumptions and requirements of the ordinal logistic regression analysis are tested, followed by the results derived from the ordinal logistic regression analysis. The chapter is concluded by an evaluation of the proportional odds assumption for the ordinal logistic regression analysis.

5.1 Descriptive Statistics and missing values

Prior to the evaluation of the descriptive statistics, a large number of missing values were identified (Appendix 3, table 1). A large part of these missing values occurred due to the routing of the survey. Another part consists of "true" missing values. A missing value analysis is conducted to examine the nature of the missing data and provide the used imputation method. Since the missing data analysis will significantly alter the univariate statistics, these will be discussed after the missing data analysis is performed. From the original sample, 223(1.65%) SMEs had an annual turnover of more than 50 million euros, thereby not meeting the SME-definition as defined by the European Union. These SMEs are therefore deleted from the sample.

5.1.1 Missing value analysis and data transformations

As displayed in the previous section, a significant amount of missing values is present in the data. A large part of these missing values stems from the routing of the Flash Eurobarometer survey. Because of their given answers on previous questions, specific sections of the survey were deliberately not posed to some respondents, consequently not having scores on several items relevant to this research. However, to ensure a representative research sample, a number of data transformation are executed. These data transformations can be found in the SPSS Syntax in Appendix 2 (note that some of the upcoming mentioned survey-questions were not directly relevant for this study and therefore not included in the appendix). The missing data by design and the subsequent transformations concerns the following cases.

The first missing data by design occurred since a total of 12.479 cases had missing values on the 'financial support'-variable and 'non-financial support'-variable. 2962 missing responses stemmed from respondents who indicated not to rely on any type of external support

for the production of their green products and/or services. These respondents were therefore coded as 0 "not mentioned" on the underlying external support variables.

Another part of the displayed missing cases of the support-variables (N=8648) stems from the initial 'green products/services' question. Respondents who do not offer green products and/or services logically also do not rely on any type of external support for the production of these green products and/or services. Since these cases had missing values on the subsequent external support question, and type of support questions, these cases were coded as 0. I control for the 'green_products_services_yesno'-variable, consequently making differences in effects visible in the analysis.

Thirdly, missing values by design occurred since 889 respondents had no valid score on the survey question 'What actions is your company undertaking to be more resource efficient?'. Respondents scoring 'none' (783 respondents) or 'don't know/no answer' (106 respondents) were subsequently not questioned on the EMS adoption item. Since having an EMS is considered to increase resource efficiency (Delmas & Toffel, 2004), respondents answering 'none' were recoded as having no EMS.

The final missing data by design occurred since 869 respondents had no valid score on the 'green_products_services_yesno' variable, consequently not having a valid score on the items regarding the multiple indicators for 'regulative, normative and cognitive institutional context', as well as the 'support context'. These missing values on the 'green_products_services_yesno' variable will be discussed in the next section.

A new examination of the missing values shows that almost all variables show at least some amount of remaining missing data (Table A3.2). Some (control)variables contain a substantial amount of missing data, up to 1034 cases (7.8 percent). Since categorical data are not amenable to imputation because there are no sophisticated measures to estimate for them (Hair, Black, Babin, & Anderson, 2013), and the sample size after these data transformations remained large enough to conduct this research' analyses with, all cases with any missing values were handled using listwise deletion. Listwise deletion was considered the most appropriate method to deal with these missing values, since this method generally handles missing values best, and the reduction of the sample was not producing any problems (Williams, 2015; (Hair et al., 2013). This method resulted in the final sample of 10.262 valid respondents (Table A3.3).

5.1.2 Descriptive statistics of the final sample

The descriptive statistics of this research can be found in Appendix 4. To give a good view on this research' sample, the frequencies and proportions are displayed. A first look at the dependent variable 'Performance' shows that the respondents are quite equally divided throughout the categories (table A4.1): 37.6% of the cases experienced an increase, 28.8% of the respondents experienced no change, and 33.6% experienced a decrease in annual turnover in the past two years. A closer look at the EMS adoption variable shows that almost one-third of the SMEs in the sample has adopted one or more EMSs (30.7%), whereas two-third of the sample has not adopted any type of EMS (69.3%) (table A4.2).

This study's multiple independent variables are of binary nature, having values of 0 or 1. Therefore, a frequency table is presented showing the number of samples for each variable having a value of 1, indicating the presence of the variable (table A4.3). From the institutional context, 19,4% of the SMEs perceive regulative pressures, 53.5% perceive normative pressures and 30.3% perceive cognitive pressures. Additionally, only 2,4% of the respondents rely on financial support, whereas only 4.2% rely on non-financial support. This seems remarkable small at first, but when proceeding to the control variables in Table A4.4, it appears that only 31.3% of respondents produce green products or services at all, making these number a bit more understandable.

Finally, the control variables are displayed in table A4.4. The respondents are roughly equally dispersed in four sector categories. Looking at the size of the SMEs, the sample contains relatively many micro (1 to 9 employees) (4694, 45.7%) and small enterprises (10 to 49 employees) (3660, 35.7%), and less medium-sized (50 to 249 employees) (1908, 18.6%) enterprises. The sample sizes per size-category are however still reasonable. Finally, 31.3% of the SMEs in this study's sample produce green products or services.

Now that the descriptive statistics of this research are examined, it will be interesting to see how the variables relate to each other, and see if this can confirm and explain the proposed hypotheses. A binary logistic regression as well as an ordinal logistic regression analysis will be performed.

5.2 Binary logistic regression

In order to examine the hypotheses of this research that consider 'EMS adoption' as the dependent variable, a binary logistic regression is run. However, before the binary logistic regressions can be conducted, a number of assumptions and requirements are checked.

5.2.1 Binary logistic regression: assumptions

The assumptions that have to be met prior to the binary logistic regression analysis are (1) the presence of a binary dependent variable, (2) linearity of the logit of the dependent variable, (3) independence of errors, (4) absence of multicollinearity, and (5) sample size requirements.

Since the dependent variable is a dichotomous variable, the first assumption is met. The second assumption that has to be met is that any continuous predictor variables must have a linear relationship with the logit of the dependent variable (Field, 2013). Since this research only entails variables of categorical nature, this assumption is not applicable.

The third assumption entails the independence of errors. A violation of this assumption will produce overdispersion in the data. To test for the independence of errors, a Durbin-Watson test is conducted, producing a value of 1,898. Since this value is close to 2, this indicates that the data meets the assumption of independent errors (Durbin & Watson, 1992; Field, 2013).

In order to test for the fourth assumption of multicollinearity, a correlation matrix is run that includes all independent and control variables (table 5.1). The correlation coefficients are based on Spearman's rho, since all variables are of nominal measurement level (Field, 2013). The outcomes of the correlation matrix show no signs of multicollinearity, with the highest coefficient of .352 not approaching the critical value of .80. To test for any other forms of multicollinearity, a linear regression analysis is run to analyse the collinearity diagnostics. The variance inflation factor (VIF) values and tolerance statistic values (table 5.2) showed no values over 10 (VIF) or below 0.1 (tolerance) (Menard, 1995; Myers & Myers, 1990). Therefore, there are no indications of multicollinearity.

Table 5.1: Bivariate correlation matrix

Variables	1	2	3	4	5	6	7	8
1. Sector	-							
2. Size	-.099	-						
3. Age	-.110	.279	-					
4. Green products	.007	.039	.044	-				
5. Regulative pressures	.034	.035	.016	.012	-			
6. Normative pressures	-.021	.034	.025	.228	-.311	-		
7. Cognitive pressures	.004	.023	.023	.190	-.178	.056	-	
8. Financial support	.020	.020	.010	.229	.037	.042	.059	-
9. Non-financial support	.008	.035	.020	.307	.028	.085	.079	.352

Notes: Displayed values: Spearman's correlation coefficients

Finally, several sample size requirements were checked. Hosmer, Lemeshow, and Sturdivant (2000) recommend a total sample size of at least N=400, which is met. Besides the total sample size, the sample size per category of the dependent variable needs to be checked. A minimum of 10 cases per estimated parameter, per category of the dependent variable, is recommended (Hair et al., 2013). Since the dependent variable contains two categories, and this study contains nine independent variables (including control variables), a minimum of 90 cases per category of the dependent variable is required. The smallest group has 3147 cases, consequently meeting this requirement as well.

Since all assumptions and requirements are met, the analysis can confidently be conducted and the results interpreted.

Table 5.2: Collinearity statistics. Dependent variable: EMS adoption.

	Tolerance	VIF
Control variables		
Sector	.981	1.019
Size	.910	1.099
Age	.911	1.098
Green products/services	.816	1.226
Dependent variables		
Regulative pressures	.859	1.164
Normative pressures	.846	1.183
Cognitive pressures	.927	1.079
Financial support	.859	1.165
Non-financial support	.820	1.219

5.2.2 Binary logistic regression: results

In order to test the hypotheses regarding 'EMS adoption' as the dependent variable, a binary logistic regression is conducted. Two models are run, of which the first model only includes the control variables. The second model subsequently includes the main effects stemming from the institutional context variables and external support variables. By adding these predictor variables, any increases in the explanatory power of the model can be perceived, and thus the added value of the predictor variables. The results of both models are presented in table 5.3.

The results-table includes the B, standard error, Wald statistic and the Exp(B). The latter being know and interpreted as the Odds-ratio (Field, 2013). In addition, the Tests of Model Coefficients (OTMC), -2Log Likelihood, Nagelkerke's R-square and Hosmer and Lemeshow's test statistics are displayed to assess each model's overall goodness of fit and improvement compared to the previous model. In case the OTMC is significant, it can be concluded that the model with the included variables is a better fit with the data than the previous model. This is the case for both models (model 1: 925.346, p=.000, model 2: 940.247, p=.000), where a significant OTMC for model 1 means that including the control variables improves the model in comparison to the baseline model, in which only the constant is included. The significant OTMC for model 2 displays an improvement compared to model 1. This is confirmed by the -2Log Likelihood statistic, also called deviance. This statistic shows an, although small, improvement for both models. For the Lemeshow's test, an insignificant test shows that the model fits the data well. Although this is not the case for model 1 (15.556, p=.049), model 2 shows to have a good fit with the data (12.137, p=.145).

Finally, Nagelkerke's R-square is used to assess the explanatory power of the models. Table 5.6 shows that the R-square shows a slight increase based on including the main effects to the model (.122 against .124). This small improvement can be explained by the marginal contribution of the individual main effects, as will become apparent in the next section. It should however be concluded that adding the main effects improves the model.

Model 1 shows that the control variables 'Size' and 'Green products/services' are significant, whereas 'Sector' only shows to have two significant categories. Control variable 'Age' is non-significant throughout all categories.

SME size appears to have an increasing effect on EMS adoption, where small-sized enterprises (10-49) are more inclined to adopt an EMS (B=.664, p=.000) than micro-sized enterprises (1-9). In fact, the odds that a small enterprise adopts an EMS is 1.943 times higher

than for micro-sized enterprises. This effect is even stronger for medium-sized SMEs (B=1.422, p=.000), for whom the odds to adopt an EMS is 4.147 times higher than micro-sized enterprises.

The results of model 1 show in addition that 'Green products/services' is also having a significant effect on EMS adoption (B=.544, p=.000). The odds that SMEs that provide green products or services for their customers adopt an EMS is 1.723 higher than SMEs compared to SMEs that do not provide green products or services.

Finally, there are some differences to be inspected for the control variable 'Sector'. Compared to the reference category 'manufacturing', both the 'retail-'(B=-.277, p=.000) and 'services-'sectors (B=-.390, p=.000) show significant negative effects, where the odds that a retail SME adopts an EMS is 1.319 times lower than for manufacturing SMEs, and for service SMEs even lower (1.477 times). The 'industry' sector shows however no significant differences compared to the reference category.

Model 2 shows the results of the main effects. Regulative pressures appear to be the only significant main effect of the model (B=.147, p=.000). SMEs that perceive regulative pressures are 1.158 times more inclined to adopt an EMS than those who are not perceiving regulative pressures. Therefore, hypothesis 1a is confirmed. Since the effects of normative and cognitive pressures are non-significant (B=.021, p=.663 and B=.090, p=.073), hypotheses 1b and 1c are rejected. For the support-context, merely insignificant effects for external financial support as well as for external non-financial support can be inspected (respectively B=.288, p=.053 and B=.111, p=.339). Therefore, hypotheses 2a and 2b are rejected. Furthermore, all control variables that showed to have a significant effect in model 1 remained their significance in model 2. Now that the effects considering 'EMS adoption' as the dependent variable are examined, the next section proceeds to the effects considering 'Performance' as the dependent variable.

Table 5.3: results of the binary logistic regression analysis. Dependent variable: EMS adoption.

Variables	Model 1				Model 2			
	B	S.E.	Wald	Exp (B)	B	S.E.	Wald	Exp (B)
constant	-1.089	.264	17.004***	.337	-1.141	.266	18.400***	.319
Control variables								
Sector: Manufacturing [a]								
Sector: Retail	-.277	.063	19.589***	.758	-.274	.063	19.177***	.760
Sector: Services	-.390	.065	35.083***	.677	-.397	.065	37.402***	.672
Sector: Industry	.128	.067	3.714	1.137	.120	.067	3.258	1.128
Size: micro (1-9) [a]								
Size: small (10-49)	.664	0.52	161.063***	1.943	.660	.052	158.641***	1.935
Size: medium (50-250)	1.422	.063	512.545***	4.147	1.415	.063	505.551***	4.117
Age: 0-1 [a]								
Age: 2-5	-.378	.268	1.982	.685	-.382	.268	2.022	.683
Age: 6-9	-.473	.268	3.105	.623	-.476	.269	3.141	.621
Age: 10-19	-.313	.263	1.418	.731	-.314	.263	1.427	.730
Age: 20-29	-.195	.264	.548	.823	-.195	.264	.547	.823
Age: 30-39	-.393	.270	2.115	.675	-.398	.271	2.169	.671
Age: 40-49	-.153	.280	.300	.858	-.155	.280	.308	.856
Age: 50+	-.308	.269	1.311	.735	-.318	.269	1.400	0.727
Green products/services: (yes)	.544	0.47	132.022***	1.723	.483	.052	85.043***	1.622
Main Effects								
Regulative					.147	0.060	5.910**	1.158
Normative					.021	.049	.190	1.022
Cognitive					.090	.050	3.224	1.094
Financial support					.288	.149	3.762	1.334
Non-financial support					.111	.116	.913	1.117
Model summary								
OTMC	925.346	.000			940.247	.000		
-2 Log likelihood	11725.782				11710.880			
Nagelkerke's R square	.122				.124			
Hosmer & Lemeshow Chi-square	15.556	.049			12.137	.145		

Notes: *p<.05, **p<.01, ***p<.001. a=reference category.

5.3 Ordinal logistic regression

In order to examine the hypotheses of this research that consider 'Performance' as the dependent variable, an ordinal logistic regression is run. However, before the ordinal logistic regressions can be conducted, a number of assumptions and requirements have to be checked.

5.3.1 Ordinal logistic regression: assumptions

Prior to the ordinal logistic regression, the assumptions of (1) sample size, (2) presence of ordinal level dependent variable, (3) absence of multicollinearity and (4) the presence of proportional odds have to be met (Brant, 1990; Field, 2013; Hair et al., 2013).

First, the sample size requirements are comparable to what was previously tested for the binary logistic regression. Since this analysis uses exactly the same sample as the binary logistic regression, the minimum sample size of N=400 as recommended by Hosmer et al. (2000) is met. The minimum of 80 cases per estimated parameter per category of the dependent variable (one main effect, three interactions effects and four control variables) is met, since the smallest group comprises 2981 cases. In addition, the presence of an ordinal-measured dependent variable is guaranteed since the dependent variable 'Performance' contains the three levels 'Decreased', 'Remained unchanged', and 'Increased'.

In order to test for the third assumption of multicollinearity, a correlation matrix is run, using the independent, moderating and control variables (table 5.4). The correlation coefficients are based on Spearman's rho, since all variables are of nominal measurement level (Field, 2013). The outcomes of the correlation matrix show no signs of multicollinearity, with the highest coefficient of -.311 not approaching the critical value of .80. To test for any other forms of multicollinearity, the assumption is further checked by running a linear regression analysis, after which the collinearity diagnostics are analysed (table 5.5). Variance inflation factor (VIF) values and tolerance statistic values of over 10 (VIF) or below 0.1 are alarming (Menard, 1995; Myers & Myers, 1990). Since the output in table 5.5 shows very good Tolerance- as well as VIF-values, it can be concluded that there are no indications of multicollinearity. The final assumption of presence of proportional odds has to be checked after the analysis is conducted (Brant, 1990).

Table 5.4: Bivariate correlation matrix.

Variables	1	2	3	4	5	6	7
1. Sector	-						
2. Size	-.099	-					
3. Age	-.110	.279	-				
4. Green products	.007	.039	.044	-			
5. EMS adoption	-0.22	.255	.096	.124	-		
6. Regulative pressures	.034	.035	.016	.012	.032	-	
7. Normative pressures	-.021	.034	.025	.228	.032	-.311	-
8. Cognitive pressures	.004	.023	.023	.190	.040	-.178	.056

Notes: Displayed values: Spearman's correlation coefficients

Table 5.5: Collinearity statistics, dependent variable: Performance.

	Tolerance	VIF
Control variables		
Sector	.981	1.019
Size	.857	1.167
Age	.911	1.098
Green products/services	.808	1.237
Dependent variables		
EMS adoption	.918	1.090
Regulative pressures	.858	1.165
Normative pressures	.846	1.183
Cognitive pressures	.927	1.079

5.3.2 Ordinal logistic regression: results

The results of the ordinal logistic regression analysis are shown in table 5.6. Several models are run to test for the various hypotheses that consider 'Performance' as the dependent variable. Model 1 primarily only includes the control variables. Model 2 subsequently adds the single predictor variable 'EMS adoption' to the model. Finally, three models (model 3-5) are run whereby the moderating effects of the institutional context are included separately.

The results table includes the b-values and standard errors for the variables. In addition, a model summary is given that includes Nagelkerke's R-square and the -2Log likelihood statistic with the corresponding Chi-square test of the model. Nagelkerke's R-square serves to provide us insights in the model explanatory value (model fit to the data). It can be interpreted as the total percentage of the dependent variable explained by the whole model. The -2Log likelihood statistic gives us an indication of how well the model fit predicts the data. The related Chi-square test subsequently tells us how well the model predicts the data compared to the base-line model of the coefficient only. A significant Chi-square test indicates an improvement in this prediction (Field, 2013).

Finally, the Pearson's Goodness-of-fit test is included in the results table. Interpretation of this test should however be done carefully, since the chi-square test is very sensible for large samples and empty cells. When the sample size is large, the chi-square test is likely to be significant. Setting a lower p-value is therefore desirable. In addition, in case the model relies on multiple nominal or categorical level predictors, many empty cells might appear in the contingency table (Meade, Johnson, & Braddy, 2008). After running the models, the aforementioned is indeed happening with the data. All of the models contain a substantial

number of cells with zero frequencies: model 1 has 34 (6,1%), model 2 has 112 (10,3%), model 3 has 386 (19,2%), model 4 has 355 (17,2%), and finally model 5 has 357 (17,2%) cells with zero frequencies. Despite the limitations, model 3 (p=.137) and model 5 (p=.151) still show non-significant goodness-of-fit tests, indicating a good model fit. The Pearson's Goodness-of-Fit Chi-square test is therefore still included, but should be careful interpreted.

The base-model (model 1) only included the control variables. The model has an explanatory power of .087 (Nagelkerke's R-square) and a significant Chi-square test result of 821.608. Roughly all control variables have a significant contribution in predicting the dependent variable. SMEs in the services-sector perform significantly better than SMEs in the industry business (b=.167, p=.000). Differences in the manufacturing and retail sector were however non-significant. Furthermore, SME size has a clear contribution to performance. Small-sized SMEs perform significantly better than micro-size SMEs (b=.578, p=.000). This effect is even stronger for medium-sized SMEs compared to micro-sized SMEs (b=1.052, p=.000).

Age seems to have a negative effect on performance, showing that older SMEs almost consistently have a significantly worse performance than younger SMEs. This looks odd at first sight, but can be explained by the fact that performance is measured in turnover growth, and the reference category consists of SMEs of 0-1 years. It is plausible that turnover growth of the other categories will always be lower than those SMEs that just started doing business, because their turnover will always grow in the first years.

Finally, SMEs that provide green products or services to their customers perform significantly better than SMEs who do not (b=.261, p=.000). These control variables remain to be significant in the following models.

Model 2 subsequently adds the predictor variable, 'EMS adoption', to the model. The model summary statistics indicate that this model does not have a higher explanatory power than the base model (Nagelkerke's R-square=.087). Furthermore, the significant Chi-square test result of 822.223 (p=.000) is barely higher than the previous model, indicating no improvement in model fit. This can be explained by examining the single predictor variable that was added (EMS adoption), which has no significant effect on the prediction of the outcome variable (b=.023, p=.581). This surprisingly means that in general, SMEs that adopt an EMS do not performance significantly better or worse that SMEs that do not adopt an EMS. Hypothesis 3 is therefore rejected.

Model 3 adds the moderating effect of regulative pressures to the model. Again, the model summary statistics indicate that this model does not have a higher explanatory power

than the previous model (Nagelkerke's R-square=.087), and the model fit to the data has barely improved (Chi-square = 822.223, p=.000). The interaction effect between 'EMS adoption' and 'regulative pressures' has no significant effect (b=.029, p=.535). This means that the relationship between EMS adoption and performance of SMEs is not moderated by regulative pressures. Hypothesis 4a is therefore rejected.

Model 4 again comprises the control variables and predictor variable, but this time includes the moderating effect of normative pressures to the model. Unfortunately, this model has not improvement in explanatory power (Nagelkerke's R-square =.087), and that the model fit to the data has, although significant, barely improved (Chi-square=823.505, p=.000). The interaction effect between 'EMS adoption' and 'normative pressures' consequently is non-significant (b=.014, p=.842). This means that the relationship between EMS adoption and performance of SMEs is not moderated by normative pressures. Hypothesis 4b is therefore rejected.

The final model 5 tests hypothesis 4c that predicts that the relationship between EMS-adoption and performance of SMEs is moderated by cognitive pressures. The model summary statistics indicate different results than encountered in the previous models. The model's explanatory power, although small, is improved (Nagelkerke's R-square =.088), and there is also a moderate improvement in the model's chi-square test (831,180), indicating that the model gives a significant better prediction of the data than the previous models. Finally, Pearson's Goodness-of-fit test, although previously labelled as unreliable, is still non-significant. An examination of the moderating effect of cognitive pressures shows us that this effect is significant (b=.194, p=.000). This tells us that there is, in contrast to the previous estimated effects, an interaction effect occurring between EMS adoption and cognitive pressures on SMEs performance. SMEs that adopt an EMS will therefore perform better than SMEs that do not adopt an EMS, but that this effect is only significant for SMEs that perceive cognitive pressures from their environment. Hypothesis 4c is therefore confirmed.

Table 5.6: results of the ordinal logistic regression. Dependent variable: 'Performance'.

Variables	Model 1 B	S.E.	Model 2 B	S.E.	Model 3 B	S.E.
Control variables						
Sector: Industry [a]						
Sector: Manufacturing	.045	.058	.046	.058	.045	.058
Sector: Retail	-.017	.053	-.015	.053	-.016	.053
Sector: Services	.167**	.055	.169**	.055	.169**	.055
Size: micro (1-9) [a]						
Size: small (10-49)	.578***	.042	.575***	.043	.575***	.043
Size: medium (50-250)	1.052***	.055	1.045***	.057	1.046***	.057
Age: 0-1 [a]						
Age: 2-5	-.459	.245	-.459	.245	-.458	.245
Age: 6-9	-.870***	.245	-.869***	.245	-.868***	.245
Age: 10-19	-1.350***	.242	-1.350***	.242	-1.350***	.242
Age: 20-29	-1.706***	.243	-1.707***	.243	-1.706***	.243
Age: 30-39	-1.605***	.247	-1.604***	.248	-1.604***	.248
Age: 40-49	-1.831***	.256	-1.831***	.256	-1.831***	.256
Age: 50+	-1.644***	.247	-1.643***	.247	-1.643***	.247
Green products/services: (yes)	.261***	.040	.259***	.041	.260***	.041
Main effect						
EMS adoption			.023	.042	.029	.047
Moderating effects						
Regulative*EMS-adoption					-.041	.082
Normative*EMS-adoption						
Cognitive*EMS-adoption						
Model summary						
Nagelkerke' R square	.087		.087		.087	
-2log likelihood	1732,088		2774,774		4057.527	
Chi-square	821,608***		821,912***		822.223***	
GOF Pearson Chi-square	454,938***		807,025**		1376,265	

Notes: *p<.05, **p<.01, ***p<.001. a=reference category.

Table 8 (continued): results of the ordinal logistic regression. Dependent variable:

Variables	Model 4 B	Model 4 S.E.	Model 5 B	Model 5 S.E.
Control variables				
Sector: Industry [a]				
Sector: Manufacturing	.046	.058	.047	.058
Sector: Retail	-.014	.053	-.014	.053
Sector: Services	.168**	.055	.169**	.055
Size: Micro (1-9) [a]				
Size: small (10-49)	.576***	.043	.574***	.043
Size: Medium (50-250)	1.046***	.057	1.046***	.057
Age: 0-1[a]				
Age: 2-5	-.457	.245	-.469	.245
Age: 6-9	-.866***	.245	-.878***	.245
Age: 10-19	-1.346***	.242	-1.359***	.242
Age: 20-29	-1.703***	.243	-1.714***	.243
Age: 30-39	-1.601***	.248	-1.614***	.247
Age: 40-49	-1.826***	.256	-1.844***	.256
Age: 50+	-1.640***	.247	-1.657***	.247
Green products/services: (yes)	.266***	.042	.237***	.041
Main effect				
EMS adoption	-.015	.061	0.017	.050
Moderating effects				
Regulative*EMS-adoption				
Normative*EMS-adoption	.014	.068		
Cognitive*EMS-adoption			.194**	.072
Model summary				
Nagelkerke's R Square	.087		.088	
-2log likelihood	4361,038		4272,873	
Chi-square	823,505***		831,180***	
GOF Pearson Chi-square	1466,291*		1415,961	

Notes: *p<.05, **p<.01, ***p<.001. a=reference category

5.3.3 The assumption of proportional odds

The final assumption of the ordinal logistic regression analysis is the assumption of proportional odds. Since the dependent variable of this analysis is of ordinal nature, the ordinal regression analysis will create different intercept terms for every threshold of the dependent variable, where every threshold represents a level and all levels below. The assumption of proportional odds entails that the effects of the explanatory variables are consistent across the different thresholds of the constant. In other terms, the explanatory variables have the same effect on the odds regardless of the threshold (Brant, 1990). SPSS tests for this assumption with the 'test of

parallel lines'. In this test, an ordinal model that contains one set of coefficients for all the thresholds is compared to a model with a separate set of coefficients for each threshold value. If the latter model is a significantly better fit to the data, the assumption of proportional odds is violated.

The test of parallel lines appears to be significant (p=.000) for all five models of this study. Therefore, the assumption of proportional odds is violated. This is however no surprise since the assumption is said to be obsolete and therefore almost always violated (O'Connell, 2006), especially when the model contains a large number of explanatory variables (Brant, 1990) and the sample size is large (Clogg & Eliason, 1987), as is the case in this study. Nevertheless, another method can be used from which the assumption still can be tested by using separate logistic regressions that compare the odds for every threshold level.

According to the method of Brant (1990), separate logistic regressions are conducted for the different threshold levels of the dependent variable 'performance', namely 'turnover increased' and 'turnover unchanged and above'. This way, the consistency of the odds ratios between the different levels can be examined. The tests are again repeated for every model. In addition, ordinal logistic regressions are performed for all levels of the explanatory variables individually, to separately check for the test of parallel lines for every explanatory variable. The results of both tests are displayed in Appendix 5.

An examination of the output in Appendix 5 reveals that only one category of one predictor variable has a significant value (control variable sector, category retail, p=.000) on the separate test of parallel lines. In addition, the beta-coefficients of this variable vary across the threshold levels, indicating differing odds for the various levels of the outcome variable. Sector type therefore is likely to be the main reason why the overall test of parallel lines for proportional odds is rejected. The variable should therefore be careful interpreted. All other predictor variables show non-significant p-values. Control variable 'age' is however showing some slightly disturbing p-values, but still of a minimum value of p=.005. In addition, the odds ratios of 'age' are somewhat dispersed. However, these values are not alarming. The odds ratios and p-value for 'green products or services' are showing no problems (Brant, 1990). Moreover, all main effects and moderating effects show highly non-significant p-values on the test of parallel lines. It can therefore be concluded that the assumption is met and the results of the ordinal logistic regression analysis can be interpreted with confidence.

6. Discussion and conclusions

This research aims to shed light on the influence that the institutional context has on SMEs regarding their adoption of environmental management systems. Furthermore, the effect that EMSs have on SME performance is evaluated. The previous chapter showed interesting results from the outcomes of the analyses. These results will be further interpreted and discussed in this chapter. Thereafter, a conclusion and answers to the main research questions will be given. This chapter finally describes the theoretical and practical implications, as well as this research' limitations and suggestions for future research.

6.1 Interpretation of results: the drivers of EMS adoption

The binary logistic regression analysis provided some interesting results. I observed that one of the five suggested relationships between EMS adoption and the institutional and support context seems to be significant. Only regulative pressures appear to have a significant effect on EMS adoption by SMEs. All other hypotheses are rejected, as will be outlined in the upcoming sections.

The results show that regulative pressures such as national, regional or local laws and regulations are having a significant effect on the adoption of an EMS by SMEs, thereby confirming hypothesis 1a. This finding supports the outcomes of previous research that already identified the influence of governmental regulations, laws and other regulative agencies as being among the most important drivers of environmental management practices for their coercive and sanctioning force (Henriques & Sadorsky, 1996; Delmas, 2002; Wang et al., 2018; Zorpas, 2010). Although these outcomes concerning regulative pressures are in line with the expectations of this study, other significant effects of normative pressures as well as cognitive pressures from the institutional context appear to be absent, as will be outlined next.

Previous studies found that customer demand towards the provision of green products stimulates the adoption of an EMS (Khanna & Anton, 2002). Even more specific, Nishitani (2001) and Delmas and Montiel (2009) showed that customers are more likely to buy products from companies that adopted the ISO 14001 standards. However, in this research, no significant relationship was found between the perception of normative pressures and the adoption of an EMS by SMEs. The results of this research therefore do not provide enough evidence to confirm hypothesis 1b and can thus not join the outcomes of previous research. With regards to cognitive pressures, the results of the analysis show that these pressures also do not have any significant influence on EMS adoption by SMEs. Although previous studies showed findings

that the company's core values as well as the behaviour of successful competitors influence SMEs to adopt an EMS (Bremmers et al., 2007; Delmas & Montiel, 2010), these findings are not confirmed in this study. It should however be noted that this effect was approaching the confidence interval of 95% (p=.073). Although no conclusions can be draw on these findings, this is remarkable and would therefore be an interesting starting point for further research.

The foremost explanation of the beforementioned results is that the coercive mechanisms of regulative pressures, such as economic fines or the ability to even close an organization, outweigh normative and cognitive pressures which do not have any direct financial consequences, but mainly consequences in the form of legitimacy sanctions (Berrone, Fosfuri, Gelabert, & Gomez-Mejia, 2013). Another possible explanation for the lacking normative and cognitive influence of environmental issues on SMEs and EMS adoption might be their relatively small size. SMEs receive less pressures compared to similar larger organizations in the same sector (Johnstone & Labonne, 2009). Larger organizations might therefore act as lighting rods for SMEs. Roberts (2003) as well as Rowley and Berman (2000) for example argued that environmental activists focussed on Nike, McDonalds's, Starbucks and Home Depot partly because they are market leaders in their sector. Zyglidopoulos (2002) adds to this argument that SMEs are frequently less internationally orientated, thereby being less exposed to different pressures at all. A final explanation for the lacking perception of institutional pressures by SMEs is their managerial attitude. The values and attitudes of (top)managers are a main factor in organization's behaviour and development (Perez-Sanchez et al., 2003). Ervin et al. (p. 402, 2013) argued that organizations in general are more inclined to adopt environmental management practices if upper management "has a positive attitude toward environmental stewardship and management believes that more intensive efforts will provide competitive advantage". On the contrary, multiple scholars have shown that SMEs' managers or company culture in general hold a negative attitude towards EMSs, thereby not having a climate that is open for influences from outside to be more environmentally aware (Cassells & Lewis, 2011; Jansson, Nilsson, Modig, & Hed Vall, 2017; Williams & Schaefer, 2013). This could mean that, although institutional pressures are present, SMEs hold a repellent attitude towards their influence, and stubbornly do not adopt any forms of environmental management.

EMS adoption is considered in literature to be weighing heavily on SMEs' resources (Hillary, 2004; Johnstone & Labonne, 2009; Zorpas, 2010). As a result, multiple scholars argued that varying types of financial and non-financial support for SMEs would foster EMS adoption

(Bianchi & Noci, 1998; Potoski & Prakash, 2005). In this study's sample of 10262 respondents, only 239 SMEs (2,3%) received financial support, and 422 SMEs (4,2%) received non-financial support for their green initiatives. An important note is that out of this study's sample, 3208 SMEs (31.3%) offered green products or services. From this group, 7.45% received financial support, and 13.15% received non-financial support. The results of the analysis also show that both financial as well as non-financial support do not have a significant effect on EMS adoption. A possible explanation for the absence of external support for green initiatives in SMEs could be that SMEs, and their investors, believe that the high fixed costs of those activities associated with EMS adoption and certification still don not outweigh the potential legitimizing benefits (Hillary, 2004; Zorpas, 2010). Financial support reached a nearly significant value of p=.053 within the confidence interval. Strictly speaking, the hypothesis is therefore not confirmed. The outcome is however remarkable and would be an interesting starting point for further research.

Finally, large differences in EMS adoption occur between micro, small and medium-sized SMEs. Significant results were found that show that the larger SMEs are much more inclined to adopt and EMS compared to smaller SMEs. This finding contributes to the theory of Darnall, Henriques, and Sadorsky (2010) and shows that even within the group of SMEs, differences in environmental practices occur between micro-, small- and medium-sized enterprises.

The previous findings provided insights in the institutional and external support drivers of EMS adoption by SMEs. The second part of the analysis has further examined the effects that the adoption of an EMS has on the performance of SMEs, and how this relationship is moderated by the institutional context. A discussion on the interpretation of these results will be given in the next section.

6.2 Interpretation of results: EMS adoption and performance

The ordinal logistic regression analysis provided interesting insights in how EMS adoption stimulates SME performance. The outcomes of the analysis revealed that only one out of four suggested hypotheses is confirmed. Surprisingly, EMS adoption on its own does not have a significant effect on performance. However, cognitive pressures appear to have a moderating effect on the relationship between EMS adoption and performance of SMEs: EMS adoption is only having a positive effect on performance in case the respondents perceive cognitive pressures from their environment, as will be discussed next.

First of all, it appears that EMS adoption on its own is not benefiting the performance of SMEs. Various researchers have stated that the implementation of environmental practices would improve the legitimacy of SMEs, thereby directly increasing performance (Díez-Martín et al., 2013; Luken & Stares, 2005; Meyer & Rowan, 1977; Tilley, 1999). The results of this research' analysis however show no support for this hypothesis.

In addition to this direct effect, several moderating effects on the EMS adoption to performance relationship were examined. Contrary to the hypotheses of this study, regulative pressures and normative pressures appear not to be moderating the effect that EMS adoption by SME has on their performance. I expected that the presence of regulative pressures would negatively moderate this relationship due to SMEs' slack resources which would outweigh potential benefits of EMS adoption (Aguilera-Caracuel & Ortiz-de-Mandojana, 2013). Such regulations were hypothesized to be too restrictive, not providing the SME with improved gains from the implementation. However, the results do not confirm this hypothesis. This could have several reasons. Firstly, since SMEs are relatively small, they face less regulatory scrutiny compared to larger organizations (Hillary, 2004). Adding to that, although the adoption of EMSs could be viewed as proactiveness regarding the environment, the ISO 14000 standard-family does not demand organizations to act beyond respecting governmental regulations (Christmann & Taylor, 2001). Current environmental regulations might therefore not be as stringent for every SME as expected. Subsequently, regulative pressures will currently not be of such heavy nature that EMS adoption is required, and will therefore also not yield any rewards or "punishments". Another explanation could be that, although Delmas (2002) showed that governments function as a coercive force by actively promoting their approval of ISO 14001 standards by improving the reputation of adopters, this does not lead to clear tangible benefits for SMEs.

Although pressures from normative institutions were expected to matter a great deal in moderating the relationship between EMS adoption and performance, no significant effect was found. This is surprising, since literature provided several indications suggesting that the adoption of an EMS would have a stronger effect on performance when the SME was strongly embedded in the community (Niehm, Swinney & Miller, 2008), or when SMEs mimic the environmental behaviour of other organizations in their supply chain network (Guler et al., 2002). Such ties however appear not to entail any legitimizing benefits in this study's results. Mueller, Dos Santos, and Seuring (2009) came up with a possible explanation. From the different types of EMSs and standards, SMEs are inclined to adopt the ones with the lowest exigencies. This strategy however jeopardizes the reputation of environmental systems and

standards, and mitigates the long-term trust in them from stakeholders such as consumers and suppliers. From a business point of view, any efforts for environmental management will therefore not lead to benefits for SMEs.

Finally, the analysis provided the result that the effect that EMS adoption has on performance is moderated by the presence of cognitive institutions. This outcome supports the arguments for SMEs that showing comparable environmental behaviour like their successful competitors is beneficial for performance (Zhu & Sarkis, 2007), and that employees have a significant contribution in the effectiveness of environmental management (Hornsby et al., 1994). Employees are presumably better motivated when their organization shows serious environmental efforts.

Based on the results, I conclude that EMS adoption only has a positive effect on performance when the company's core values are aligned with environmental values, or when the SMEs direct competitors also are engaging in environmental practices. The latter could however be explained by the fact that, when many competitors also rely on environmental practices, the environmental debate is highly present in the industry or sector. When an SME is located in a "green" sector, the SME is by definition expected to have some forms of environmental practices. This would therefore be an interesting starting point for future research.

6.3 Conclusion

In the last few decades, the awareness of environmental issues by governments, policy makers, advocacy groups, organizations and society as a whole has emerged rapidly (Banerjee, 2002; Elkington, 2013; Gadenne et al., 2009; Haffar & Searcy, 2019). Organizations are therefore increasingly expected to account for the environmental consequences of their business activities (Banerjee, 2002; Porter & Kramer, 2006). Despite their significant contribution to environmental pollution of an estimated 64 to 70%, many SMEs believe that "environmental issues are global in nature, and therefore beyond their ability to resolve" (Johannson, 1997, p. 9). According to Merritt (1998), this is the reason why current environmental awareness and practices of SMEs differ significantly from larger organizations. Although research has applied a variety of perspectives to study SMEs' engagement in environmental practices, relatively few academics have approached the issue from an institutional perspective (Delmas & Toffel, 2004; Lindgreen & Swaen, 2010). The aim of this research was therefore to get a better understanding of the institutional context of environmental issues that surrounds SMEs and their use of

environmental management systems, and whether environmental management systems could benefit SMEs. This research therefore attempted to find an answer to the following research questions:

(1) *What is the influence of institutional pressures towards environmental issues on SMEs' adoption of environmental management systems?*

(2) *Could the use of environmental management systems enhance SME performance?*

In order to examine both questions, this research specified environmental practices and standards via a focus on various environmental management systems. Multiple pressures from different institutions were examined. Surprisingly, SMEs are not influenced by normative and cognitive institutions to adopt forms of environmental management systems, neither does external support contribute to this. Nevertheless, it was identified that SMEs are influenced by regulative pressures to adopt an EMS. Although these regulative pressures do have an effect on the EMS adoption by SMEs, they do not have any significant (dis)benefits in terms of performance. Vice versa, although cognitive pressures are currently not a reason for SME to adopt an EMS, when present, will strengthen the effect that the EMS has on performance. This therefore hides an interesting opportunity for SMEs in practice, as will be discussed in section 6.5.

6.4 Theoretical contributions

The outcomes of this study answer in a few ways to the demand for more institutional-perspective research in environmental management literature. First of all, knowledge about SMEs and their environmental efforts is extended by specifying which institutional pressures SMEs are sensitive to, and which are not directly of influence. Furthermore, this research increases the theoretical understanding of CSR in smaller businesses, thereby contributing to a more comprehensive understanding of the business world's engagement with the environment (Lindgreen & Swaen, 2010; Murillo & Lozano, 2006; Thornton & Byrd, 2013; Williamson et al., 2006). By using a quantitative dataset that comprised data of a significant amount of all types of SMEs, the generalizability of the results was increased. Additionally, this research revealed the relevance of environmental management for the business case of SMEs. The outcomes of this research therefore contribute to strategic management literature, as it points

out under which conditions environmental management could be beneficial for SMEs in order to receive legitimacy from their environment.

6.5 Practical implications

The outcomes of this research have some valuable implications for SMEs in practice, as it helps SMEs understand their institutional context in terms of environmental issues and improve their responsiveness towards them. First of all, it turns out that although SMEs feel pressures from regulative institutions to engage in environmental management, these institutions will not yield them with significant benefits for such engagement. Nevertheless, although not being a self-contained reason for the adoption of EMSs by SMEs yet, the presence of cognitive institutions does in fact improve the effect that EMS adoption has on performance. Based on the results of this research, an advice towards SMEs would be not to engage in more environmental practices than legally required, unless cognitive institutions such as employees, business culture and successful competitors are highly environmental orientated. SMEs should therefore be actively aware of such signals from their institutional environment, as a strategic response could lead to an increased performance.

A noteworthy remark is that this study primarily focussed on the economic performance of SMEs, and the benefits of environmental management in this sense. Although relevant for the business case of SMEs, EMSs are initially designed to help organizations reduce their carbon footprint and reduce waste, thereby improving our planet and stop climate change. This is and should always be the primary consideration for SMEs for the implementation of environmental management systems.

6.5 Limitations and suggestions for future research

This research contains several limitations which offer new opportunities for future research. The first limitation concerns the use of secondary data. Although the use of already collected data has positive implications in terms of objectivity, it brought some difficulties to the research. First of all, the researcher was limited in the inclusion of variables. It would be interesting to include factors as economic rationality and other measures of performance to the researched model. Future research therefore might build further on this study and include those factors to get a more comprehensive picture of the drivers and outcomes of environmental management in SMEs. Another downside of the use of secondary data lies in the operationalization of variables, which could not be as precisely specified as desired. Although the operationalization is mainly based on previous research, the validity of the measurement

could be improved. All independent variables were measured as 'reasons to produce green products or services'. A more specific operationalization that measured the institutional and support variables as 'reasons to adopt an environmental management system' could for instance benefit the validity of this research. Furthermore, nearly all variables relied on a single indicator. Although this improves the comprehensibility of the measurement, the inclusion of more indicators per variable would improve the reliability of each variable. A third limitation of the used dataset was that some transformations had to be made. Although these transformations were necessary for the benefit of a representable sample, this could give a distorted picture of the measurement of the external support variables. Finally, due to the design of the survey, all variables are of categorical nature. The inclusion of more continuous variables could improve the research quality, by providing more detailed information of the sample.

A second limitation of this research can be found in the topicality of the data. Since this study used data that was collected in 2013, and sustainability is still a hot topic in practice, changes might have occurred in the figures concerning environmental management and SMEs in the very recent years. The use of more recent data would therefore be useful for future research.

A third limitation of this research concerns the used method of analysis. Since the researcher chose for the combination of a binary and an ordinal logistic regression, this produced multiple isolated results. The use of a path-dependent analysis technique could however multiply the effects found, thereby giving a more realistic picture of the relationships between the variables (Hair et al., 2013). For this reason, path modelling analysis is a preferred statistical tool for success factor research (Albers, 2010). Due to the categorical nature of this research' variables, a path analysis was however not appropriate for this research (Henseler, Hubona, & Ray, 2016). Future studies could nevertheless benefit from this technique.

The fourth encountered limitation is that this research relies on quantitative data, not being able to delve deeper in the specific arguments of perception of SMEs. Future qualitative research could therefore significantly contribute with more in depth results, and could find more explanations in the 'why' and 'how' of environmental management in SMEs. A suggestion for future research would therefore be to design a new study with a more appropriate operationalization of variables and method of analysis and to collect quantitative and qualitative data simultaneously.

Finally, the outcomes of this study reveal a promising starting point for future research. The results showed that cognitive pressures towards environmental issues moderate the relationship between EMS adoption and performance in SMEs. Interestingly, the analysis in

addition showed an almost significant result that cognitive pressures also motivates SMEs to adopt an EMS. This could be further examined by future research by taking an in-depth approach, specifically targeting the institutions that exert these pressures. Furthermore, next to EMS-adoption and turnover-growth, other measures of environmental management as well as performance could be examined to extend the findings of this study.

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Appendix 1: Operationalization

Variables	Indicators (related survey question)
Performance	Over the past two years, has your company's annual turnover increased, decreased or remained unchanged? -Increased -Decreased -Remained unchanged -Not applicable -Don't know / No answer
Adoption of environmental management systems (EMS adoption)	Does your company use one or more of these environmental management systems? 1) EMAS (Environmental Management and Audit System) 2) ISO 14001 3) ISO 14064 (greenhouse gases) 4) ISO 16000 (energy management system) 5) A national or regional environmental management system 6) Other (not read out) 7) None (not read out) 8) DK/NA
Regulative pressures	What are the main reasons why your company offers green products or services? 1) (Is not relevant in terms of) compliance with national, regional or local laws.
Normative pressures	What are the main reasons why your company offers green products or services? 1) (Is not relevant in terms of) demand from customers 2) (Is not relevant in terms of) company's image
Cognitive pressures	What are the main reasons why your company offers green products or services? 1) (Is not relevant in terms of) company's core values 2) (Is not relevant in terms of) catching up with main competitors
External financial support	Which type of external support does your company get for the production of its green products or services? 1) Public funding (grants or guarantees or loans)

	2) Private funding (from a bank, investment company or venture capital fund)
	3) Funding from friends or relatives
External non-financial support	Which type of external support does your company get for the production of its green products or services?
	1) Advice or other non-financial assistance from public administration
	2) Advice or other non-financial assistance from private consulting and audit companies
	3) Advice or other non-financial assistance from business associations
Control variable: Green products or services	Does your company offer green products or services?
	1) Yes
	2) No, but we are planning to do so in the next 2 years
	3) No, and we are not planning to do so
	4) DK/NA
Control variable: Age	How long has your company been in business (years)?
	1) 1 year and less
	2) 2-5 years
	3) 6-9 years
	4) 10-19 years
	5) 20-29 years
	6) 30-39 years
	7) 40-49 years
	8) 50+ years
	9) DK/NA
Control variable: Size	How many employees does your company have?
	1) 1 to 9 employees
	2) 10 to 49 employees
	3) 50 to 249 employees
	4) DK/NA
Control variable: Sector	NACE CODE
	1) Manufacturing (NACE category C)
	2) Retail (NACE category G)
	3) Services (NACE categories I/J/K/H/L/M)
	4) Industry (NACE categories B/D/E/F)
	5) DK/NA

Appendix 2: SPSS Syntax

* Encoding: UTF-8.
* Encoding: .
* Thesis Mark Smelt – 2020-2021.
* Created November 5, 2020.

*----------------------------------DATA TRANSFORMATIONS----------------------------.
* Delete irrelevant variables.
delete variables studyno TO serialid.
delete variables split.
delete variables scr10a TO scr10b.
delete variables scr11.
delete variables scr15.1 TO scr15.4.
delete variables q1.
delete variables q2a.1 TO q2b.10.
delete variables q2t.1 TO q2t.8.
delete variables q3a.1 TO q7.
delete variables q9 TO q16.10.
delete variables q18.1 TO q21.
delete variables q23.1 TO q23.15.
delete variables q26 TO wex.

*Rename relevant variables.
rename variables (q2t.9=No_resource_efficient_actions)
(q2t.10=Unknown_resource_efficient_actions).
rename variables (scr10t =Company_size).
rename variables (naceb=Sector_category).
rename variables (scr12=Company_age) (scr13=Performance).
rename variables (q8.1=EMS_EMAS) (q8.2=EMS_ISO14001) (q8.3=EMS_ISO14064)
(q8.4=EMS_ISO16000) (q8.5=EMS_national.regional) (q8.6=EMS_other) (q8.7=EMS_none)
(q8.8=EMS_unknown).
rename variables (q24.1=reliance_own_financial_resources)
(q24.2=reliance_own_tech_expertise) (q24.3=reliance_external_support)
(q24.4=reliance_other) (q24.5=reliance_unknown).
rename variables (q25.1=financial_support.public_funding)
(q25.2=financial_support.private_funding)
(q25.3=financial_support.funding_friends_relatives).
rename variables (q25.4=non_financial_support_publicadministration)
(q25.5=non_financial_support_private_consulting_audit)
(q25.6=non_financial_support_business_associations).
rename variables (q25.7=external_support_other) (q25.8=external_support_unknown).

*Compute 'EMS-adoption' variable.
Compute EMS_adoption=9.
Variable labels EMS_adoption 'Adoption of an EMS yes/no'.
IF (EMS_EMAS=1 OR EMS_ISO14001=1 OR EMS_ISO14064=1 OR EMS_ISO16000=1
OR EMS_national.regional=1 OR EMS_other=1) EMS_adoption=1.
IF (EMS_none=1) EMS_adoption=0.
IF (EMS_unknown=1) EMS_adoption=8.
Missing values EMS_adoption (8,9).

Variable level EMS_adoption (nominal).
Execute.

*Compute variables for institutional pressures for (not) producing green products/services.
Compute Regulative=9.
Variable labels Regulative 'Compliance to laws & regulations'.
IF (q22a.8=1 OR q22b.8=1) Regulative=1.
IF (q22a.8=0 OR q22b.8=0) Regulative=0.
Missing values Regulative(9).
Execute.

Compute Normative_1=9.
Variable labels Normative_1 'Customer demand'.
IF (q22a.1=1 OR q22b.1=1) Normative_1=1.
IF (q22a.1=0 OR q22b.1=0) Normative_1=0.
Missing values Normative_1(9).
Execute.

Compute Normative_2=9.
Variable labels Normative_2 'Companys image'.
IF (q22a.2=1 OR q22b.2=1) Normative_2=1.
IF (q22a.2=0 OR q22b.2=0) Normative_2=0.
Missing values Normative_2(9).
Execute.

Compute Normative=9.
Variable labels Normative 'Normative total'.
IF (Normative_1=1 OR Normative_2=1) Normative=1.
IF (Normative_1=0 AND Normative_2=0) Normative=0.
Missing values Normative (9).
Variable level Normative (nominal).
Execute.

Compute Cognitive_1=9.
Variable labels Cognitive_1 'Competitor pressure'.
IF (q22a.7=1 OR q22b.7=1) Cognitive_1=1.
IF (q22a.7=0 OR q22b.7=0) Cognitive_1=0.
Missing values Cognitive_1(9).
Execute.

Compute Cognitive_2=9.
Variable labels Cognitive_2 'Companys values'.
IF (q22a.5=1 OR q22b.5=1) Cognitive_2=1.
IF (q22a.5=0 OR q22b.5=0) Cognitive_2=0.
Missing values Cognitive_2(9).
Execute.

Compute Cognitive=9.
Variable labels Cognitive 'Cognitive total'.

IF (Cognitive_1=1 OR Cognitive_2=1) Cognitive=1.
IF (Cognitive_1=0 AND Cognitive_2=0) Cognitive=0.
Missing values Cognitive(9).
Variable level Cognitive (nominal).
Execute.

*Compute variables for external support.
Compute Financial_support=9.
Variable labels Financial_support 'Any type of financial support'.
IF (financial_support.public_funding=1 OR financial_support.private_funding=1 OR
financial_support.funding_friends_relatives=1) Financial_support=1.
IF (financial_support.public_funding=0 AND financial_support.private_funding=0 AND
financial_support.funding_friends_relatives=0) Financial_support=0.
IF (reliance_unknown=1 OR reliance_unknown=9) Financial_support=9.
Missing values Financial_support(9).
Variable level Financial_support (nominal).
Execute.

Compute Non_financial_support=9.
Variable labels Non_financial_support 'Any type of non-financial support'.
IF (non_financial_support_publicadministration=1 OR
non_financial_support_private_consulting_audit=1 OR
non_financial_support_business_associations=1) Non_financial_support=1.
IF (non_financial_support_publicadministration=0 AND
non_financial_support_private_consulting_audit=0 AND
non_financial_support_business_associations=0) Non_financial_support=0.
IF (reliance_unknown=1 OR reliance_unknown=9) Non_financial_support=9.
Missing values Non_financial_support(9).
Variable level Non_financial_support (nominal).
Execute.

*Compute variable for green products/services yes or no.
Compute Green_products_services_yesno=9.
IF (q17=1) Green_products_services_yesno=1.
IF (q17=2 OR q17=3) Green_products_services_yesno=0.
IF (q17=4) Green_products_services_yesno=9.
Missing values Green_products_services_yesno (9).
Variable level Green_products_services_yesno (nominal).
Execute.

*Indicate missing values for all relevant variables.
Missing values Sector_category (5).
Missing values Company_size (4).
Missing values Company_age (9).
Missing values Performance (4,5).
Missing values reliance_unknown (1,9).
Missing values external_support_unknown (1,9).

*Delete 223 cases with more than 50 million Euro's in turnover.

Select if not (scr14=6).

*---------------------------------MISSING VALUE ANALYSIS--------------------------------.

*Check frequencies and missing values.
DATASET ACTIVATE DataSet1.
MVA VARIABLES= Performance EMS_adoption Regulative Normative Cognitive
Financial_support
    Non_financial_support Green_products_services_yesno Company_age Company_size
Sector_category
  /MAXCAT=25
  /CATEGORICAL=Performance EMS_adoption Regulative Normative Cognitive
Financial_support
    Non_financial_support Green_products_services_yesno Company_age Company_size
Sector_category.

*--------------------------------Clear missing data due to design----------------------------------.

*Recode 8648 cases having missing values on 'reliance on any type of support for producing green'.
IF (green_products_services_yesno=0) reliance_external_support=0.

*Recode 2962 cases for 'Type of external support' into no answer for reasons of 'Not mentioned' on 'External support'(2962 cases).
IF (reliance_external_support=0) Financial_support=0.
IF (reliance_external_support=0) Non_financial_support=0.
EXECUTE.

*Recode 783 cases having 'no resource efficient actions' into "0" for EMS-adoption.
IF (no_resource_efficient_actions=1) EMS_adoption=0.

*Check new frequencies and missing values for all relevant variables.
MVA VARIABLES= Performance EMS_adoption Regulative Normative Cognitive
Financial_support
    Non_financial_support Green_products_services_yesno Company_age Company_size
Sector_category
  /MAXCAT=25
  /CATEGORICAL=Performance EMS_adoption Regulative Normative Cognitive
Financial_support
    Non_financial_support Green_products_services_yesno Company_age Company_size
Sector_category.

*-----------------------------------True missing values--------------------------------------.

*Delete 869 cases having missing values on 'green products/services.
Select if not (green_products_services_yesno=4).

*Listwise deletion for missing values on the'EMS-adoption' variable (879 cases).

Select if not (EMS_unknown=1).

*Listwise deletion of cases with missing values on categorical variables.
Select if not (company_size=4).
Select if not (company_age=9).
Select if not (performance=5).
Select if not (performance=4).

*Check new frequencies and missing values for all relevant variables.
MVA VARIABLES= Performance EMS_adoption Regulative Normative Cognitive
Financial_support
    Non_financial_support Green_products_services_yesno Company_age Company_size
Sector_category
  /MAXCAT=25
  /CATEGORICAL=Performance EMS_adoption Regulative Normative Cognitive
Financial_support
    Non_financial_support Green_products_services_yesno Company_age Company_size
Sector_category.

*-----------------------------------DESCRIPTIVE STATISTICS-------------------------------.

*Descriptive statistics of the final sample.
DATASET ACTIVATE DataSet1.
FREQUENCIES VARIABLES=Performance EMS_adoption Regulative Normative
Cognitive Financial_support
    Non_financial_support Green_products_services_yesno Company_age Company_size
Sector_category
  /ORDER=ANALYSIS.

*-------------------------------ASSUMPTIONS CHECK---.
*Checking the assumptions for the binary logistic regression analysis.

*Checking for independence of errors.
DATASET ACTIVATE DataSet1.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT EMS_adoption
  /METHOD=ENTER Sector_category Company_size Company_age
Green_products_services_yesno Regulative
    Normative Cognitive Financial_support Non_financial_support
  /RESIDUALS DURBIN.

*Correlation matrix.
NONPAR CORR
  /VARIABLES=Sector_category Company_size Company_age
Green_products_services_yesno Regulative
    Normative Cognitive Financial_support Non_financial_support

```
  /PRINT=SPEARMAN TWOTAIL NOSIG
  /MISSING=PAIRWISE.
```

*Multicollinearity test.
```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COLLIN TOL
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT EMS_adoption
  /METHOD=ENTER Sector_category Company_size Company_age
Green_products_services_yesno Regulative
    Normative Cognitive Financial_support Non_financial_support.
```

*Checking the assumptions for the ordinal logistic regression analysis.

*Correlation matrix.
```
NONPAR CORR
  /VARIABLES=Sector_category Company_size Company_age
Green_products_services_yesno EMS_adoption
    Regulative Normative Cognitive Financial_support Non_financial_support
  /PRINT=SPEARMAN TWOTAIL NOSIG
  /MISSING=PAIRWISE.
```

*Multicollinearity test.
```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COLLIN TOL
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Performance
  /METHOD=ENTER Sector_category Company_size Company_age
Green_products_services_yesno Regulative
    Normative Cognitive EMS_adoption.
```

*--------------------BINARY LOGISTIC REGRESSION ANALYSIS-------------------------.

*Binary logistic regression analysis (model 1 and 2).
```
LOGISTIC REGRESSION VARIABLES EMS_adoption
  /METHOD=ENTER Sector_category Company_size Company_age
Green_products_services_yesno
  /METHOD=ENTER Sector_category Company_size Company_age
Green_products_services_yesno Regulative
    Normative Cognitive Financial_support Non_financial_support
  /CONTRAST (Sector_category)=Indicator(1)
  /CONTRAST (Company_size)=Indicator(1)
  /CONTRAST (Company_age)=Indicator(1)
  /CONTRAST (Green_products_services_yesno)=Indicator(1)
  /CONTRAST (Regulative)=Indicator(1)
  /CONTRAST (Normative)=Indicator(1)
```

```
/CONTRAST (Cognitive)=Indicator(1)
/CONTRAST (Financial_support)=Indicator(1)
/CONTRAST (Non_financial_support)=Indicator(1)
/SAVE=PRED PGROUP ZRESID
/CLASSPLOT
/PRINT=GOODFIT CORR ITER(1) CI(95)
/CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

*--------------------ORDINAL LOGISTIC REGRESSION ANALYSIS---------------------.

*Transform performance variable levels into the right order.
RECODE Performance (2=1) (3=2) (1=3) (4=4) (5=5).
VALUE LABELS Performance 1'Decreased' 2'Remained unchanged' 3'Increased'.
Variable level Performance (Ordinal).
Execute.

*Transformation of the categories of predictor and control variables for ordinal logistic regression.
RECODE EMS_Adoption (1=0) (0=1) (8=8)(9=9).
VALUE LABELS EMS_Adoption 1'No EMS' 0'EMS adopted'.
VARIABLE level EMS_Adoption (Nominal).
Execute.

RECODE Company_size (3=1) (2=2) (1=3) (4=4).
Value labels Company_size 1'50-249' 2'10-49' 3'1-9'.
Variable level Company_size (nomimal).
Execute.

RECODE Company_age (8=1) (7=2) (6=3) (5=4) (4=5) (3=6) (2=7) (1=8) (9=9).
Value labels Company_age 1'50+' 2'40-49' 3'30-39' 4'20-29' 5'10-19' 6'5-9' 7'2-5' 8'1 or less'.
Variable level Company_age (nominal).
Execute.

Recode Green_products_services_yesno (0=1) (1=0) (9=9).
Value labels Green_products_services_yesno 0'Green_products_services_yes'
1'Green_products_services_no'.
Variable level Green_products_services_yesno (nominal).
Execute.

Recode Regulative (1=0) (0=1) (9=9).
Value labels Regulative 0'Regulative' 1'No regulative'.
Variable level Regulative (nominal).
Execute.

Recode Normative (1=0) (0=1) (9=9).
Value labels Normative 0'Normative' 1'No normative'.
Variable level Normative (nominal).
Execute.

Recode Cognitive (1=0) (0=1) (9=9).

Value labels Cognitive 0'Cognitive' 1'No cognitive'.
Variable level Cognitive (nominal).
Execute.

*Ordinal logistic regression analysis (model 1).
DATASET ACTIVATE DataSet1.
PLUM Performance BY Sector_category Company_size Company_age
Green_products_services_yesno
  /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
  /LINK=LOGIT
  /PRINT=FIT PARAMETER SUMMARY TPARALLEL.

*Ordinal logistic regression analysis (model 2).
PLUM Performance BY Sector_category Company_size Company_age
Green_products_services_yesno
   EMS_adoption
  /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
  /LINK=LOGIT
  /PRINT=FIT PARAMETER SUMMARY TPARALLEL.

*Ordinal logistic regression analysis (model 3).
DATASET ACTIVATE DataSet1.
PLUM Performance BY Sector_category Company_size Company_age
Green_products_services_yesno
   EMS_adoption Regulative
  /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
  /LINK=LOGIT
  /LOCATION=Sector_category Company_size Company_age
Green_products_services_yesno EMS_adoption
   EMS_adoption*Regulative
  /PRINT=FIT PARAMETER SUMMARY TPARALLEL
  /SAVE=ESTPROB.

*Ordinal logistic regression analysis (model 4).
PLUM Performance BY Sector_category Company_size Company_age
Green_products_services_yesno
   EMS_adoption Normative
  /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
  /LINK=LOGIT
  /LOCATION=Sector_category Company_size Company_age
Green_products_services_yesno EMS_adoption
   EMS_adoption*Normative
  /PRINT=FIT PARAMETER SUMMARY TPARALLEL
  /SAVE=ESTPROB.

*Ordinal logistic regression analysis (model 5).
PLUM Performance BY Sector_category Company_size Company_age
Green_products_services_yesno
  EMS_adoption Cognitive
 /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
 /LINK=LOGIT
 /LOCATION=Sector_category Company_size Company_age
Green_products_services_yesno EMS_adoption
  Cognitive*EMS_adoption
 /PRINT=FIT PARAMETER SUMMARY TPARALLEL
 /SAVE=ESTPROB.

*----------------------------Testing the Proportional Odds Assumption------------------------.

*Recode dependent variable 'performance' into binary variables for 2 thresholds levels.
DATASET ACTIVATE DataSet1.
RECODE Performance (1=0) (2=1) (3=1) INTO Performance_threshold1.
VARIABLE LABELS Performance_threshold1 'Turnover unchanged and above'.
EXECUTE.

RECODE Performance (1=0) (2=0) (3=1) INTO Performance_threshold2.
VARIABLE LABELS Performance_threshold2 'Turnover increased (and above)'.
EXECUTE.

*Check frequencies.
FREQUENCIES VARIABLES=Performance Performance_threshold1
Performance_threshold2
 /ORDER=ANALYSIS.

*Recode categorical explanatory variables for separate tests of parallel lines.
RECODE Sector_category (1=1) (2=0) (3=0) (4=0) INTO Sector_category_manufacturing.
VARIABLE LABELS Sector_category_manufacturing 'manufacturing'.
EXECUTE.
RECODE Sector_category (3=0) (4=0) (1=0) (2=1) INTO Sector_category_retail.
VARIABLE LABELS Sector_category_retail 'retail'.
EXECUTE.
RECODE Sector_category (4=0) (1=0) (3=1) (2=0) INTO Sector_category_services.
VARIABLE LABELS Sector_category_services 'services'.
EXECUTE.
RECODE Sector_category (1=0) (2=0) (3=0) (4=1) INTO Sector_category_industry.
VARIABLE LABELS Sector_category_industry 'Industry'.
EXECUTE.

RECODE Company_size (3=1) (2=0) (1=0) INTO Size_micro.
VARIABLE LABELS Size_micro 'micro'.
EXECUTE.
RECODE Company_size (1=0) (2=1) (3=0) INTO Size_small.

VARIABLE LABELS Size_small 'small'.
EXECUTE.
RECODE Company_size (3=0) (1=1) (2=0) INTO Size_medium.
VARIABLE LABELS Size_medium 'medium'.
EXECUTE.

RECODE Company_age (1=1) (2=0) (3=0) (4=0) (5=0) (6=0) (7=0) (8=0) INTO
Age_50plus.
VARIABLE LABELS Age_50plus '50+'.
EXECUTE.
RECODE Company_age (3=0) (4=0) (5=0) (6=0) (7=0) (8=0) (1=0) (2=1) INTO Age_40_49.
VARIABLE LABELS Age_40_49 '40-49'.
EXECUTE.
RECODE Company_age (4=0) (5=0) (6=0) (7=0) (8=0) (1=0) (2=0) (3=1) INTO Age_30_39.
VARIABLE LABELS Age_30_39 '30_39'.
EXECUTE.
RECODE Company_age (5=0) (6=0) (7=0) (8=0) (1=0) (2=0) (4=1) (3=0) INTO Age_20_29.
VARIABLE LABELS Age_20_29 '20_29'.
EXECUTE.
RECODE Company_age (6=0) (7=0) (8=0) (1=0) (2=0) (3=0) (5=1) (4=0) INTO Age_10_19.
VARIABLE LABELS Age_10_19 '10_19'.
EXECUTE.
RECODE Company_age (7=0) (8=0) (1=0) (2=0) (3=0) (4=0) (6=1) (5=0) INTO Age_6_9.
VARIABLE LABELS Age_6_9 '6_9'.
EXECUTE.
RECODE Company_age (8=0) (1=0) (2=0) (3=0) (4=0) (5=0) (7=1) (6=0) INTO Age_2_5.
VARIABLE LABELS Age_2_5 '2_5'.
EXECUTE.
RECODE Company_age (1=0) (2=0) (3=0) (4=0) (5=0) (6=0) (8=1) (7=0) INTO
Age_1_or_less.
VARIABLE LABELS Age_1_or_less '1 or less'.
EXECUTE.

*Logistic regression with different thresholds for model 1.
LOGISTIC REGRESSION VARIABLES Performance_threshold1
  /METHOD=ENTER Sector_category Company_size Company_age
Green_products_services_yesno
  /CONTRAST (Sector_category)=Indicator
  /CONTRAST (Company_size)=Indicator
  /CONTRAST (Company_age)=Indicator
  /CONTRAST (Green_products_services_yesno)=Indicator
  /CLASSPLOT
  /CASEWISE OUTLIER(2)
  /PRINT=GOODFIT ITER(1) CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).

LOGISTIC REGRESSION VARIABLES Performance_threshold2
  /METHOD=ENTER Sector_category Company_size Company_age
Green_products_services_yesno
  /CONTRAST (Sector_category)=Indicator

/CONTRAST (Company_size)=Indicator
/CONTRAST (Company_age)=Indicator
/CONTRAST (Green_products_services_yesno)=Indicator
/CLASSPLOT
/CASEWISE OUTLIER(2)
/PRINT=GOODFIT ITER(1) CI(95)
/CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).

*Separate ordinal logistic regressions for levels of control variables in model 1.
PLUM Performance BY Sector_category_manufacturing
 /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
 /LINK=LOGIT
 /PRINT=TPARALLEL.
PLUM Performance BY Sector_category_retail
 /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
 /LINK=LOGIT
 /PRINT=TPARALLEL.
PLUM Performance BY Sector_category_services
 /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
 /LINK=LOGIT
 /PRINT=TPARALLEL.

PLUM Performance BY Sector_category_industry
 /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
 /LINK=LOGIT
 /PRINT=TPARALLEL.
PLUM Performance BY Size_micro
 /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
 /LINK=LOGIT
 /PRINT=TPARALLEL.
PLUM Performance BY Size_small
 /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
 /LINK=LOGIT
 /PRINT=TPARALLEL.
PLUM Performance BY Size_medium
 /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
 /LINK=LOGIT
 /PRINT=TPARALLEL.

PLUM Performance BY Age_1_or_less
 /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
 /LINK=LOGIT

/PRINT=TPARALLEL.
PLUM Performance BY Age_2_5
  /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
  /LINK=LOGIT
  /PRINT=TPARALLEL.
PLUM Performance BY Age_6_9
  /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
  /LINK=LOGIT
  /PRINT=TPARALLEL.
PLUM Performance BY Age_10_19
  /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
  /LINK=LOGIT
  /PRINT=TPARALLEL.
PLUM Performance BY Age_20_29
  /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
  /LINK=LOGIT
  /PRINT=TPARALLEL.
PLUM Performance BY Age_30_39
  /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
  /LINK=LOGIT
  /PRINT=TPARALLEL.
PLUM Performance BY Age_40_49
  /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
  /LINK=LOGIT
  /PRINT=TPARALLEL.
PLUM Performance BY Age_50plus
  /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
  /LINK=LOGIT
  /PRINT=TPARALLEL.

PLUM Performance BY Green_products_services_yesno
  /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
  /LINK=LOGIT
  /PRINT=TPARALLEL.

*Logistic regresion with different thresholds for model 2.
LOGISTIC REGRESSION VARIABLES Performance_threshold1
  /METHOD=ENTER Sector_category Company_size Company_age
Green_products_services_yesno EMS_adoption
  /CONTRAST (Sector_category)=Indicator
  /CONTRAST (Company_size)=Indicator
  /CONTRAST (Company_age)=Indicator

```
 /CONTRAST (Green_products_services_yesno)=Indicator
 /CONTRAST (EMS_adoption)=Indicator
 /CLASSPLOT
 /CASEWISE OUTLIER(2)
 /PRINT=GOODFIT ITER(1) CI(95)
 /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).


DATASET ACTIVATE DataSet1.
LOGISTIC REGRESSION VARIABLES Performance_threshold2
 /METHOD=ENTER Sector_category Company_size Company_age
Green_products_services_yesno EMS_adoption
 /CONTRAST (Sector_category)=Indicator
 /CONTRAST (Company_size)=Indicator
 /CONTRAST (Company_age)=Indicator
 /CONTRAST (Green_products_services_yesno)=Indicator
 /CONTRAST (EMS_adoption)=Indicator
 /CLASSPLOT
 /CASEWISE OUTLIER(2)
 /PRINT=GOODFIT ITER(1) CI(95)
 /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

*Separate ordinal logistic regressions for levels of control variables in model 2.
```
PLUM Performance BY EMS_adoption
 /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
 /LINK=LOGIT
 /PRINT=TPARALLEL.
```

*Logistic regression with different thresholds for model 3.
```
LOGISTIC REGRESSION VARIABLES Performance_threshold1
 /METHOD=ENTER Sector_category Company_size Company_age
Green_products_services_yesno EMS_adoption
  EMS_adoption*Regulative
 /CONTRAST (Sector_category)=Indicator
 /CONTRAST (Company_size)=Indicator
 /CONTRAST (Company_age)=Indicator
 /CONTRAST (Green_products_services_yesno)=Indicator
 /CONTRAST (EMS_adoption)=Indicator
 /CONTRAST (Regulative)=Indicator
 /CLASSPLOT
 /CASEWISE OUTLIER(2)
 /PRINT=GOODFIT ITER(1) CI(95)
 /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).


LOGISTIC REGRESSION VARIABLES Performance_threshold2
 /METHOD=ENTER Sector_category Company_size Company_age
Green_products_services_yesno EMS_adoption
  EMS_adoption*Regulative
 /CONTRAST (Sector_category)=Indicator
 /CONTRAST (Company_size)=Indicator
```

```
 /CONTRAST (Company_age)=Indicator
 /CONTRAST (Green_products_services_yesno)=Indicator
 /CONTRAST (EMS_adoption)=Indicator
 /CONTRAST (Regulative)=Indicator
 /CLASSPLOT
 /CASEWISE OUTLIER(2)
 /PRINT=GOODFIT ITER(1) CI(95)
 /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

*Separate ordinal logistic regressions for levels of control variables in model 3.
```
PLUM Performance BY EMS_adoption Regulative
 /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
 /LINK=LOGIT
 /LOCATION=EMS_adoption*Regulative
 /PRINT=TPARALLEL.
```

*Logistic regression with different thresholds for model 4.
```
LOGISTIC REGRESSION VARIABLES Performance_threshold1
 /METHOD=ENTER Sector_category Company_size Company_age
Green_products_services_yesno EMS_adoption
   EMS_adoption*Normative
 /CONTRAST (Sector_category)=Indicator
 /CONTRAST (Company_size)=Indicator
 /CONTRAST (Company_age)=Indicator
 /CONTRAST (Green_products_services_yesno)=Indicator
 /CONTRAST (EMS_adoption)=Indicator
 /CONTRAST (Normative)=Indicator
 /CLASSPLOT
 /CASEWISE OUTLIER(2)
 /PRINT=GOODFIT ITER(1) CI(95)
 /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

```
LOGISTIC REGRESSION VARIABLES Performance_threshold2
 /METHOD=ENTER Sector_category Company_size Company_age
Green_products_services_yesno EMS_adoption
   EMS_adoption*Normative
 /CONTRAST (Sector_category)=Indicator
 /CONTRAST (Company_size)=Indicator
 /CONTRAST (Company_age)=Indicator
 /CONTRAST (Green_products_services_yesno)=Indicator
 /CONTRAST (EMS_adoption)=Indicator
 /CONTRAST (Normative)=Indicator
 /CLASSPLOT
 /CASEWISE OUTLIER(2)
 /PRINT=GOODFIT ITER(1) CI(95)
 /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

*Separate ordinal logistic regressions for levels of control variables in model 4.

PLUM Performance BY EMS_adoption Normative
  /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
  /LINK=LOGIT
  /LOCATION=EMS_adoption*Normative
  /PRINT=TPARALLEL.

*Logistic regression with different thresholds for model 5.
LOGISTIC REGRESSION VARIABLES Performance_threshold1
  /METHOD=ENTER Sector_category Company_size Company_age
Green_products_services_yesno EMS_adoption
    Cognitive*EMS_adoption
  /CONTRAST (Sector_category)=Indicator
  /CONTRAST (Company_size)=Indicator
  /CONTRAST (Company_age)=Indicator
  /CONTRAST (Green_products_services_yesno)=Indicator
  /CONTRAST (EMS_adoption)=Indicator
  /CONTRAST (Cognitive)=Indicator
  /CLASSPLOT
  /CASEWISE OUTLIER(2)
  /PRINT=GOODFIT ITER(1) CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).

LOGISTIC REGRESSION VARIABLES Performance_threshold2
  /METHOD=ENTER Sector_category Company_size Company_age
Green_products_services_yesno EMS_adoption
    Cognitive*EMS_adoption
  /CONTRAST (Sector_category)=Indicator
  /CONTRAST (Company_size)=Indicator
  /CONTRAST (Company_age)=Indicator
  /CONTRAST (Green_products_services_yesno)=Indicator
  /CONTRAST (EMS_adoption)=Indicator
  /CONTRAST (Cognitive)=Indicator
  /CLASSPLOT
  /CASEWISE OUTLIER(2)
  /PRINT=GOODFIT ITER(1) CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).

*Separate ordinal logistic regressions for levels of control variables in model 5.
PLUM Performance BY EMS_adoption Cognitive
  /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
  /LINK=LOGIT
  /LOCATION=Cognitive*EMS_adoption
  /PRINT=TPARALLEL.

*--END OF SYNTAX---.

Appendix 3: Missing value analysis

Table A3.1: first missing data examination.

Variables	N	Missing Count	Percent
Performance	12610	676	5.1
EMS adoption	11469	1817	13.7
Regulative pressures	12417	869	6.5
Normative pressures	12417	869	6.5
Cognitive pressures	12417	869	6.5
Financial support	807	12479	93.9
Non-financial support	807	12479	93.9
Green products or services	12417	869	6.5
Age	13154	132	1.0
Size	13284	2	0
Sector	13286	0	0

Table A3.2: second missing data examination.

Variables	N	Missing Count	Percent
Performance	12610	676	5.1
EMS adoption	12252	1034	7.8
Regulative pressures	12417	869	6.5
Normative pressures	12417	869	6.5
Cognitive pressures	12417	869	6.5
Financial support	12417	869	6.5
Non-financial support	12417	869	6.5
Green products or services	12417	869	6.5
Age	13154	132	1.0
Size	13284	2	0
Sector	13286	0	0

Table A3.3: Final missing data examination.

Variables	N	Missing Count	Percent
Performance	10262	0	0
EMS adoption	10262	0	0
Regulative pressures	10262	0	0
Normative pressures	10262	0	0
Cognitive pressures	10262	0	0
Financial support	10262	0	0
Non-financial support	10262	0	0
Green products or services	10262	0	0
Age	10262	0	0
Size	10262	0	0
Sector	10262	0	0

Appendix 4: Descriptive statistics

Table A4.1: Dependent variable: Performance.

Variables	Category	Frequency	Percentage
Performance	Increased turnover	3815	37.2%
	Unchanged turnover	2981	29.0%
	Decreased turnover	3466	33.8%

Table A4.2: (In)dependent variable: EMS adoption.

Variables	Category	Frequency	Percentage
EMS Adoption	One or more types of EMS	3147	30.7%
	No EMS	7115	69.3%

Table A4.3: Independent variables.

Variables	Frequency	Percentage
Regulative	1989	19.4%
Normative	5494	53.5%
Cognitive	3106	30.3%
Financial support	239	2.3%
Non-financial support	422	4.1%

Table 4.4: Control variables.

Variables	Category	Frequency	Percentage
Sector	Manufacturing	2322	22.6%
	Retail	3159	30.8%
	Services	2741	26.7%
	Industry	2040	19.9%
Size	Micro (1-9)	4694	45.7%
	Small (10-49)	3660	35.7%
	Medium (50-249	1908	18.6%
Age (in years)	<1	74	0.7%
	2-5	1208	11.8%
	6-9	1242	12.1%
	10-19	3041	29.6%
	20-29	2284	22.3%
	30-39	908	8.8%
	40-49	437	4.3%
	50+	1068	10.4%
Green products or services	Yes	3208	31.3%
	No	7054	68.7%

Appendix 5: Assumption testing for proportional odds

Table A5.1: Assumption of proportional odds testing for model 1.

	B Coefficients			Odds ratios		Test of parallel lines (p-values)
	Ordinal	Threshold 1	Threshold 2	Threshold 1	Threshold 2	
Control variables						
Sector: Industry [a]						
Sector: Manufacturing	.045	.045	.056	1.046	1.058	.524
Sector: Retail	-.017	-.095	.059	.909	1.061	.000
Sector: Services	.167**	.205***	.145**	1.227	1.156	.008
Size: micro (1-9) [a]						
Size: small (10-49)	.578***	.547***	.619***	1.728	1.858	.635
Size: medium (50-250)	1.052***	.997***	1.115***	2.709	3.050	.887
Age: 0-1 [a]						
Age: 2-5	-.459	-1.208**	-.330	.299	.719	.129
Age: 6-9	-.870***	-1.780***	-.658**	.169	.519	.005
Age: 10-19	-1.350***	-2.136***	-1.226***	.118	.293	.245
Age: 20-29	-1.706***	-2.494***	-1.586***	.083	.205	.842
Age: 30-39	-1.605***	-2.393***	-1.494***	.091	.224	.734
Age: 40-49	-1.831***	-2.598***	-1.741***	.074	.175	.547
Age: 50+	-1.644***	-2.359***	-1.593***	.094	.203	.022
Green products/services: (yes)	.261***	.247***	.273***	1.280	1.314	.476
Chi-square		596.545***	692.534***			
Hosmer & Lemeshow test		6.681	12.491			

Notes: *p<.05, **p<.01, ***p<.001. a=reference category.

Table A5.2: Assumption of proportional odds testing for model 2.

	B Coefficients			Odds ratios		Test of parallel lines (p-values)
	Ordinal	Threshold 1	Threshold 2	Threshold 1	Threshold 2	
Control variables						
Sector: Industry [a]						
Sector: Manufacturing	.046	.045	.058	1.046	1.059	.524
Sector: Retail	-.015	-.095	.063	.910	1.065	.000
Sector: Services	.169**	.205**	.150***	1.228	1.162*	.008
Size: micro (1-9) [a]						
Size: small (10-49)	.575***	.546***	.614***	1.726	1.848	.635
Size: medium (50-250)	1.045***	.994***	1.102***	2.702	3.009	.887
Age: 0-1 [a]						
Age: 2-5	-.459	-1.208**	-.327	.299	.721	.129
Age: 6-9	-.869***	-1.779***	-.653**	.169	.520	.005
Age: 10-19	-1.350***	-2.136***	-1.224***	.118	.294	.245
Age: 20-29	-1.707***	-2.494***	-1.585***	.083	.205	.842
Age: 30-39	-1.604***	-2.392***	-1.491***	.091	.225	.734
Age: 40-49	-1.831***	-2.597***	-1.741***	.074	.175	.547
Age: 50+	-1.643***	-2.359***	-1.590***	.095	.204	.022
Green products/services: (yes)	.259***	.246***	.268***	1.279	1.308	.476
Main Effect						
EMS adoption	.023	.009	.045	1.009	1.046	.387
Chi-square		596.575***	693.416***			
Hosmer & Lemeshow test		6.515	12.689			

Notes: *p<.05, **p<.01, ***p<.001. a=reference category.

Table A5.3: Assumption of proportional odds testing for model 3.

	B Coefficients			Odds ratios		Test of parallel lines (p-values)
	Ordinal	Threshold 1	Threshold 2	Threshold 1	Threshold 2	
Control variables						
Sector: Industry [a]						
Sector: Manufacturing	.045	.045	.057	1.046	1.059	.524
Sector: Retail	-.016	-.095	.062	.910	1.064	.000
Sector: Services	.169**	.205**	.150*	1.228	1.162	.008
Size: micro (1-9) [a]						
Size: small (10-49)	.575***	.546***	.614***	1.726	1.848	.635
Size: medium (50-250)	1.046***	.995***	.1.103***	2.704	3.013	.887
Age: 0-1 [a]						
Age: 2-5	-.458	-1.208**	-.327	.229	.721	.129
Age: 6-9	-.868***	-1.779***	-.652**	.169	.521	.005
Age: 10-19	-1.350***	-2.135***	-1.223***	.118	.294	.245
Age: 20-29	-1.706***	-2.494***	-1.584***	.083	.205	.842
Age: 30-39	-1.604***	-2.392***	-1.490***	.091	.225	.734
Age: 40-49	-1.831***	-2.597***	-1.741***	.074	.175	.547
Age: 50+	-1.643***	-2.358***	-1.589***	.095	.204	.022
Green products/services: (yes)	.260***	.246***	.270***	1.280	1.310	.476
Main effect						
EMS adoption	.029	.013	.056	1.013	1.058	.387
Moderating effects						
Regulative*EMS-Adoption	-.041	-.024	-.056	.976	.946	.824
Chi-square		596.636***	693.783*			
Hosmer & Lemeshow test		6.744	13.467			

Notes: *p<.05, **p<.01, ***p<.001. a=reference category.

Table A5.4: Assumption of proportional odds testing for model 4.

	B Coefficients			Odds ratios		Test of parallel lines (p-values)
	Ordinal	Threshold 1	Threshold 2	Threshold 1	Threshold 2	
Control variables						
Sector: Industry [a]						
Sector: Manufacturing	.046	.045	.057	1.046	1.059	.524
Sector: Retail	-.014	-.095	.063	.910	1.065	.000
Sector: Services	.168**	.205**	.150*	1.228	1.162	.008
Size: micro (1-9) [a]						
Size: small (10-49)	.576***	.546***	.614***	1.726	1.847	.635
Size: medium (50-250)	1.046***	.994***	1.101***	2.702	3.008	.887
Age: 0-1 [a]						
Age: 2-5	-.457	-1.208*	-.326	.299	.722	.129
Age: 6-9	-.866***	-1.780***	-.652**	.169	.521	.005
Age: 10-19	-1.346***	-2.136***	-1.222***	.118	.295	.245
Age: 20-29	-1.703***	-2.495***	-1.583***	.083	.205	.842
Age: 30-39	-1.601***	-2.393***	-1.489***	.091	.226	.734
Age: 40-49	-1.826***	-2.598***	-1.739***	.074	.176	.547
Age: 50+	-1.640***	-2.359***	-1.589***	.094	.204	.022
Green products/services: (yes)	.266***	.247***	.265***	1.280	1.304	.476
Main effect						
EMS adoption	-.015	.014	.027	1.014	1.027	.387
Moderating effects						
Regulative*EMS-Adoption						.824
Normative*EMS-adoption	.014	-.010	.032	.990	1.033	.613
Chi-square		596.590***	693.595***			
Hosmer & Lemeshow test		7.353	14.484			

Notes: *p<.05, **p<.01, ***p<.001. a=reference category.

Table A5.5: Assumption of proportional odds testing for model 5.

	B Coefficients			Odds ratios		Test of parallel lines (p-values)
	Ordinal	Threshold 1	Threshold 2	Threshold 1	Threshold 2	
Control variables						
Sector: Industry [a]						
Sector: Manufacturing	.047	.045	.058	1.046	1.060	.524
Sector: Retail	-.014	-.095	.063	.910	1.066	.000
Sector: Services	.169**	.205**	.150*	1.227	1.162	.008
Size: micro (1-9) [a]						
Size: small (10-49)	.574***	.545***	.613***	1.725	1.675	.635
Size: medium (50-250)	1.046***	.995***	1.103***	2.706	3.012	.887
Age: 0-1 [a]						
Age: 2-5	-.469	-1.217*	-.337	.296	.714	.129
Age: 6-9	-.878***	-1.789***	-.663**	.167	.515	.005
Age: 10-19	-1.359***	-2.145***	-1.234***	.117	.291	.245
Age: 20-29	-1.714***	-2.502***	-1.593***	.082	.203	.842
Age: 30-39	-1.614***	-2.400***	-1.499***	.091	.223	.734
Age: 40-49	-1.844***	-2.610***	-1.754***	.074	.173	.547
Age: 50+	-1.657***	-2.369***	-1.601***	.094	.202	.022
Green products/services: (yes)	.237***	.232***	.254****	1.261	1.290	.476
Main effect						
EMS adoption	0.017	-.052	-0.015	.950	.985	.387
Moderating effects						
Regulative*EMS-Adoption						.824
Normative*EMS-adoption						.613
Cognitive*EMS-Adoption	.194**	.194*	.182*	1.214	1.200	.543
Chi-square		601.679***	698.591***			
Hosmer & Lemeshow test		5.532	11.959			

Notes: *p<.05, **p<.01, ***p<.001. a=reference category.